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The Effects of Cooperative Learning Strategies and Attitudes on Performance in Secondary School Mathematics in the South West Region of the Republic of Cameroon

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ABSTRACT

This study examined, "The Effects of Cooperative Learning Strategies and Attitudes on Performance in Secondary School Mathematics in the South West Region of Cameroon". The researcher's concern about the study emerged from his observations over a period of more than five consecutive years on the very poor performance of students at the General Certificate of Education, Ordinary Level. This made him to ask a number of questions, from which one general research question was formulated. This was: - To what extent do cooperative learning strategies and attitudes affect performance of students in secondary school mathematics? This general research question gave rise to four specific research questions which were translated to a general hypothesis and four specific hypotheses respectively. A combined quasi-experimental and survey research design was used for the study. The target population of the study consisted of 5,671 Form Three students in the entire South West Region. From this population, a sample of 359 Form Three students was selected for the survey study, and 65 students in their intact groups of 34 and 31 students were used for the quasi-experimental study. Both probability, in particular, simple random sampling technique and the non-probability sampling, in particular, purposive sampling techniques were used in the study to select the subjects. The questionnaire, pre-test and post-test, instrument for focus group discussion were the instruments used for data collection. Validation of the instruments was done through face, content and constructs validity. Reliability was achieved through the test-re-test method. The hypotheses were tested through inferential statistics. In particular, through the t-test and Pearson Correlation (r) coefficient product moment. The results rejected all the null hypotheses while retaining their alternative forms. This led to the following conclusions:

1. The mean performance of students exposed to peer tutoring in the study of mathematics is significantly better than that of those who study individually.
2. The mean performance of students exposed to positive interdependence in the study of mathematics, is significantly better than that of those who study individually.
3. There is a significant relationship between interest in secondary school mathematics and performance.
4. There is a significant relationship between participation in mathematics lesson and performance in secondary school mathematics.

Based on these results, recommendations were made to teachers to regularly use cooperative learning strategies so as to raise the interest of learners and their participation in mathematics, with the results being improved performance.

Keywords: *Cooperative Learning, Attitudes, Performance, Peer tutoring, Positive interdependence, Interest, Participation*

INTRODUCTION:

Knowledge in Mathematics is needed as an important tool for understanding and for applications in science and technology leading to development. Specifically, Mathematics equips students with uniquely powerful ways to describe, analyse and change the world. It can stimulate moments of pleasure and wonder for all students, when they solve a problem for the first time, discover a more elegant solution, or notice hidden connections. Students who are functional in mathematics and financially capable are able to think independently in applied and abstract ways, and can reason, solve problems and assess risk. (Fombin, 1992).

Mathematical thinking is important for all members of a modern society as a habit of mind for its use in the workplace, business and finance; and for personal decision-making. Mathematics is fundamental to national prosperity as it is essential in public decision-making and for participation in the knowledge of economy. It is a creative discipline. The language of mathematics is international as its importance is universally recognized over time as a means of solving problems.

Mathematics is one of the major subjects in the sciences in which its performance directly and indirectly affects performance in the other science subjects as it provide tools for understanding physics, chemistry, engineering, technology, economics and others. It is also important as an entrance requirement to read the science subjects in high school and science disciplines in higher secondary schools and the university programs in Cameroon and other nations of the world.

In Cameroon secondary schools, the study of mathematics is usually not taken seriously by many students. Sometimes this lack of seriousness is blamed on teachers for not bringing into the teaching learning process methods with strategies that can improve students' performance. At times the blame is on the learners who are coerced by society or parenting factors to develop attitudes which produce poor results.

According to Merton (1998), the success of students depends much on the teacher. If teachers present their subject matter and fail to engage students in the learning process, learning becomes abstract and may lead to a mistaken belief that the subject is difficult, and that it is meant for a few gifted ones.

By asking students to rate their likes for professions, Light Body and Dunrell (1996) discovered that the kinds of professions students like were mathematics and physical sciences related professions such as laboratory technology, medicine, engineering, astrology, electronics, and computers.

Statement of the Problem

The role played by good performance in mathematics need not be over emphasized. Unfortunately, it is disheartening to note that with all the importance attached to mathematics, performance in secondary schools in Cameroon remains deplorable at the General Certificate of Education Examination. This is shown on table 1 of this study.

This poor performance seems to be a major handicap in the development of science and technology which are corner stones for development.

In its quest for becoming an emergent country by 2035, Cameroon has formulated several objects as a vision for its attainment. Amongst these are: Eradication of poverty by reducing it to less than 10%.

The present poverty rate of Cameroon according to World Bank estimate stands at 40% since the 2017 review.

- To bring it down to 10% will imply that performance in mathematics should be greatly improved. This is because to enhance development in science and technology, knowledge in mathematics is needed in Engineering which has to do with road construction, construction of modern cities, aviation, cars manufacture etc. The development of these sectors will lead to massive employment opportunities for all Cameroonians thus leading to a reduction of poverty level drastically. Unfortunately, the trend as far as performance in mathematics shows that Cameroon is far from this realization.

  Make tremendous improvements in health care.
- Knowledge in mathematics is needed in health care services. Most universities have a pass in Ordinary level mathematics as a mandatory condition to study medicines and other health related disciplines. Tremendous improvement in health care facilities will require the need to train many Cameroonians to take care of our hospitals, clinics, and train technicians in health technology to manage equipment for health care placed in medical institutions, reduce infectious diseases and HIV to a minimum and guarantee public health hygiene. Many Cameroonians are eliminated in their quest for professions in these domains due to poor performance in mathematics

Become an upper middle income country

- A World Bank classification in 2016 places Cameroon as lower middle income country. Lower income countries are those with a Gross National Investment (GNI) per capita between $1,046 to $4,125 which is a GNI per capital equivalent of 523,000 to 2,062,500 FCFA frs. The major characteristic of lower middle income level is the provision of citizens with essential services such as water and electricity. For the economies in the upper middle income category which Cameroon has as a vision attainment in 2035, their basic challenges are curbing corruption and improving governance.

The provision for electricity for example needs knowledge in mathematics. To move to the upper middle income level, Cameroon needs to overcome the present shortages realized in these domains. This seems to be far from being realized. The attainment of this objective for vision 2035 seems to be threatened.

Become a newly industrialised country

- To attain this objective, Cameroon must arrive at a state where it uses machines to do work that was once done by people. Good performance in mathematics is a cornerstone in large scale industrialization in agriculture and manufacturing industries. Students who have interest in studies relating to industrialization are usually required to have least a pass grade in ordinary level mathematics at the General Certificate of Education Examination. At this level of performance in this subject, it will be difficult to attain this objective. For it to be achieved, we need improved performance in mathematics.

Become a country whose economy will be mainstreamed into the global economy in terms of trade, finances etc. In this way, the economy becomes very competitive to attract foreign investment and reduce financial deficits with a favourable balance of payment.

- Here too, good performance in mathematics is involved.

With the current challenges set before us in realizing vision 2035, it seems as if, it is imperative for the teacher to structure classroom events, involve the learners in the lesson, create opportunities for them to learn from peers and become architects of their own knowledge. This seems to be the way by which learning will become more meaningful and long lasting with improved results.

Research Questions

General Research Question

To what extent do cooperative learning strategies and attitudes affect students' performance in secondary school mathematics?

Specific Research Questions

1. To what extent does peer tutoring affect performance of students in secondary school mathematics?
2. To what extent does positive interdependence affect performance of students in secondary school mathematics?
3. To what extent does interest affect performance in secondary school mathematics?
4. To what extent does participation in a mathematics lesson affect performance in secondary school mathematics?

Background of the Study

The educational, system in Cameroon is divided into primary, secondary and tertiary levels. The primary level lasts for six years, the secondary lasts for seven years; that is five years for the ordinary level and two years for the advanced level. Certificates obtained at the Ordinary and Advanced levels determine admission into various fields of students at the tertiary level (Universities and Higher Institution of learning).

Many parents desire their children to enroll in professional courses which make use of knowledge in mathematics at the tertiary level. These include medicines, science and technology, pharmacy, engineering, electronics, etc. unfortunately, this desire is not met due to poor performance in the subject.

In Cameroon, efforts to enhance the effectiveness of mathematics education have included making mathematics a compulsory subject during the first five years of secondary education. Bate (2010) observes that, in Cameroon mathematics enjoys a special status in the school curriculum by being one of the core subjects, and that more lessons of mathematics are taught in schools than any other science subject.

Studies carried out by Cockcroft (2011) revealed that, mathematics is a difficult subject both to teach and to learn. Its importance however, cannot exclude it from the school curriculum. According to him, "mathematics is only one of the many subjects on the curriculum. Yet, thee is greater pressure for children to usefulness". For many, the usefulness of mathematics is seen in terms of arithmetic skills needed for use at home, a means of communication and as a tool for studying other subjects.

Despite the important role played by mathematics today, it is ironical that, performance, particularly at the ordinary level GCE is usually very poor when compared to other subjects. This bring into question the teaching and learning strategies put in place by the teacher to involve the learners in the subject and enhance performance.

Releases from the Cameroon General Certificate of Education (GCE) Examination Board in the past five years reveal the general performance in maths as follows:

Table 1: Summary performance at the General Certificate of Education Examination in Mathematics

Year	No of candidates who sat	No of candidates who passed	Percentage passed
2016	90,901	11,272	12.4
2015	86,724	8,152	9.4
2014	81,675	12,333	15.1
2013	75,010	7,951	10.6
2012	61,311	5,457	8.9

Source: Results Booklet for GCE Results for 2012, 2013, 2014, 2015, 2016

The results above show that for the last five years, the percentage passed for Maths at the GCE "O" level had not attained 16.0% for any of the years. In 2012 it was 8.9%, in 2013 it was 10.6%, 2014 registered 15.1%, in 2015 it was 9.4% and in 2016 it was 12.4%.

Rating the performance in mathematics in relation to other subjects nationwide reveals the following:

Table 2: Comparing performance in Mathematics to other subjects

Year	Subject	% pass	Year	Subject	% pass	Year	Subject	% pass	Year	Subject	% pass
2016	Religious knowledge	67.3	2015	Econs	66.7	2014	Religious Studies	68.3	2013	Eng. Lit.	65.8
	Commerce	64.9		Commerce	61.3		Econs	64.7		Biology	62.8
	Biology	63.4		Religious Studies	55		Eng. Lit.	60		Rel. Know	60.457.3
	Economics	62.1		Biology	52.8		Biology	56.5		Economics	55.2
	Geography	55.4		Eng. Lit.	50.6		Commerce	50.4		Commerce	50.6
	English Literature	50.6		Geography	49.4		Eng. Lang.	47.4		Geography	44.2
	Chemistry	44.4		History	53.2		Geography	44.2		History	40.4
	History	37.4		Eng. Lang.	43.1		Chemistry	31.6		Chemistry	24.2
	English Language	18.3		Chemistry	40.6		History	29.9		Eng. Lang.	8.9
	Mathematics	12.4		Maths.	9.6		Maths	15.1		Maths	

Source: GCE Results and Statistical Analysis of the Performance at the GCE "O" Levels for2013, 2014, 2015, 2016

Results on table 2 show that when the percentage pass in mathematics nationwide was compared to other subjects, mathematics tailed the chart.

This research has the conviction that teaching and learning strategy which most teachers use in the classroom have led to the passive understanding of the subject, dislike of the teacher and subject, low participation in the classroom and eventually poor performance.

In a regional seminar workshop held in CCAS Kumba, the South West Association of Mathematics Teachers (SWAMT, 2001) examined the poor performance registered in mathematics and attributed it to poor teaching methods, and little effort that is put in by many students, thinking that mathematics is a domain for a few individuals and lack of knowledge by a wide variety of students particularly females on the usefulness of mathematics.

For teaching methods, they found out that, most teachers are used to the traditional methods which do not give room to learning by the students themselves. Here, they said that most teachers dominate classroom events causing teaching and learning to be a one-way traffic with the students considered to have little or nothing to contribute in their learning. The students were considered as vessels which needed to be filled. Little activities were observed, interactions amongst students and students, and between students and teachers are minimal.

Virtually, when the learners are not active in the teaching-learning process, acquisition of mathematical concepts will be low by a majority of learners and translation of these concepts into skills required in engineering, medicine, astrology and others will be the domain of a few.

In their recommendations for the effective teaching of mathematics in schools the following were spelt out amongst others:

- Effective teachers in mathematics should be knowledgeable, have a strong general background and understand the subject matter at a high level. They should understand how pupils learn and how to encourage learning.
- Effective mathematics teachers should be flexible, and have the ability to impart knowledge, through appropriate instructional techniques for particular situations. They should be flexible in making important instructional decisions. They model what is to be learnt, set appropriate goal levels for academic advancement, concentrate on a few dominant goals with a clear instructional objective. They should explain what is expected of students and allow for review and conclusion.
- Effective mathematics teachers should communicate clearly, get students involved in the classroom by asking questions, motivate learners, enrich

Methodology

In this study, the research design adopted was combined quasi-experimental survey research design. Quasi-experimental research is used in the establishment of cause and effect relationship. This design differs from the true experimental study in that, it lacks the elements of random assignments to treatment and control groups.

In this study, the cause is cooperative learning strategies, whose application was done through peer tutoring and positive interdependence and their effects observed in performance. As one of the characteristics of a quasi-experimental research design being the lack of a random assignment, students in classes from the two schools selected for the study remained intact. The two schools and classes were;

Form 3A &B of GHS BachuoNtai in Mamfe Central Sub-division, Manyu Division and Form 3A & B of GSS Lobe in EkondoTiti Sub division, in Ndian.

This study also incorporated the views of Nworgu (1990) in relation to survey studies which state that a survey research is one in which a group of people or elements is studied by collecting and analyzing data relating to their views and opinions from a few people or elements considered to be representatives of the entire group. The collection of data was done in line with the variables of the study.

Accordingly, their views or opinions in relation to student attitudes and more particularly, classroom participation and students' interest in Mathematics were sampled. Performance was determined by students' scores in mathematics obtained through the terminal examination.

Area of Study

This study was carried out in Cameroon, a bilingual country located in Central Africa. It is bounded by Nigeria in the West, the Republic of Chad and Central Africa in the East, Gabon, Equatorial Guinea and the Republic of Congo in the South and Nigeria and Chad in the North. Sometimes described as Africa in Miniature because it inhabits all the major climates and vegetation of the continent, Cameroon's land mass is 472,710$km_{2=}$ (182,510Sq.miles), with 2730km^2+ (1.050 sq miles) of water (Fonge 2016). According to the 2012 census statistics, it has a population of about 20,386,799 persons, found in ten administrative regions (Decree No. 2008/376 of 12th November 2008), two of which are English speaking, see Fig. 5: Map of Cameroon). The study was specifically carried out in the South West Region, which is one of the administrative regions of the country.

Population of the Study

The population consisted of all the secondary school students of Public Secondary Schools in the South West Region. The total was 40, 41811 (source:

Department of School Map and Statistics, Regional Delegation of Secondary Education, South West, Buea. Data for 2017/2018 School Year)

Target Population

The target population consisted of all the form three students of Government Secondary Schools in the South West Region.

Table 3: Summary of Target Population for the Study

Division	Class	Total enrolment
Fako	Form 3	2076
KupeMuanenguba	Form 3	467
Lebialem	Form 3	431
Manyu	Form 3	787
Meme	Form 3	1582
Ndian	Form 3	328
Total		5671

Source: 2017/2018 Statistical Data for the South West Regional Delegation of Secondary Education, Buea

Accessible Population

According to Nworgu (2004), the accessible population is the population within the reach of the researcher. The researcher at times draws his sample from the accessible population, or could use it as its sample particularly when its size is small and the elements can all be used in eth experiment or investigation.

For this study the researcher had access to twelve Form 3 classes of twelve different schools in the South West with two schools each from each division. This constituted the accessible population.

Sampling and Sampling Procedure

According to Krejcie and Morgan (1970) on the determination of sample size from a target population, a population of 5671 as is the case with this study, has as sample 359.

The representation of the sample was proportions to the accessible population.

Table 4: Summary of Sample selected from the Accessible Population for the Study

Division	Accessible school	Accessible Class	Accessible Population	Sample selected
Fako	GSS Debuncha	Form 3	43	30
	Mudeka	Form 3	53	37
Kupe-Muanenguba	GSS Muabi	Form 3	29	20
	GHS Ewusi	Form 3	43	30
Lebialem	GSS Fonjimeaw	Form 3	36	25
	GHS Alou	Form 3	81	57
Manyu	GSS Besongabang	Form 3	33	23
	GHS Buchuo	Form 3	34	24
Meme	GSS Mabanda	Form 3	56	33
	GHS Barombi	Form 3	47	39
Ndian	GSS Bongong	Form 3	27	19
	GSS Lobe	Form 3	31	22
Total			513	359

For the experimental study all the Form 3 students of GHS Bachuontai and GSS Lobe in their intact stream of Form 3A and B were used.

Table 5: Sample used for the Experimental Study

School	Form	Stream	Sample
GHS BachuoNtai	3	A	16
		B	18
GSS Lobe	3	A	15
		B	16
Total			65

For the first round of the experiment, the Form 3A classes of the above schools were used as experimental group while the Form 3B classes were used as control groups. In the second round of the experiment the Form 3B classes became the experimental groups while the Form 3A classes became the control groups.

Both the probability and non-probability sampling procedures were used in the selection process of the elements. For probability sampling, the simple random proportionate sampling procedure was used. In particular, a table of random numbers was used to select the sample. To do this:

For non-probability sampling technique, sampling technique, specifically, the purposive sampling technique was used. As main characteristics of non-probability sampling procedure, selection of a sample does not involve random selection, as does the probability sampling procedure. This does not mean that, non-probability sampling are not representative of the population.

Due to the fact that the quasi-experimental research design was adopted as part of in this study and it does not give room for randomization, the non-probability sampling technique was employed.

According to Trochim (2006), purposive sampling is used when we approve the sample within a pan in mind or when the intended sample possess the characteristics we needed for the purpose of the study.

In this study, Form 3 students possess the characteristics needed for the research. Form Three is a determinant class where students prepare their minds on which subjects to select for the Ordinary Level Examination. In this class, all the subjects are compulsory, just as they are for Forms 1 and 2. It is in this class that attitudes towards a subject determine the choice for future career.

Instruments for Data Collection

In this study, two instruments for data collection were used. These were the teacher made test and the questionnaire.

The Questionnaire

The questionnaire was designed to gather information about respondents in relation to the concerned variables of the study. It was designed into two sections. Section A had 9 items which were formulated for the variable on participation in classroom mathematics. Section B consisted of 13 items formulated to gather information interest in mathematics. The items on the questionnaire were closed ended response format of a four-scale quantinum of the Likert scale, consisting of Strongly Agree (SA), Agree (A), Disagree (DA) and Strongly Disagree (SDA).

Preference to section A of the questionnaire was a brief letter addressed to respondents, informing them about the purpose of the study, and requesting their objective responses to the items. Confidentiality for the responses was guaranteed, with the researcher telling them that, there are no wrong answers or more correct ones.

Pre-test and Post-test

In this study, the same test was used at the pre and post-test levels. The test consisted of 3 problems to be solved.

Lesson Notes

Two lesson notes were designed and used for the experiment. These were on the area of the trapezium and on the use of the Pythagoras' theorem. They were each used in both the control and experimental groups. The difference being that, during teaching in the experimental group, treatment was applied. This was either peer tutoring or positive interdependence, while the control groups were void of these interventions.

Validation of the Instruments

Instruments for this study were subjected to face validity, content and validity construct validity.

Face Validity

After constructing the instruments, copies were handed to some colleagues for proof reading. The suggestions initially made by some colleagues and their implementations, helped to improve on the quality of the instruments before they were submitted to the supervisor for scrutiny. After submission to the supervisor, she went through the items, correcting some, deleting the irrelevant ones and indicating the inclusion of some items. A panel was constituted to also examine the instruments during the defence of the research proposal. The corrections made helped to improve on the quality of the instruments.

Content Validity
To achieve this, all the content of matter taught to students during the experiment was an extract of the Mathematics Scheme of Work for Government Colleges in Cameroon. Also, recognized textbooks such as Harmonised Mathematics by AkwaUsman Meh (3rd Ed.) and Ordinary Level Mathematics by Harwood Clarkes (5th Ed.) were consulted.

The test items for post and pre-test were presented to the President of the South West Association of Mathematics Teachers SWAMT), Fako branch, Mr. Ketchen Richard, a teacher in Saker Baptist College Limbe. He went through the items, ensuring that they match with the content.

Construct Validity
Construct validity was ensured by the use of more than one instrument to measure the variables, and at each time, the results of the variable were observed and checked whether they respond to what that variable is.

Preventive Mechanism for Extraneous variables
To prevent the influence of extraneous variable, the following measures were taken;
- The researcher taught the classes himself. This ensured the use of a common teaching method and strategy where ever there was need.
- The children came from schools whose population had similar characteristics, that is a rural background. Parents' involvement in their studies was almost similar.

Pilot study
A pilot study was conducted in GHS Bonadikombo by using 10 Form Three students. They were randomly assigned to two groups, of 5 students each, that is, the experimental and control groups. A pre-test was administered to the two groups. The results of the two groups were compared using the student t-test of comparism between groups. It was discovered that the two groups were operating at approximately the same level of knowledge. Thereafter, the experimental group was subjected to a treatment condition, while the control group was void of it.

In the experimental group, each member was assigned a role to play in solving mathematics problems. They were trained on sharing ideas which is essential in positive interdependence and practiced it during group0 learning. Mathematics problems after they were taught.

In the second experiment, students in the experimental group worked together. The more knowledgeable students taught his peers. They exchange ideas in a relaxed atmosphere. The mathematics problem was on finding the area of a circle. In the control group, students worked individually. At the end of that exercise which lasted for 15 minutes, all 10 students were administered a post test whose items were similar to the pre-test. The items were on area of a circle. Each of them solved the problem individually. The researcher collected the scripts, marked them and analysed the results in terms of control and experimental groups. Those in the experimental group performed exceedingly better, that is, they had a mean score of 15.7 while those in the control group had a mean score of 12.3. The questionnaire was all administered to the ten students. The responses were scored and analysed. The results proved that the research questions of this study could be answered. .

Reliability of the Instruments
The test-retest method of reliability was employed. Those students who were used for the conduct of a pilot study in GHS Bonadikombo were re-administered fresh copies of the same instruments. The responses were scored and a correlation made between the scores of the two tests, that is, between the results of the two post tests for the experimental study and those for the answered questionnaire. Those for the Post-test gave an r-value of 0.91 while that for the answered questionnaire gave an r-value of 0.87. This was judged to be high and proof that the instruments were fit for administration.

Administration of the Instruments
A letter signed by the Dean of the Faculty of Education soliciting for the authorities that be, to permit the researcher collect relevant data for this study was collected by this researcher to the various chools involved in the study. This was presented to their respective Principals, who either assigned their Vice Principals to assist in the data collection process.

In GHS Bachuontia, the pre-test administered was on finding the area of a trapezium. While in GSS Lobe it was on the use of the Pythagoras' theorem.

Treatment of the Experimental and Control Groups

By a random assignment, Form 3A classes were designated as the experimental groups for the two schools while Form 3B were designated control groups for the first round of the experiment. In the second round, Forms 3A became the control groups while Forms 3B were the experimental groups.

The Experimental Set Up

In the first round of the experiments, in GHS Bachuontai, the experimental group (3A) was exposed to peer tutoring while the control group (3A) was void, of it. In GSS Lobe, the experimental group (3A) was exposed to positive interdependence while the control group (3B) was void of it.

In the second round of the experiment in GHS Bachuontai, the experimental group which now became Form 3B was exposed to positive interdependence in studying mathematics while the control group which now became Form 3A was void of it. In GSS Lobe, the experimental group which now became Form 3B was exposed to peer tutoring in studying mathematics while the control group Form 3A was void of it.

In each of the schools the researcher first of all taught the two combined groups using the same methods and strategies for the lessons designed, trained all the students on using positive interdependence in studying mathematics, and peer tutoring.

Training on Peer tutoring Strategies

The researcher explained the concept. In the explanation, the roles of the tutor and tutored were made clear. The tutor (who is one of the peers in the group) solves the mathematics problem to the tutees and asks tutees to repeat same. The tutor immediately gives feedback at the work of tutees, prompts the mistakes and corrects them. After the correct response from the tutee, the tutor solves the mathematics problem to the tutees and asks tutees to repeat same. The tutor immediately gives feedback at the work of tutees, prompts the mistakes and corrects them. After the correct response from the tutee, the tutor solves the next problem; or another member in the group who is more knowledgeable in that area takes the position of the tutor, while the other members become tutees. In case of failure or incorrect response of tutees, the tutors repeat the same practice. This training took 45 minutes.

Training on Positive Interdependence

The researcher explained the concept. In the explanation, the importance of positive interdependence was highlight. The notions of "Many hands do light work", and 'Together we can make it better than alone' were emphasized. The research explained the following to the students and asked them to practice in solving mathematics problems.

- ➢ Share ideas in getting the correct solutions to mathematics problems.
- ➢ Your contributions will enhance group success.
- ➢ At any point you do not understand, ask a question to your fellow mates. Their contributions will help each one of you to do well in mathematics.
- ➢ Make sure you contribute to the success of the group.
- ➢ Ensure that you can solve similar problems alone when time arises by following up all the stages the mathematics problem is solved.
- ➢ To ensure that everyone participates, auxiliary roles will be assigned to group members. This took 45 minutes.
- ➢ Group leader: Co-ordinates group activity, by providing direction for the group work.
- ➢ Secretary (Recorder): He keeps a public record of the team's ideas and progress. He ensures that ideas are clear and accurate before writing.
- ➢ The checker: Keeps track of the groups progress towards its goal. May ask questions like, "Does this accurately reflect what the solution to this problem is?"
- ➢ Encourager: Praises and affirms the positive contributions. Records positive comments and actions.
- ➢ Material/ time manager: Gets materials to be used for the task to be accomplished in the group, insures that it is properly used and makes returns for excesses. He monitors time and help to keep the group on task.

After the training in each school, the application of various concepts trained on was done asking them to solve the problems stated in the application phase of the lesson notes. Those in the control group worked individually without collaboration, while those in the experimental group applied the training received for application of peer tutoring strategy and positive interdependence as the case may arise. This took place after the administration of the pre test.

Students in the experimental group were organized in groups of 5 and 6 each. After the lesson on finding the area of a trapezium, each of the organized groupings in the experimental class (3A) applied the strategy for peer tutoring as per the training received in solving the problems stated at the application phase of the lesson notes. Those in the control group worked individually without collaboration.

This was followed by the administration of a post test for all the students who took part in both the control and experimental groups. They worked individually at the post test level. The analysed results indicated in terms of performance if the peer tutoring strategy had a positive effect on performance or not.

A similar experimental setting in GHS Lobe took was conducted. This time it was the application of positive interdependence strategy in the experimental group (Form 3A) and the control group was void of it. This was in line with the training done using this strategy. The post test that followed and the scores obtained marked the end of the 1st phase of the experiment.

During the second phase of the experiment, Form 3B was the experimental group and was exposed to peer tutoring strategy while Form 3A became the control group and was void of this strategy in GSS Lobe. In GHS Bachuontai., Form 3B became the experimental group and was exposed in the application of positive interdependence strategy while Form 3A became the control group. The post tests after the exposure to treatment conditions of the second round experiment and the scores collected mark the end of the experimental procedures.

Administration of the questionnaire

The direct administration technique was used. 359 copies of the questionnaire were administered to all those who are in the sample.

The itinerary for the administration of the questionnaire started from Manyu 14th March 2018 and ended in Fako on the 10th of April 2018.

Out of 359 copies of the questionnaire administered, 333 were recovered, giving a recovery rate of 92.8%.

RESULTS

Response to Research Questions

Extracts from summary tables of analyses done by using the statistical package for social sciences version 22 for this study were used to answer the research questions.

Research Question 1: To what extent does peer tutoring affect the performance of students in secondary school mathematics?

Table 6: Summary of Analyses by the use of the Statistical Package for Social Sciences on Descriptive Statistics relating to Response to Research Question One.

Treatment Applied	School	Exptal Group	N	Mean at pre-test	Mean at post test	Overall mean at both school at pre-test	Overall mean at post test for both schools	Differences between post test and pre-test
Peer Tutoring Strategy	GHS B'ntai	3A	16	9.87	12.37	9.91	12.47	2.56
	GHS Lobe	3B	16	9.94	12.56			

The results on table … show that, at the pre-test level, that is, before the application of peer tutoring strategy, the overall mean for the two schools was 9.91. After the application of treatment, the post-test mean was 12.49. The difference from pre to post test determines the extent by which according to this study, peer tutoring affects performance in secondary school mathematics.

Response to Research Question 1; The extent to which peer tutoring strategy affects students' performance in secondary school mathematics is by a significant value of 2.56.

Research Question 2: To what extent does positive interdependence affect performance of students in secondary school mathematics?

Table 7: Summary of Analyses by the use of the Statistical Package for Social Science on Descriptive Statistics relating to Response to Research Question 2

Treatment Applied	School	Exptal Group	N	Mean at pre-test	Mean at post test	Overall mean at both school at pre-test	Overall mean at post test for both schools	Differences between post test and pre-test
Positive interdependence	GHS B'ntai	3A	15	9.63	12.33	9.54	12.47	2.93
	GHS Lobe	3B	18	9.56	12.61			

Results on table7 show that, at the pre-test level, before the application of positive interdependence strategy, the overall mean for both schools was 9.54. After the application of treatment, the overall post-test mean was 12.47. The difference from pre to post test determines the extent.

Response to Research Question 2: The extent to which positive interdependence affects performance of students in secondary school mathematics is by a significant value of 2.93.

Research Question 3: To what extent does interest affect performance in secondary school mathematics?

Table 8: Summary of Analyses by the use of the SPSS Relating to Response to Research Question 3

Variables of Interest	N	df	Test statistic	$\bar{\dot{r}}\,xy -$ comp	Maximum value	Magnitude
Interest mathematics	333	332	Pearson Correlation (r)	0.83	1	High
Performance						

Results on table … show that, at degree of freedom 331, rxy – computed value was 0.83. The magnitude was determined by comparing it to the maximum value of 1.

Table 9: Determination of Magnitude of Internet on Performance

Range	Magnitude	Maximum value
0.68 – 1	High	1
0.34 – 0.67	Moderate	
0.00 – 0.33	Low	

Table 9 shows that the range for determination of magnitude ranges from 0 – 1. Between 0 to 0.33, it is valued as low. Between 0.34 to 0.67, it is valued as moderate, while between 0.68-1, it is high.

Response to Research Question 3

Since $\bar{\dot{r}}\,xy -$computed valued (0.83) lies between 0.68 and 1, the extent by which interest in mathematics affects performance is valued to be high.

Research Question 4: To what extent does participation in mathematics affect performance of students?

Table 10: Summary of Analysis by the use of SPSS Relating to Response to Research Question 4

Variables of Interest	N	df	Test statistic	$\bar{r}xy-$ comp	Maximum value	Magnitude
Interest mathematics Performance	333	332	Pearson Correlation (r)	0.71	1	High

Results on table10 show that, at degree of freedom 332, rxy-computed value was 0.71

Response to Research Question 4

Since $\bar{r}xy-$ computed value (0.71) lies between 0.68 and 1, the extent by which participation in mathematics affects performance is valued to be high.

Hypotheses Testing

The student t-test of comparison between groups was used to verify the pre-test hypotheses, hypotheses 1 and 2. The Pearson correlation product moment $\bar{r}$ was used to verify hypotheses 3 and 4 while the analyses of variance.

Pre-test Hypotheses

Null hypothesis (Ho): There is no significant difference in the mean performance of students in the two groups before the application of treatment in the experimental study.

Alternative hypothesis (Ha): There is a significant difference in the mean performance of students in the two groups before the application of treatment in the experimental study.

Table 11: Summary of t-test Analyses from SPSS computation on performance of students in both Experimental and Control Groups in the two schools (GHS Bntai and GSS Lobe) before the application of Treatment

School	Class	N	Mean $(\overline{x})$	Standard Deviation	Standard Error	df	t-comp.	t-crit.	Confidence level	Direction
GHS Bachuontai	3A	16	9.87	0.21	0.03	15	0.341	1.753	95%	Two tail
	3B	18	9.56	0.16	0.07					
GSS Lobe	3A	15	9.53	0.38	0.12	14	0.211	1.761	95%	Two tail
	3B	16	9.94	0.32	0.09					

Verification of Pre-test hypothesis

At a confidence level of 95% in both schools, the t-computed value (0.341) for GHS Bachuontai is less than the t-critical value (1.753).

Equally the t-computed value (0.211) for GSSLobe is less than the t-critical value (1.761). This led to the rejection of the alternative hypotheses and retention of the null form, following the decision rule. Inference made led to the conclusion that, there is no significant difference in the mean performance of students before the application of treatment in both schools.

Hypothesis 1

Null hypothesis (Ho): The mean performance of students exposed to peer tutoring in mathematics is not significantly better than that of those who study individually.

Alternative hypothesis (Ha): The mean performance of students exposed to peer tutoring in mathematics is significantly better than that of those who study individually.

Table 12: Summary of t-test Analyses from SPSS Computation on performance of students exposed to Peer Tutoring and those for individualized learning in Maths

School	Class	Grp	N	Mean $(\overline{x})$	Standard Deviation	Standard Error	df	t-comp.	t-crit.	Confidence level	Direction
GHS Bachuontai	3A	Exptal	16	12.37	0.472	0.071	32	3.686	2.041	95%	One tail
	3B	Control	18	9.97	0.331	0.062					
GSS Lobe	3A	Exptal	15	12.56	0.264	0.014	29	3.827	2.045	95%	One tail
	3B	Control	16	10.40	0.379	0.037					

At p = 0.05, difference is significant

Verification of Hypothesis 1

At a confidence level of 95% in both schools, the t-computed value (3.686) for GHS Bachuontai was greater than the t-critical value (1.753). Equally, the t-computed value (3.827) for GSS Lobe was greater than t-critical value (1.761).

According to the decision rule, when the t-computed value is greater than the t-critical value, the null hypothesis is rejected, while the alternative is retained. In this wise, the null hypothesis was rejected for this hypothesis since t-computed (3.686, 3.827) > t-crit. (1.753, 1.761). inference led us to conclude that the mean performance of students exposed to peer tutoring in mathematics is significantly better than that of those who study individually.

Hypothesis 2

Null hypothesis (Ho): The mean performance of students exposed to positive interdependence is not significantly better than that of those who study individually.

Alternative hypothesis (Ha): The mean performance of students exposed to positive interdependence is significantly better than that of those who study individually.

Table 13: Summary of t-test Analyses from SPSS Computation on Performance of Students exposed to Positive Interdependence and those for Individualised Learning in Maths

School	Class	Grp	N	Mean $(\overline{x})$	Standard Deviation	Standard Error	df	t-comp.	t-crit.	Confidence level	Direction
GHS Bachuontai	3A	Exptal	16	12.33	0.661	0.134	15	3.708	1.761	95%	One tail
	3B	Control	18	10.06	0.712	0.091					
GSS Lobe	3A	Exptal	15	12.6	0.513	0.107	14	3.406	1.753	95%	One tail
	3B	Control	16	10.34	0.557	0.890					

Verification of Hypothesis 2

At a confidence level of 95% in both schools, the t-computed value (3.708) for GSS Lobe was greater than t-crit. Value (1.761). Equally the t-computed value (3.406) for GHS Bachuontai was greater than t-crit. Value (1.753).

According to the decision rule, since t-computed value (3.708, 3.406) > t-critical value (1.761, 1.753) respectively for the two schools, the null hypothesis was rejected. Inference made led to the conclusion that, the mean performance of students exposed to positive interdependence is significantly better than that of those who study individually.

Hypothesis 3

Null hypothesis (Ho): There is no significant relationship between interest in mathematics and performance.

Alternative hypothesis (Ha): There is a significant relationship between interest in mathematics and performance.

Table 14: Summary of Pearson Product Moment Correlation from SPSS Analyses on interest in mathematics performance

Variables	N	df	$\sum X$ $\sum Y$	$\sum X^2$ $\sum Y^2$	$\sum XY$	$\bar{r}xy-$-comp.	$\bar{r}xy-$crit.
Interest in maths	333	332	6708	77032	53680	0.83**	0.087
Performance			3264	33511			

P = 0.05 $\bar{r}$ is significantly high.

Verification of Hypothesis 3

At a confidence level of 95% the computed Pearson Correlation value (r xy) = 0.831 for degree of freedom 332 and its corresponding table value r xy- crit. = 0.087.

Since $\bar{r}xy-$computed value (0.831) is greater than $\bar{r}xy-$crit. (0.087) we reject the null hypothesis following the decision rule. Inference made led us to conclude that, there is a significant relationship between interest in mathematics and performance.

Hypothesis 4

Null hypothesis (Ho): There is no significant relationship between participation in mathematics lessons and performance.

Alternative hypothesis (Ha): There is a significant relationship between participation in mathematics lessons and performance.

Table 15: Summary of Pearson Product Moment Correlation from SPSS Analyses on Participation in mathematics performance

Variables	N	df	$\sum X$ $\sum Y$	$\sum X^2$ $\sum Y^2$	$\sum XY$	$\bar{r}xy-$-comp.	$\bar{r}xy-$crit.
Participation in maths lesson	333	332	5834	70119	51947	0.713**	0.087
Performance			2496	31073			

P = 0.05 $\bar{r}$ is significantly high.

Verification of hypothesis 4

At a confidence level of 95% with degree of freedom 332, the computed Pearson Correlation Coefficient Value ($\bar{r}xy-$) = 0.713 and its table value $\bar{r}xy-$crit) = 0.087.

Since $\bar{r}xy-$ (0.713) is greater than $\bar{r}xy-$crit (0.087) we reject the null hypothesis following the decision rule. Inference made led to the conclusion that, there is a significant relationship between participation in mathematics lesson and performance.

DISCUSSION OF FINDINGS

Peer Tutoring and Academic Performance in Mathematics

The results of this study proved that, when students of the experimental group were exposed to peer tutoring, that is Form 3A of GHS Bachuontai and Form 3B of

GSS Lobe, the post-test scores gave means of 12.37 and 12.56 respectively while their control groups, that is Form 3B of GHS Bachuontai and Form 3A of GSS Lobe have mean scores of 9.97 and 10.4 respectively.

These results are confirmed by the findings of Asaf (2017) who in a Pakistan based peer tutoring programme, was designed to help students identify errors in their thinking, relate to problem solving effort in mathematics. After two rounds of treatment application, the experimental group scored means of 19.98 and 22.64 for rounds 1 and 2 respectively, while the control group scored means of 14.44 and 15.67 respectively. The improved performance due to peer tutoring could be attributed to the fact that, peers find it easier to interact amongst themselves in seeking for solutions.

Positive Interdependence and Academic Performance

Results of hypothesis two show that, when the experimental groups were exposed to positive interdependence, that is Form 3A of GSS Lobe and Form 3B of GHS Bachuontai, their post-test scores respectively resulted to means of 12.33 and 12.6 while their control groups, Form 3B of GSS Lobe and Form 3A of GHS Bachuontai respectively have means of 10.06 and 10.43. The computed values of 3.708 and 3.706 respectively for GSS Lobe and GHS Bachuontai led to the rejection of the null hypothesis, with the conclusion that, the mean performance of students exposed to positive interdependence is significantly better than that of those who study individually.

These results are similar to the findings of Johnson and Johnson (2010) who did a similar study in Italy to determine the effects of task and resource interdependence on performance ina middle class school. In Johnson and Johnson's study there were two applications of treatment on positive interdependence in two experimental groups. One was on task interdependence and the other on resource interdependence. The results proved that those students assigned to both cooperative

Interest and Performance in Mathematics

The results of hypothesis three show that at a confidence level of 95%. The r-computed value of 0.83 was greater than r-critical value of 0.087. This led to the rejection of the null hypothesis. The conclusion drawn was that, there is a significant relationship between interest in mathematics and performance. The extent by which interest in mathematics affects performance was determined to be high.

These results are confirmed by the findings of Sindhu (19982) who started that, pupils interest towards mathematics is important and strongly affects the amount of work, effort put forward and the learning that is acquired. For example, a student who has interest in studying mathematics is likely to put in more effort in learning the subject and at the same time increase the chances of performing well in the subject than a student who lacks interest.

Students who have interest in mathematics will enjoy doing mathematics assignments, attend classes regularly, be attentive in class during mathematics lessons, does not see himself/herself leaving mathematics even when it goes tough, instead he looks for ways of overcoming the difficulties.

Participation in Mathematics and Performance

The results of this study proved that, at confidence level of 95%, the r-computed value of 0.713 was greater than the r-critical value of 0.087. This led to the rejection of the null hypothesis following the decision rule. The conclusion drawn was that, there is a significant relationship between participation in mathematics lessons and performance. The extent by which participation affects performance was determined to be high. This is because the value 0.713 lies between 0.68 and 1.

In lien with these results, Firdissa (2005) discovered that, active learning is the best instructional approaches in involving students in doing things and thinking about the things they do. It implies learners' active participation, involvement, thinking doing what they think and sharing responsibilities for their learning rather than passively absorbing the supposedly rich contents provided by the instructor.

In the teaching and learning of mathematics, no matter how rich the content is, if learners are not involved in the lesson, if they are not active in participating in problem solving, they will not be transformed into real actors in mathematics.

Conclusion

The findings of this study show that, the poor performance registered in secondary school mathematics over the years in the South West region in particular and Cameroon in general can be improved on if appropriate cooperative learning strategies such as peer tutoring and positive interdependence are regularly used when studying mathematics. Also, when interest of students is raised, and their participation in the lesson is increased, the students will like mathematics, and will have high desire for them to do it and pursue careers that are mathematics oriented.

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