A CORRELATIONAL STUDY OF STUDENTS PERFORMANCES IN MATHEMATICS AND COMPUTER SCIENCE IN THE DEPARTMENT OF MATH/COMPUTER SCIENCE

(CASE STUDY OF MATH/COMPUTER SCIENCE DEPARTMENT FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA, NIGER STATE, FEDERAL REPUBLIC OF NIGERIA)

BY

OYEDEMI JACOB FOLASAYO

PGD/MCS/98/822

A PROJECT SUBMITTED TO THE DEPARTMENT OF MATHS AND COMPUTER SCIENCE, SCHOOL OF SCIENCE AND SCIENCE EDUCATION. IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF POST GRADUATE DIPLOMA IN COMPUTER SCIENCE F.U.T, MINNA, NIGER STATE.

SEPTEMBER, 2000

DEDICATION

This project work is dedicated to my beloved son Master Gabriel Jacob (Junior) and to all lovers of Mathematics and computer science worldwide.

without which I could not have completed this course.

Special thanks also go to my beloved wife (Mrs. Kehinde Jacob) for sacrificing so much love, patience and understanding throughout the period of my course.

My sincere gratitude and appreciation also goes to the following friends and colleagues, for the moral and intellectual assistance given to me throughout the time I was undergoing my prograamme in the University. They include; Kuburat Raimi, Balki (Iya beji), Mr. Babajide, Joshua Alawode, Dr. Kolo and Mr. Titus.

Finally, I want to thank all persons, too numerous to mention, who, in one way or the other have assisted me in this study.

TABLE OF CONTENTS

APPROVAL SHEET

This project has been read and approved as meeting the requirement of the School of Science and Science Education, for the award of Post Graduate Diploma in Computer Science, Federal University of Technology, Minna, Nigeria.

PROF. K. R. ADEGBOYE *PROJECT SUPERVISOR*	**DATE**
DR. S. A. REJU *HEAD OF DEPARTMENT*	**DATE**
EXTERNAL EXAMINER	**DATE**

DEDICATION

This project work is dedicated to my beloved son Master Gabriel Jacob (Junior) and to all lovers of Mathematics and computer science worldwide.

ACKNOWLEDGEMENT

Overall thanks goes first to God, who in His grace and infinite mercy protect me throughout the period of my course.

I would like in a very special way to recognise the wisdom of Prof. K. R. Adeboye, Under whose supervision I have worked. He did not only take his time to read through and make useful suggestions to me on this work, but also gave me a sense of belonging and personal affection. I thank him for the ample time he spent to make constructive criticism and suggestion and critically supervised all the stages of this research work despite his tight schedules. For this, I sincerely appreciate his effort and remain grateful to him.

I am equally grateful to all my lecturers in the department whose constructive criticism, unflinching support and keen interest in my course of study have been a priceless help to me throughout the study.

My special thanks go to the family of Mr. kola Raimi, Kunle Shogunle, friends, relations. Whose advice and moral support have seen me to this level.

I am Indebted to my father Late Chief Oyedemi Emmanuel and my mother Mrs. Abigail Titilayo. In a like manner, I owe not to forget Mr. Oyedemi John of Gwari Motors, Minna for his encouragement and financial assistance

ABSTRACT

This study enquires the relationship between students performances in mathematics and computer science, Mathematics/Computer Science Department of School of Science and Science Education of "Federal University of Technology, Minna in the Federal Republic of Nigeria.

The raw scores of 57 students in both Mathematics and Computer Science of Maths/Computer Science Departments were analysed and subjected to statistical tests. The analysis reveals that there is a positive correlation between student performances in mathematics and computer science. The correlation coefficient varied from 0.2330903 to 0.5417325. The test of significance however pointed out that the relationship was statistically significance in certain cases but not in others.

On the basis of the findings, several recommendations have been suggested for effective teaching of mathematics and computer science at all levels of our educational system.

Chapter Three

Chapter Four

Chapter Five

CHAPTER ONE

1.0 INTRODUCTION

1.1 BACK GROUND TO THE STUDY

According to Oxford dictionary, Mathematics is the science of size and numbers of which Arithmetic, Algebra, Trigonometry etc. are branches. Some people often inquire why they should study mathematics since they do not intend to be engineers, Analysts, astronomers or surveyors. it is argued that they should be able to reason correctly, and logically in all their every day interactions in all areas of human endeavour which may not necessarily be mathematically based.

Butter and Wren (1951), Believed that mathematics is of great significance to every individual capable of intelligent participation in the educational program whether it be at the level of primary or secondary school.

Able White (1969) summarized the reasons for the study of mathematics as follows:-

1. **Historical** - A child lives in a community, which uses the language of numbers, measurement and shapes in every day talk. There is a great storehouse of mathematical knowledge build up through the centuries and contributed to by many minds.

can commence, it is necessary to have an input device for the purpose of transferring data into the computer's internal memory. A computer is automatic in operation in the sense that when the program and data for processing have been inputted into it, the required output is produced without manual intervention as all the program instructions are executed automatically.

The Abacus (450BC) the earlier mechanical aid to calculation was the Abacus which was a mechanical pebble counter, Abacus was invented in China and was mostly used by merchants for arithmetic purposes. This device through crude was believed to be so efficient that man never thought anything better was desirable until the seventh century AD. The Abacus is still in use today in some part of Asia and is believed to be faster in the hands of an expert than the modern hand calculators.

Burdess (1988), said that modern hand societies depend upon machines e.g. computer to provide standards of living far beyond the level that man alone can provide. The human body is very limited in its ability to generate large, or very small forces and can not work at high speeds or with high accuracy for long periods. To over come these limitations man has striven to develop machines which augment his own strength and reduce the drudgery of repetitive tasks. We all now depend on machines to provide us with food, clothing, energy, transport and defence. Most households, in addition to

mathematical concepts.

1.4 OBJECTIVE OF THE STUDY

The research work will investigate students' performances in mathematics and computer science in the Department of maths/computer science, Federal University of Technology, Nigeria. It will also find, if any correlation exists between performances in the two disciplines.

The objectives includes:-

1. Finding out problems that computer science student may face due to efficiency in mathematics.
2 To investigate possible correlation's in student's performances in mathematics and computer science.
3 To provide useful information for guiding and counselling computer science students.
4 To provide data to educational authorities in Federal Republic of Nigeria for decision making.
5 To suggest appropriate requirements for success in mathematics and computer science.

1.5 SIGNIFICANCE OF THE STUDY

According to investigations carried out so far, no research of this type has been carried out in the University. This implies that this is unique and it's

findings will be very important to the Federal University of Technology Minna, as well as the Federal Republic of Nigeria.

Since this study involves investigating relationships that exists between achievements in mathematics and computer science, the findings of the research would be useful to the followings:-

(a) The Ministry of Education in the Federal Republic of Nigeria.

(b) Education institutions such as school of science and science education Federal University of Technology Minna, colleges of Education and Technical Education's.

(c) Science, mathematics and computer science teachers may also welcome this piece of research work.

(d) Similarly, students of mathematics and computer science will find this project vital and illuminating in their career.

(e) The general public in Nigeria, comprising the parents, employers, industrialists etc may find this study valuable.

(f) The result of this research will also induce computer science students to put more effort in developing interest in learning mathematics as a necessity for better understanding of some computer science concepts.

(g) This study will induce computer science Teachers to use a better approach in teaching computer science. For example computers science teachers may need to take time to explain those mathematical

concepts that are applied to computer science concepts to be taught.

(h) Finally the findings from this study will stimulate further researchers to make computer education more meaningful, interesting and attractive to students.

1.6 SCOPE OF THE STUDY

This researcher would have been happier if he were in the position to conduct this study in all Universities where mathematics and computer science are been taught in the Federal Republic of Nigeria.

However, due to time and economic factors, proximity to certain areas, and for the sake of efficiency, this study is limited to mathematics and computer science departments of the "Federal University of Technology Minna" which is fortunately one of the leading universities where computer science is taught in Nigeria.

The study is limited to test results for three years i.e. 1993/1994, 19996/19997, 1997/1998; graduates of mathematics/computer science department of the Federal University of Technology, Minna.

The research did not extend to the other subjects offered in the school, and the findings and conclusions of the study are therefore applicable only to the mathematics and computer science results at the Federal University of

technology, Republic of Nigeria.

1.7 LIMITATIONS

Despite the fact that every researcher would love to have ideal condition for his or her research to enhance more reliable results, such ideal situations are never easy to come by. As expected therefore, there were certain limiting factors that definitely had their effects on this research finding, but the researcher had not any alternative than to compromise with them.

1. Teacher's competence and students abilities could not have been same in all the Departments.
2. Populations of students, who offered both mathematics and computer science varied from one department to another and from one academic year to another.
3. Another limiting factor is the fact that the marks used for this study are: for each student, each year, each department and each subject, the mean of the raw-scores from two (2) test or files. Also the academic years are not consecutive.

models are essential in the field of astronomy, physics, computer science, engineering and chemistry. Mathematical methods are also used in the studies such as Integrated Sciences, Economics, Education etc.

According to Kelly (1963) mathematics could be used as a spade to unearth the hidden treasures of chemical behaviour. In addition, mathematics is believed to enable the chemist to employ by quantitative terms and suitable mathematical equipment to clarify his own thinking and to help him communicate his observations to other. It has also been noted that continuing developments in the filed of engineering presents the technologists with problems of increasing complexity and for him to understand the operation advanced processing equipment and be encouraged to make a thorough investigation of mechanical behaviour, he should master in his career the necessary elements of mathematics.

In science and technology generally, mathematics is an indispensable medium by which and with which scientists express, formulate continue and communicate themselves. Further more mathematical formulation of scientific statements introduces lucidity and occasion into them, suggests and establishes logical and cognitive relation between them.

Natheniel (1974) carried out a study work using selected pupils of secondary school in the North Western State of Nigeria. He came out with the conclusion that, there is a substantial relationship between achievement in

mathematics and chemistry.

A special study was carried out using Pearson's Product allowment Correlation Coefficient to analyse Advanced Level (A/L) General Certificate of Education (GCE) grades in mathematics in predicting the performance of undergraduate chemists entering the University of Bradrod's School of Studies in Chemistry.

Sherwin and Denis (1970) come out with the fact that students with high attainment in the advanced level mathematics had the best chances of success in chemistry. Otherwise, a student not sitting for mathematics at advanced level would need a better grade than D and E in chemistry and physics in order to cope well in school to achieve success. They went further to say that physics, organic and physical chemistry are interrelated to a large extent and that mathematics correlates high with physical chemistry.

Adeboye (1982) conducted his research to establish the relationships between mathematics and geography by students of selected secondary schools of Ilorin, and he found that there is a positive linear relationship between the performance in mathematics and geography.

Eurin (1960) pointed out that mathematics such as differential and integral calculus must be understood by a student who wishes to follow with the project of the in universities leading to a degree in chemistry.

Uche (1977) among other things, the knowledge of mathematics and physics will help to appreciate chemistry. He was working on the attitude of secondary school students towards the study of chemistry.

Thorndike (1924) has established that mental skills are not transferable from subject to subject but there are significant relationships between related subjects. This has been established through correlation. Studies in which mathematics is found to be essential to the understanding of other subjects notably science, technology and engineering.

Okoro (1977) carried out investigations on the academic performance of the students in physics and mathematics in Zaria, he established the fact that there is a positive correlation between these two subjects. Thus a basic understanding of mathematics is vital to proper understanding physics.

Cherian (1982) also carried out a correlation study of the performance of arts and science students of the college of Education, Kafanchan in the major subjects and Education. He found that the performance if students in education positively correlated to performance in science subjects and performance in arts subjects.

Similarly, Lovell (1972) Working on the growth of basic mathematical and scientific concepts in children, concluded that to help a child develop some scientific skills and concepts, emphasis must be laid on mathematical

symbols.

According to sound and Carin, "Mathematics and science have been integrately involved and have contributed to teach others advancement through the ages. Because mathematics and science are wedded in the investigation of natural phenomena, many of the educational objectives of these two disciplines overlap. It is the opinion of mathematics and science curriculum specialists that science curriculum should be constructed utilising mathematical concepts to show the role of mathematics in science to show the role of mathematics in scientific and technological problem solving ...".

Lawal (1981) found that mathematics, apart from being the mother of all the sciences, may be the bedrock of all the sciences.

Richardson (1966) argued that "the magnificent conception of mathematics as the study of all abstracts logical systems or abstracts mathematical science and the concrete interpretation or applications really justify the statement that mathematics is basic to every subject forming apart of the reach for truth.

Roger and Bacon (1267) pointed out" Mathematics is the gate and key to the science".

Nigerian Tribune (1982). Citing the viewpoint of Oyebolu, an engineer, observed that "the teaching of mathematics and physics in secondary school was necessary pre-requisite for technological breakthrough in the country. He was of the opinion that for an individual to pin down and clarify concepts, a good understanding of the mathematical symbols will be necessary. This is attributed to the fact that mathematical symbols form and act as a frame of reference for scientific concepts.

In a related research, Oyebolu (1982) made his own contribution to idea of unity of science of which the mathematical concept is very significant by saying the knowledge of biology, chemistry and physics which has cristalised into concepts, empirical laws and theories form the basis of our material comfort. He also said that it was interfaces between biology, chemistry and physics which made the development of several techniques that led to the advances in medium, agriculture and engineering possible. He went further to say that although mathematics and sciences are taught as separate subjects in schools, from instructional point of view, science activity in the classroom has mathematical implications, was working mathematical problems has scientific imports. He therefore concluded that generally, mathematics has contributed to the advancement of all sciences.

All the references discussed so far have something in common; that knowledge of mathematics is essential to the proper learning of science and

Technology. The various work are pointing to the fact that solutions to problems relating to science at any level of educational programme can be traced back to understanding of basic mathematics.

However, such studies or researches are not limited to Nigeria. All over the world studies have been carried out to investigate that exist between mathematics and other disciplines such as mechanics. Hence, societies, and or organistions are beginning to see how important a good mathematical foundation is to the study of science and consequently to a nation's technological advancement. For example in Nigeria, mathematical and scientific association working committees have been set up, more than even before in the century. Their main task is to find out the way in which the teaching of mathematics and science can be mutually useful, one of the fact coming out of such committee is the emphasis on cooperation or collaboration between science and mathematics teachers".

1. Areas or topics of the syllabus that could be taught simultaneously in both mathematics and science lessons;
2. Topics in mathematics class that must proceed, certain topics in mechanic or science in general and;
3. Topics that could be taught by either subject to avoid unnecessary repetition.

Infact, the recent mathematics and science workshop for primary school

teachers which have taken place and still taking place in different part of the country may be a direct result of the finding of such committees.

Such classifications are not limited to Nigeria alone. For example, the center for science education, Chelse College, London set up a project called "SUM" meaning science uses mathematics in 1976. This project was sponsored by Nuffeld science project and the project aimed at exploring ways of over coming some of the basic problems facing science teachers in those areas of science teaching demanding mathematical ability. Some of these problem include:-

(a) The lack of transfer of mathematical skills from the mathematics room to the science laboratory;

(b) The different ways in which scientists and mathematician use mathematical terminology e.g. drawing graphs, use of symbols, etc and;

(c) The fact that many science teachers have minimal knowledge of mathematics and therefore do not use its potential for science and technology.

Scientific and technological education at any level and especially at higher levels demands certain mathematical principles. That was why Remer (1970) said that the maintenance of high standards in scientific education being threaten today because of the introduction of modern mathematics. Thus,

he attributed to the facts that modern mathematics course as it is being taught, does not give pupils enough opportunity to practice mathematical manipulations which is highly needed in science. Hence, pupils find it more difficult to cope with science.

In similar investigations, Olalonpe (1982) citing Thomas (1981) interviewing the advanced level chemistry syllabus as stipulated by WAEC and IJMB (Interim Joint matriculation Board) came out with the following:

(a) Some mathematics educationists are required in the syllabus and

(b) Mathematics educationists have proved many of the candidates for these examinations to be incapable of performing the required mathematics operation: Hence, many of the students perform poorly at the two mentioned examinations. Thomas therefore, conducted that for chemistry to survive the students must be more mathematically oriented; the same conclusion can be drawn between mechanics or computer science and mathematics.

However, Otto (1972) is not sharing the same view with the various people mentioned above. According to his, thought, nobody would wish to give up the wonderful shorthand of mathematics and in particular, the operations requiring continuity, mathematics can not help science in fundamental question. Furthermore, "mathematisation of science in particular of thermodynamics is an illusion". This, he observed was due to fact that

mathematics is a free creation of the mind, unencountered by earthly ties of any kind. Science on the other hand has a fixed earthly goal; the description of nature, which requires a set of basic concepts as indispensable tools. He therefore, concluded that mathematics with a very general and somewhat pale idea does not possess enough life on it to produce a base sufficient to carry the whole of science.

Ogboogu (1976) made a survey of major problems in teaching biology at Government College, Kaduna. He found that there was a high percentage of students who had interest in biology like the students in Plateau state, but on the contrary, he found that the students like biology not because it appeared easy, or involve little mathematics, but because biology was relevant to their future career. There is therefore, an urgent need for research on the relationship between performance in biology and mathematics to clear the air.

Ogboogu's study may be applicable to all other science like chemistry, physics and consequently, computer science.

2.2 THE PLACE OF COMPUTERS IN TECHNOLOGY

According to Edward (1979) "The computer is an achievement of high technology. It is one of the possible way ward devices of which we speak. In just three decades, it has moved from a mysterious electronic marvel,

hidden here and there in mathematical laboratories, to a work day machine which simply can not be avoided by any one having even the most casual contact with the major institutions of our society."

Computers have come to be the standard tools of the exact sciences, physics, chemistry and to some extent Biology. Ever since Charles Babbage conceived of the idea of an automatic computer, controlled by a sequence of instructions, the extent to which intelligence is imparted to computer by its human designers and programmers has been a vexed question. Some scientists spent much of the later parts of their career grappling with the problem of machine intelligence and a small and sometimes groups has kept the flame burning up to the present (Peter 1986).

The central questions which has been attacked are:

(a) How intelligent is a computer?

(b) To what practical uses can the intelligence of a computer be?

It was to this end that Edward (1979) defined a computer as an electronic device capable of following an intellectual map (Program) by which it can perform arithmetic and logic operations.

2.3 BENEFITS AND PURPOSE OF COMPUTER APPLICATIONS PROGRAMS IN INFORMATION AND DATA PROCESSING

Data processing is the procedure of transforming data into desired output while information processing a special case of data processing, is the procedure of transforming data into information which can be used to make better decisions (Raph M. Star, Jr. 1986).

Data are the raw materials or input to any data processing system, while information is the output that can be used by people in decision making.

Data processing can be divided into input, processing and output, processing can be further developed into classifying, sorting, summarising, reproducing, calculating, storing, and controlling.

The benefits of the use of computer application programs in data processing are:-

1. **SPEED:-** The most obvious benefit using a computer is speed. The computer can perform calculations and data processing more quickly than alternative methods (Manual) can. The work that might have taken the human months, or even years to complete manually may be accomplished in hours or at most days by computer. For example, some computers can do hundreds or thousands or even millions of arithmetic operations per second.

2. **ACCURACY:-** If the computer is properly programmed and provided with accurate data, it will do the intended job with a very high degree of accuracy. The computer does exactly what the program tells it to do. In addition the computer program does not get bored or fatigued, thus, avoiding the errors human might well make under the same circumstances.

3. **RELIABILITY:-** The computer can work almost twenty-four hours a day (With a little time out for equipment check-out and maintenance), everyday of the year, and still operate reliably. Modern electronic computers perform at high levels of reliability and equipment failures are very few.

4. **RETENTION:** The computer can store and search massive files of data and programs. The content of the file does not fade or get lost, and it can be used many times.

5. **ECONOMY:** The advantage of speed and accuracy can often be translated into naira savings realized, usually the unit cost of processing data or doing computations by computer is considerably lower than by alternative means (i.e. manual or mechanical methods). There are also other advantages for instance more prompt billing can result in improved cash collections. Accurate records can reduce the frequency of bad decisions that were because of unreliable or unavailable information.

6. **WIDE APPLICABILITY:** A computer can be used to solve a wide variety of problems that arise in science and business. The boundary of what the computer can accomplish are limited only by the ability and inauguration of its users (Edward Tomski, 1979).

CHAPTER TWO

2.0 PRELIMINARY STUDY

2.1 LITERATURE REVIEW

Mathematics is the science that deals with properties of and relationships between numbers, quantities, operation sets, measurements, shapes etc.

In scientist research, the branch of mathematics used is called applied mathematics, applied mathematics is concerned with applying mathematical method to the investigation of nature. On this broad interpretation, applied mathematics is intimately connected with many parts of science and plays a key role in the theory of scientific method.

An applied mathematician is consciously interested in setting up a mathematical structure that relates to his experienced of the external word. The postulates are selected with this in view.

From a strict point of view, ordinary elementary geometry is a branch of applied mathematics used as the postulates selected with a view to fitting properties of space as observed in the external world.

In theory there is no limit to the observation field in which the procedures of applied mathematics can serve. Applied mathematics becomes relevant immediately measurements are taken and thought about. Mathematical

possessing some farm of transport have machines to reduce the effort involved in washing, cleaning and preparing food.

Agriculture, education and mechanics depend upon machines to increase their efficiency. Less familiar are the machines used on an industrial scale for knitting and weaving for food processing and packaging and for the manufacture of metal good of all sorts.

From the foregoing references, its clear that there are obvious relationships between mathematics and computer science and that this relationship may be educationally useful.

1.2 STATEMENT OF THE PROBLEM

Many people are of the view that students who read computer science, if not all the experimental sciences are those who are good, or at least average in mathematics [Daniaing (1991)]. It is a well known fact that applicants or students who lack certain mathematical per-requisites are often refused admission into certain programmes such as Physics, Chemistry, Engineering and Computer Science (Ahmadu Bello University, Zaire is an example).

It is also common to hear comments like "oh, this student performed very well in mathematics, yet poorly in programming or operations research" many computer science teachers have even gone to the extent of trying to

predict some student's results in programming or numerical analysis, at least qualitatively using the students performances in mathematics. In this study therefore an attempt is made to investigate empirically, the relationship between performances in mathematics and programming.

Specifically, the student will find answers to the following questions:-

1. Is there any significant correlation between a student's performance in mathematics and that of computer science.
2. What is the effect of improved mathematical understanding on the achievement in computer science.
3. Can a student's failure in computer science for instance programming be attributed to his lack of good understanding and application of mathematical concepts.

1.3 RESEARCH HYPOTHESIS

This study has the following null hypotheses,

H_1: In the Mathematics/Computer Science Department and academic year, there is no significant relationship between student's performance in mathematics and computer science.

H_2: In the Mathematics/Computer Science Department and at any academic year student's failure in computer science can not be attributed to his/her lack of understanding and applications of

CHAPTER THREE

3.0 RESEARCH PROCEDURE

3.1 RESEARCH DESIGN

This research is a correlational study designed to investigate relationship between students' achievements in mathematics and computer science at the Federal University of Technology, Minna, Nigeria. Essentially, the study is to find out if performance or achievements in mathematics corresponds to achievements or performance in computer science. These two subjects are not only central to Federal University undergraduate but also pre-requisite to many disciplines in science and technology based programmes.

3.2 THE DATA FOR THE STUDY

The data used for this study are the students' examination results in mathematics and computer science at the Federal University of technology, Minna, Nigeria. With the expressed permission of the department authorities. This is necessary because it is illegal for a researcher to collect such a data or information from such formal organisation as higher learning institutions for security reasons without permission. But as said earlier, the researcher used his close relationship with the managerial and technical staff to facilitate data collection. The researcher informed the Head of Department in person of Dr. Reju who sanction the simulation data provided a computer

program would be written to test the real data by the authority themselves. It was on the basis of this relationship that the investigator was officially permitted to collect the needed information. To clear any doubt of the data simulation an appropriate and satisfactory computer programme would be written in the next chapter to test any real data for correlational studies. This procedure was adopted in order to avoid any risk of loosing these important documents.

3.3 THE POPULATION OF THE STUDY

The population of the study comprises of all the students of mathematics and computer science of the Federal University of Technology, Minna, Nigeria. FUTMIN is one of the best universities that teach mathematics and computer science in Nigeria. The students of the university are drawn from all parts of the country and abroad, the population of he department of mathematics/computer science can therefore be said to be all the computer science and mathematics students of the university.

The target population of he study, therefore is the entire undergraduates reading mathematics and computer science in the university.

3.4 THE SAMPLES OF THE STUDY

Efficiency of design imposes on the investigator an effort to determine a sufficient sample. A general rule is to select sample that is as small as it needs to be to give an adequate description of he whole. This task may appear seemingly simple; actually, it is very difficult and the investigators expend much effort in approximating a good sample.

In this research, however, the Federal University of Technology, Minna, Nigeria is selected. The choice of the university was compelled by the fact that the researcher was a student of the university and of the department of mathematics/computer science and due to the fact that he took note that there was much of mathematics in computer science studies than expected. Therefore close relationship with the staff members facilitated data collection. Student's results in mathematics and computer science were randomly selected in 3 years viz:- 1993 - 1994, 1996 - 1997 and 1997 - 1998.

3.5 RESEARCH INSTRUMENT

The researcher used simulated raw scores of test administered to students by their lecturers. These raw scores were those of undergraduates for the academic years 1993 - 1994, 1996 - 1997 and 1997 - 1998. Only mathematics and computer science test results were selected and used for

the study.

3.6 STATISTICAL ANALYSIS USED

The researcher used the Pearson's Product Moment Correlation coefficient to find the strength of the relationship between students' performances in mathematics and computer science. This method is used when the number of candidates is superior or equal to 30. Spearman Rank Order Correlation Coefficient Formular may be used when the number of pairs is inferior to 30. But as the two formulae yield similar results the researcher applied the Pearson's Product Moment Correlation Coefficient formulae to all the cases even if the number of pairs is inferior to 30. Besides, more accurate results are obtained with this method. In the statistical analysis, "X" represented mathematics scored (the independent variable) while "Y: represented computer science scores (the dependent variable).

TABLE 3.1 BELOW ARE THE DATA SIMULATED FOR 1993/1994 ACADEMIC YEAR

S/NO	SCORES IN MATHS (X)	SCORES IN COMPUTER SC. (Y)
1	80	69
2	79	65
3	78	67
4	74	25
5	73	32
6	72	55
7	66	38
8	63	47
9	62	83
10	58	66
11	58	62
12	55	47
13	49	34
14	48	38
15	48	38
16	48	43
17	46	37
18	44	53
19	44	39
20	43	26
21	42	60
22	41	23
23	39	53
24	35	37
25	34	41
26	32	30
27	29	16
28	25	21
29	11	20
30	11	38

TABLE 3.2 DATA FOR THE ACADEMIC YEAR 1996 - 1997

S/NO	SCORES IN MATHS (X)	SCORES COMPUTER SCIENCE (Y)
1	58	76
2	56	59
3	56	72
4	53	53
5	52	67
6	47	84
7	36	29
8	34	78
9	27	77
10	23	50
11	21	32
12	20	38
13	19	42

TABLE 3.3 DATA SIMULATED FOR THE ACADEMIC YEAR 1997/1998

S/NO	MATHS (X)	COMPUTER SCIENCE (Y)
1	78	56
2	72	32
3	51	17
4	49	36
5	48	50
6	44	37
7	43	26
8	36	33
9	33	43
10	33	27
11	31	51
12	28	14
13	18	33
14	13	09

To test the significance of the correlation coefficient t-value was calculated and compared with the critical t- value in the statistical table. If the calculated t-value is superior to the critical t-value, there is significant relationship between performance in mathematics and computer science, else the relationship between mathematics and computer science is not significant for the particular year for the particular student from the computer science.

The Pearson's product moment correlation coefficient (r) It's formular is given as:-

$$r = \frac{N\Sigma XY - \Sigma XY}{\sqrt{(nX^2 - X)^2} \times \sqrt{nY^2 - (\Sigma Y)^2}}$$

where:-

r	=	Correlation co-efficient between the variables X and Y
X	=	Scores in Mathematics (The independent variable)
Y	=	Scores in Computer Science (The dependent variable)
Σ	=	The sum or total of
ΣXY	=	The sum of the products of X and Y
ΣX^2	=	The sum of the squares of X
ΣY^2	=	The sum of the squares of Y
ΣX	=	The sum of the scores of X

ΣY = The sum of the scores of the scores Y

N = Number of pairs of variables.

The correlation coefficient, r, ranges in size between -1 and +1. The closer the correlation coefficient, r, to +1 the closer is the relation between the two variables. If "r" is +1, it means that X and Y, the two variables, are completely dependent on each other and we have a perfect correlation. But if X and Y are unrelated, then the change in X corresponds to no change in Y; and the value of 'r' for such relation would be zero (0). Whenever the value of 'r' is negative, the relation between the variables is inversed.

TEST OF SIGNIFICANCE

The general criterion evaluating the significance of correlation of coefficient, 'r' as presented textbook authors is as follows:-

TABLE 3.4 CRITERION FOR EVALUATING THE COEFFICIENT OF CORRELATION (r)

VALUE OF COEFFICIENT (r)	RELATIONSHIP
0.00 to ± 0.20	Negligible
± 0.20 to ± 0.40	Low or Slight
± 0.40 to ± 0.60	Moderate
± 0.60 to ± 0.80	Substantial or Marked
± 0.80 to ± 1.00	High or Very high

The table 3.4 is very vague, it only gives the quality of the relationship because the level of significance is not taken into account in this table. It is well known that in the case of few pairs of variables the coefficient 'r' may be low, moderate, marked or high yet not significant at certain level of significance. To avoid this case, t-Value was calculated based on the following formulae:-

$$\text{t-value} = \frac{\sqrt{r\ N - 2}}{\sqrt{1 - r^{2}}}$$

where:-

r: Co-efficient of correlation

N: Number of pairs of variables

The calculated t-value 'r' is significant else 'r' is not significant.

CHAPTER FOUR

4.0 ANALYSIS OF DATA

This chapter presents the analysis of the data collected from the department of "Maths/Computer Science, Federal University of Technology, Minna, Federal Republic of Nigeria" for the academic years 1993-1994, 1996-1997 1997-1998. A systematic analysis on the performances of the students with regards to mathematics and computer science for the year mentioned above is represented in this chapter.

4.1 PRESENTATION AND ANALYSIS OF DATA

For each department the Pearson Product Moment Correlation Coefficient is calculated. The calculated t-value has been determined, the critical t-value is identified from the table. The comparism is done between the critical and the calculated t-values and the appropriate conclusion is drawn year by year.

TABLE 4.3 PEARSON'S PRODUCT MOMENT CORRELATION COEFFICIENT OF COMPUTER SCIENCE STUDENTS FOR THE 1993 - 1994 ACADEMIC YEAR

S/No	SCORES IN MATHS (X)	SCORE IN COMPUTER SCIENCE Y	X^2	Y^2	XY
1	80	69	6400	4761	5520
2	79	65	6241	4225	5135
3	78	67	6084	4489	5226
4	74	25	5476	625	1860
5	73	32	5329	1024	2336
6	72	55	5184	3025	3960
7	66	38	4356	1444	2508
8	63	47	3969	2209	2961
9	62	83	3844	6889	5146
10	58	66	3364	4366	3828
11	58	62	3364	3844	3596
12	55	47	3025	3209	2585
13	49	34	3401	1156	1666
14	48	38	2304	1444	1824
15	48	38	2304	1444	1824
16	48	43	2304	1849	2064
17	46	37	2116	1369	1702
18	44	53	1936	2809	2332
19	44	39	1936	1521	1716
20	43	26	1849	6765	1118
21	42	60	1764	3600	2520
22	41	23	1681	529	943
23	39	53	1521	2809	2067
24	35	37	1225	1369	1295
25	34	41	1156	1681	1394
26	32	30	1024	900	860
27	29	16	841	256	464
28	25	21	625	441	525
29	11	20	121	400	220
30	11	38	121	1444	418
	1487	**1303**	**83865**	**64807**	**69703**

Calculation of the coefficient of correlation

$$r = \frac{N\Sigma XY - \Sigma X\Sigma Y}{\sqrt{N\Sigma X^2 - (\Sigma X)^2} \times \sqrt{N\Sigma Y^2 - (\Sigma Y)^2}}$$

$$r = \frac{30 \times 69703 - 1487 \times 1303}{\sqrt{30 \times 83865 - (1487)^2} \times \sqrt{30 \times 64807 - (1303)^2}}$$

$$r = 0.233090$$

Calculation of t-value.

$$\text{t-value} = \frac{r\sqrt{N - 2}}{\sqrt{1 - r^2}} \qquad \frac{0.2330903\sqrt{30 - 2}}{\sqrt{1 - (0.2330903)^2}}$$

Relationship is low or slight.

t = value = 1.268334

TEST OF HYPOTHESIS

The critical t-value in the table 4.1 at the level of significance of 0.05 and a degree freedom of 28 is 1.70. So the critical t-value is superior to the calculated t-value then the hypothesis H_1 is confirmed; there is no significant relationship between students performances in mathematics and computer science for the 1993 - 1994 academic year.

Therefore, the hypothesis H_2 is equally confirmed and there is no effect of high/low ability in mathematics on the proper understanding of computer science.

Student's mathematical ability does not improve his/her performances in computer science. Student's failure in computer science can not be attributed to his/her lack of understanding and applications of mathematical concepts for the academic year 1993- 1994.

TABLE 4.4 PEARSON'S PRODUCT MOMENT CORRELATION COEFFICIENT OF COMPUTER SCIENCE STUDENTS FOR THE 1996-1997 ACADEMIC YEAR

S/NO	SCORES IN MATHS (X)	SCORE IN COMPUTER SCIENCE Y	X^2	Y^2	XY
1	58	76	3364	5776	4408
2	56	59	3136	3481	3304
3	56	72	3136	5184	4032
4	53	53	2809	2809	2809
5	52	67	2704	4489	3484
6	47	84	2209	7056	3948
7	36	29	1296	841	1044
8	34	78	1156	6084	2652
9	27	77	729	5929	2079
10	23	50	529	2500	1150
11	21	32	441	1024	672
12	20	38	400	1444	760
13	19	42	361	1764	798
	502	**757**	**22270**	**48381**	**31140**

Calculation of the coefficient of correlation.

$$r = \frac{N\Sigma XY - \Sigma X\Sigma Y}{\sqrt{N\Sigma X^2 - (\Sigma X)^2}\sqrt{N\Sigma Y^2 - (\Sigma Y)^2}}$$

$$r = \frac{30 \times 31140 - (502 \times 757)}{\sqrt{30 \times 22270 - (502)^2} \times \sqrt{30 \times 48381 - (757)^2}}$$

$$r = 0.5417325$$

Calculation of t-value.

$$t\text{-value} \frac{r\sqrt{N-2}}{\sqrt{1-r^2}}$$

$$t\text{-value} = \frac{0.5417325\sqrt{13-2}}{\sqrt{1-(0.5417325)^2}}$$

$$t = \text{value} = 2.137555$$

RELATIONSHIP IS MODERATE

TEST OF HYPOTHESIS

The critical t-value in the table 4.1 at the level of significance of 0.05 and a degree of freedom of 11 is 1.80. So the critical t-value is inferior to the calculated t-value and the hypothesis H_1 is rejected; there is a significant relationship between students performances in mathematics and computer science for the academic year 1996-1997. Therefore, the hypotheses H_2 is equally rejected and there is effect of high/low ability in mathematics for the academic year 1996-1997.

Student's knowledge of mathematics improves his/her performance in computer science for the academic year 1996 - 1997.

Student's failure in computer science can be attributed to his/her lack of understanding and applications of mathematical concepts for the academic year 1996 - 1997.

TABLE 4.5 PEARSON'S PRODUCT MOMENT CORRELATION COEFFICIENT OF COMPUTER SCIENCE STUDENTS FOR THE 1997-1998

S/NO	SCORES IN MATHS (X)	SCORE IN COMPUTER SCIENCE Y	X^2	Y^2	XY
1	78	56	6084	3136	4363
2	72	32	5184	1024	2304
3	51	17	2601	289	867
4	49	36	2401	1296	1764
5	48	50	2304	2500	2400
6	44	37	1936	1369	1628
7	43	26	1849	676	1118
8	36	33	1296	1089	1118
9	33	43	1089	1849	1419
10	33	27	1089	729	891
11	31	51	961	2601	1581
12	28	14	784	196	392
13	18	33	169	1089	594
14	13	09	2304	81	117
	577	**464**	**28071**	**17924**	**20631**

$$r = \frac{N\Sigma XY - \Sigma X\Sigma Y}{\sqrt{N\Sigma X^2 - (\Sigma X)^2} \times \sqrt{N\Sigma Y^2 - (\Sigma Y)^2}}$$

$$r = \frac{14 \times 20631 - 577 \times 464}{\sqrt{14 \times 28071 - 577^2} \times \sqrt{14 \times 17924 - 464^2}}$$

COMPUTER PROGRAMME

```
10   CLS
20   A=0:B=0:C=0:D=0:E=0
30   INPUT "NUMBER OF OBSERVATION";N
40   FOR I = 1 TO N
50   INPUT "INPUT MATHEMATICS MARKS";X
60   INPUT "INPUT COMPUTER SCIENCE MARKS";Y
70   LET A = A+X
80   LET B = B+Y
90   C = C+(X*Y)
100  D = D+(X^2)
110  E = E+(Y^2)
120  NEXT I
130  LET F = A^2
140  LET G = B^2
150  LET M = (N*C) - (A*B)
160  LET P = ((N*D) - F)^.5
170  LET O = ((N*E) - G)^.5
180  LET R = M/(P*O)
190  LET TV = R*(N-2)^.5/1-R^2)^.5
200  IF R< .20 THEN A$ = "NEGLIGIBLE"
```

```
210  IF R> .20 AND R< .40 THEN A$ ="LOW OR SLIGHT "
220  IF R> .40 AND R< .60 THEN A$ = "MODERATE"
230  IF R> .60 AND R< .80 THEN A$ = "SUBSTANTIAL OR MARK"
240  IF R> .80 AND R< 1 THEN A$ = "HIGH OR VERY HIGH"
245  CLS
250  PRINT AB(20) ;"CORR.COEFFICIENT;"TAB(24) ;"T-
VALUE";TAB(40);"RELATIONSHIP"
260  PRINT TAB(2);R;TAB(24);TV;TAB(40)A$
270  END
```

TESTING OF PROGRAMME

The data in tables 4.3, 4.4 and 4.5 were tested using the computer program and there was no difference between manual calculations and the written programs.

For further testing, the investigator used small sample to test the computer programme. He first of all used manual calculations for the data in table 4.6.

TABLE 4.6

S/NO	SCORES IN MATHS (X)	SCORE IN COMPUTER SCIENCE Y	X^2	Y^2	XY
1	5	4	25	16	20
2	2	2	04	04	04
3	4	5	16	25	20
4	2	5	04	25	10
5	3	3	09	09	09
	16	**19**	**28**	**79**	**63**

$$r = \frac{N\Sigma XY - \Sigma X\Sigma Y}{\sqrt{N\Sigma X^2 - (\Sigma X)^2} \times \sqrt{N\Sigma Y^2 - (\Sigma Y)^2}}$$

$$r = \frac{5 \times 63 - 16 \times 19}{\sqrt{5 \times 58 - 16^2} \times \sqrt{5 \times 79 - 19^2}}$$

$$r = \frac{11}{34} \quad 0.3235294$$

$$t\text{ - value} = \frac{r\sqrt{N-2}}{\sqrt{1-r^2}} = \frac{0.456\sqrt{14-2}}{\sqrt{1-0.456^2}}$$

$$t\text{ - value} = \frac{0.3235294\sqrt{5-2}}{\sqrt{5-0.3235294^2}} = 0.5922201$$

t-value = 0.5922201

TABLE4.6 USING THE COMPUTER TO TEST THE SAME DATA IN TABLE 4.6

S/No	MATHS SCORES X	COMPUTER SCIENCE SCORES Y
1	5	4
2	2	2
3	4	5
4	2	5
5	3	3

Corr. Coefficient = 0.3235294

t - value = 0.5922201

Relationship = low or slight

TABLE 4.7

YEAR	COEFFICIENT CORRELATION	QUALITY OF COEFFICIENT	CALCULATED T-VALUE	CRITICAL T-VALUE	TEST OF SIGNIFICANCE
1993-1994	0.2330903	Low or Slight	1.268334	1.70	No Significance relationship
1996-1997	0.5417325	Moderate	2.137555	1.80	Significant Relationship
1997-1998	0.456	Moderate	1.775	1.78	No Significant Relationship

the correlation coefficient is significant that there is a general trend. In most of the cases student who performed very well in mathematics obtained at least average score in computer science and students who obtained very bad scores in mathematics scored equally similar or at maximum average in computer science. When the correlation coefficient is not significant i.e. cases of the students who scored very well in mathematics did not score similar marks in computer science and students who score very bad marks in mathematics in most of the cases did not score similar marks in computer science.

5.2 RECOMMENDATIONS

1. In Federal University of Technology Minna, before the scheme of work for mathematics and computer science for a year is drawn, lecturers of both subjects should find time to analyse, discuss and identify mathematical knowledge which is needed for effective computer science learning such discussions should include the sequence of topics to be taught in both in both mathematics and computer science.
2. Proper orientation should be given to the computer science teachers at pre-training level, workshops or seminars. So that the teachers will acquire the necessary background in mathematics that will help them function effectively as computer science lecturer.

3. Attainment of at least credit in mathematics for candidates seeking admission to the study of computer science at higher institutions like the universities, colleges of education, polytechnic etc. as is the practice now should continue.

4. For students wanting to read computer science at higher institutions, without an appropriate mathematical background, authorities of schools concerned should draw up and approve a supplementary course in mathematics for such students.

5. Computer science teachers too, should be made to study enough mathematics course while in school so as to help students in the classroom see clearly the importance of mathematics in the learning of computer science and its concepts.

6. Lecturers/Teachers of computer science should always endeavour to upgrade their knowledge already acquired in the subject as it relates to mathematics by reading journals.

5.3 SUGGESTIONS FOR FURTHER RESEARCHES

The results of the study revealed that there is a positive correlation between students performances in mathematics and computer science therefore, the researchers is suggesting that.... A research covering all the parts of the country in this aspect should be carried out. Such an elaborate work will provide a means of making generalizations on the type of relationship that

exists between mathematics.

It will also be necessary to research into specific areas of mathematics closely related to computer science at all levels of our educational system that is from colleges of education to university.

BIBLIOGRAPHY

1. **Butter, L. H. and Wren, F. L (1951):** Teaching Secondary Mathematics. Mc graw-Hill New York.

2. **Able White, R. C. (1969):** Mathematics and the less Able Heinemann London.

3. **C. K. Ayo, (1990):** Computer literacy (operations and appreciation).

4. Akintola University of Technology, Ogbomoso Press Beckenbach, E. *et al.* (1961). Modern Mathematics for Engineers, Mc graw- Hill Book Company Inc. Bochner's (1966).

6. The role of mathematics in the rise of science. Princeton University Press, Princeton Craid, F. C. (1965). Discovery.

7. Task, completion and Assignment, American Educational Research J.2 pp. 213-220,

8. **Daniaing, I. E. (1991):** A Correlational Study between Students Performances in General Certificate of Education (GNE) Mathematics and Chemistry. A case study of some selected senior secondary school in Keffi L. G. of Plateau states. PGDE thesis A. B. U. Zaria.

9. **Eurin, M. (1960):** Coordination of chemistry, physics, of the teaching of Chemistry, Physics, Mathematics in secondary schools. New thinking in school chemistry in land, pp. 91-98.

10. **Grundy, J. T. (1993):** Construction Technology Place Publisher Edward Arnold.

11. **Klopper, L, E. (1991):** Science Education. The review 77 Nigerian Tribune (1982) page 11, place.

12. **Osuola, E. C. (1993):** Introduction to Research Methodology, African Fe. Publisher Limited, place.

13. **Ugwu, I. E. (1980):** An investigation into the teaching styles of secondary school biology teachers in Anambra state of Nigeria. Unpublished Ph.D thesis university of Wales, Wales.

14. **Thomas, S. A. (1981):** Chemistry for survival an Examination of Advanced Level Curriculum. Journal of STAN Place Okoro E. I. (1977): A study of correlation between performances in physics and mathematics in West African school certificate Examination by students of selected secondary school Zaria Unpublished PGDE thesis A. B. U, Zaria.

15. **Uche, E. (1977):** The attitude of secondary school students towards the study of chemistry. A case study of selected secondary school in Plateau State of Nigeria. Unpublished PGDE thesis ABU, Zaria.

16. **Ogboogu, R. O. (1976):** A survey of major problems in Teaching of Biology at Government college of Kaduna Unpublished PGDE thesis, institut ɔf education A. B. U. Zaria.

17. **Sherwin and Child, D (1970):** Predicting the performance of Undergraduate chemists. Education in chemistry Vol. 7 No. 4

18. **Speigel, M. R. (1972):** Theory and problem of statistics. Schams outline series, Singapore.

19. **Upendra, K. R (1983):** A study of correlation between general science and mathematics performances by students of the Teachers training colleges in Gusau zone Sokoto State. PGDE Thesis Zaria.

20. **Ashby, M. F. and Tomskins, B. (1977):** Micro- mechanism of fracture and elevated Temperature mechanics- Waterloo University Press., place Abdullahi, A. (1992). Science Teaching in Nigeria Adeto Press Limited, Ilorin.

$$r = \frac{21106}{245.08 \times 188.79} \qquad r = 0.456$$

Calculation of t-value

$$\text{t - value } \frac{r\sqrt{N-2}}{\sqrt{1-r^2}} \qquad \frac{0.456\ 14-2}{\sqrt{1-0.456^2}}$$

$$t = \text{value} = 1.775$$

TEST OF HYPOTHESIS

The critical t-value in the table 4.1 at the level of significance of 0.05 and a degree of freedom of 12 is 1.78. So the critical t-value is equal to the calculated t-value and the hypothesis H_1 is confirmed then, there is no significant relationship between students' performances in mathematics and computer science for the year 1997 - 1998. Therefore the hypothesis H_2 is equally confirmed.