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Inservice training program in mathematics education for Ikwuano/Umuahia elementary school teachers in Imo state of Nigeria.

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INSERVICE TRAINING PROGRAM IN
MATHEMATICS EDUCATION FOR
IKWUANO/UMUAHIA ELEMENTARY
SCHOOL TEACHERS IN IMO STATE
OF NIGERIA

A Dissertation Presented

by

IHEANYICHUKU D. OKOROAFOR

Submitted to the Graduate School of the
University of Massachusetts in partial fulfillment
of the requirements for the degree of

DOCTOR OF EDUCATION

MAY 1987

EDUCATION

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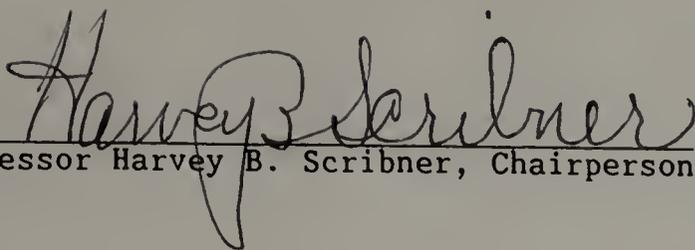
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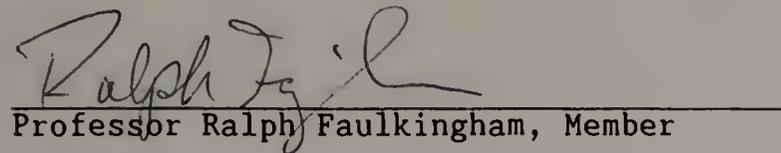
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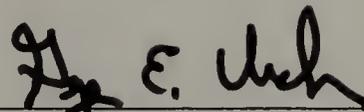
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DEDICATION

I dedicate this to my wife, Evelyn. Without her, I would not have successfully completed this work. She has been an inspiration, strength, and encouragement to me. Her faith in me was a big motivation to me. And to my daughters, Amara and Blessing, who had to endure an undevoted father for nearly four years, I appreciate your understanding and patience. I assure you, things are going to be different from now on.

ACKNOWLEDGEMENTS

Bless the Lord, O my soul; and all that is within me, Bless His holy name. Bless the Lord, O my soul, and forget not all His benefits.

Lord Jesus, thank you for saving me.

I wish to express my gratitude to my committee for their generous help and support during the writing of this dissertation. I am especially indebted to Harvey B. Scribner, my chairperson for his fatherly care, critical evaluations at various stages of the study and for his full cooperation; to Bob Miltz goes my gratitude for his academic advice and support; to Ralph Faulkingham, I express my gratitude and appreciation for his generous help with the statistical aspect of the study and for his dedication to work with me; to E.Y.I. Ihezue, Chief Inspector of Imo State, I express my gratitude for his cooperation.

I would also like to thank my mother, Mrs Erina Okoroafor for her devotion and support all through my life.

To my wife, Evelyn, and my daughters Amara and Blessing, I appreciate your understanding and cooperation.

Finally, my special thanks and gratitude go to Sally Sonn of the Department of Mechanical Engineering for her intelligent typing of the dissertation.

ABSTRACT

INSERVICE TRAINING IN MATHEMATICS EDUCATION
FOR IKWUANO/UMUAHIA ELEMENTARY SCHOOL TEACHERS
IN IMO STATE OF NIGERIA

MAY 1987

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According to Nigeria's policy on education, mathematics instruction is considered very important for meeting the scientific and technological needs of the nation. Since mathematics is the tool for science and technology, poor performance in this subject is causing the public serious concern. The poor performance in math is viewed as a major impediment to the technological transformation of the country by its leaders.

The purpose of this study is to assess the perceived instructional training needs of elementary teachers in mathematics and to provide guidelines for establishing valid, effective mathematics inservice education programs for Ikwuano/Umuahia School system.

The instrument used for gathering primary data in this study is a combination of questionnaires and scheduled interviews. One hundred and

eighty four questionnaires were returned from respondents. Twenty two participants were also interviewed orally with the same questionnaire.

The data from the questionnaire were analyzed and findings from the research reveal that elementary teachers in Ikwuano/Umuahia School System perceive a more than moderate instructional training need for help in the following five areas:

1. developing effective learners and mastery of the basic mathematics concepts and skills;
2. guiding teachers to set up and achieve realistic goals;
3. locating materials and inservice support in mathematic education;
4. identifying and undertaking readiness factors that affect learning; and
5. motivating children to learn mathematics.

The findings made in the research serve as a source for establishing guidelines for effective inservice training program in mathematics for Ikwuano/Umuahia elementary teachers. This study concludes with the evaluation of the model inservice program which provides useful guidelines, both for conducting effective inservice training in mathematics instruction for teachers, and for as providing recommendations for further studies.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	v
ABSTRACT	vi
LIST OF FIGURES	xii
LIST OF TABLES	xiii
 C H A P T E R I	 1
Introduction	1
Statement of Problem	5
Purpose of the Study	11
Significance of the Study	12
Limitations	16
Definition of Terms	16
 C H A P T E R I I	 18
 LITERATURE REVIEW	 18
Educational Needs Assessment	19
Elementary Teachers' Needs	24
Instrumentation	25
Results	26
Coffing and Hutchinson Model	34
The Lee Model	36
The Harless Model	37
The Interview	38
The Questionnaire	40
The Interview-Questionnaire	41
Educational Needs Assessment in Nigeria	42
Elementary Mathematics Needs Assessment	46
The Effects of Innovation in Mathematics	49
Overview of Teacher Education in Nigeria	60
The Pre-Statuary System	60
Inservice Education	68
The Central Office Approach to Inservice	74
The Principal	76
Steering Committee	76
The School-Improvement Approach to Inservice Program	76
Description of a Successful Inservice Program	83
Evaluation Procedure	85
The Mechanics of Reform in English Primary Schools	89
Development of a Mathematics Laboratory	94

C H A P T E R I I I	97
THE DESIGN OF THE STUDY	97
Study Design	97
Methodology	98
Instrumentation	99
Construction of the Questionnaires	105
Population	105
Administration of the Questionnaire	108
Interview and its Administration	109
Administration of the Revised Interview	112
C H A P T E R I V	115
ANALYSIS OF DATA	115
Introduction	115
Analysis of Data from the Questionnaire	116
Self-assessment of Subjects on the School Curriculum	131
Teachers' Improvement Assessment	133
Educators' Opinion of Math Instruction	134
Attitudes of Educators Toward Math	136
C H A P T E R V	139
INTERPRETATION OF DATA ANALYSIS	139
Competence	140
Relationship Between Qualification and Opinion of Inservice Training	141
Relationship Between Experience and Opinion of Teacher Education	142
Attitude	144
Differences Between Questionnaire and Oral Interview Responses	145
SUMMARY	146
C H A P T E R V I	149
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	149
Summary of Literature Review	149
Summary of Survey	155
Discussion of Findings	156
Conclusions	159
Evaluation	161
Recommendations for Further Studies	163
Planning of Teachers' Inservice Program	164
Development of a Math Laboratory	166

REFERENCES	167
APPENDIX A	175
A Letter to the Imo State Chief Inspector of Education to Introduce the Proposed Study.	176
APPENDIX B	177
The Initial Questionnaire Survey	178
APPENDIX C	182
The First Stimulus Question for Oral Interview	183
APPENDIX D	184
The Revised Questionnaire	185

LIST OF FIGURES

1. Kaufman Needs Assessment Model	35
2. Degree of Abstractness in Learning Experiences	82

LIST OF TABLES

TABLE	TITLE	
1	Purpose of Needs Assessment	23
2	Distribution of Elementary School Teacher Sample Returns	28
3	Factor Needs Ranked by Priority	29
4	Initial Questionnaire Format	100
5	Revised Questionnaire Format	103 104
6	Number of Participants by Schools and Location	107
7	Initial Interview Question	111
8	Sex of respondents	119
9	Total number of years teaching	119
10	Total number of years Administering	119
11	Participants' qualifications	120
12	Subject with adequate materials	120
13	Subject most effective in	121
14	Nigeria's most import subject	121
15	Students' poorest subject (Rural Schools)	122
16	Urban students' poorest subject	122
17	Teachers need more math training	123
18	Most helpful training form	123
19	Teachers need for specialization in math	124
20	Need for participatory inservice training	124
21	Plans to strengthen math	125
22	Changes in math curriculum	125
23	Homework and parents	126

<u>TABLE</u>	<u>TITLE</u>
24	Practical value of math 126
25	Subject least effective in 127
26	Attitude to teaching of math 127
27	Subject of parents concern 128
28	Nervous with math 128
29	Math interesting 129

CHAPTER I

Introduction

A medieval curse, uttered as a final level of pique and condemnation resounded, "May you have to teach other people's children!" Out of experience, many present day teachers are discovering the meaning of the above statement. Teaching other people's children has become a very difficult occupation, worsened by "other people" who hold little confidence in what teachers do and at the same time who fail to provide the necessary resources with which the teachers are expected to do their duties. Because of the society's attitude toward teachers generally, teachers are not encouraged to do their best (Barth, 1981). They feel unappreciated, not respected as professionals, undersupported, undervalued and unrewarded.

The beginning of modern education in Nigeria in the twentieth century did not require a very high level of education for teachers. During that period, teachers were only required to know how to read and write indigenous and English languages, and to be able to do some arithmetic. In other words, the teachers were expected to possess minimum qualifications for their job. The doctrine of accountability was more or less foreign to the educational setting of Nigeria in earlier days because of the limited educational objectives established for the nation. Until the late 1950's, the main objective of primary education was to produce people who would serve as clerical workers, teachers in mission schools and churches, and others were prepared to work with the

expatriate officers in different categories (clerks and interpreters) (Ogunsola, 1975). Because of the narrow curriculum adopted in schools during the early history of education in Nigeria, recruitment of teachers was not an intensive activity.

With the change in the educational objectives of Nigeria which accompanied independence of the country in 1960, there arose a need for many qualified teachers. This change included a wider curriculum in the increased school subjects and educational objectives for educational advancement. With better economic standing and the development of education in Nigeria, many parents accepted the responsibility of giving their children secondary education. In Nigeria, one cannot do his/her secondary education unless he/she passes the highly competitive Common Entrance Examination into secondary schools. To gain entrance into a popular and reputable secondary school, candidates undergo serious tutorial coaching in the subjects of English and mathematics. It requires competent teachers in those subjects to give the adequate coaching which candidates need to perform well in the entrance examination.

The increase in the number of aspiring and qualified students for secondary education has led to the opening of new secondary schools. Likewise, the increase in the number of literate parents has resulted in more demands on the teachers by the parents who now want to get their money's worth from their children's education expenses (school fees and education levy).

In the last three decades, Nigeria has witnessed a transition in her educational activities. In 1955, the then Western Region of Nigeria

launched free primary education for all children of Western Nigeria origin. That was followed in 1957, by the inception of the same policy by the Eastern Nigeria government for pupils of Eastern Nigeria origin. The above action called for the recruitment of many more teachers in the two regions. Due to the increasing need, many unqualified people were recruited as teachers to meet the new demand because of the increase of the student population. Haste was one of the reasons why the majority of the teachers hired for free primary education were provided little if any pre-service teacher education. Another reason for employing people without adequate training was the cost of recruiting qualified personnel as contrasted with the low cost for less well-trained teachers.

In Nigeria, education was viewed as an investment that the nation could make for quick development of its economic, political, sociological and human resources (National Policy on Education, 1977). In January 1974, the Federal Military Government under the leadership of General Yakubu Gowon announced at Sokoto its intentions to embark upon a program of universal primary education (UPE) on a national scale. The announcement raised some questions in professional and university circles as to how such a gigantic program could be funded. Eventually the military-run government decided to start the UPE in September of 1976 to be made compulsory in 1979. Through this program of universal primary education, the nation tried to foster the much needed unity of Nigeria by correcting the imbalances in interstate and intra-state development. The implementation of UPE (a national movement) caused another school population explosion thereby increasing the demand for more teachers. The need to meet the demand for more teachers led to the

reduction of the normal period of time for elementary teacher education. Many of the teachers recruited at that time were ill-trained. Some enlightened Nigerians are of the opinion that the schools are staffed increasingly with people who do not have a career interest in teaching but who have taken up the job as a stepping-stone to other career goals. In other words, it is a popular belief that many teachers are in the profession because they have not found an alternative, but the moment they do, they abandon teaching for the alternative (Solaru, 1964).

Furthermore, due to an increasing awareness of accountability, some teachers leave the job because of incompetence caused by inadequate qualification. For many teachers there is little enthusiasm at the beginning of every academic year as they tend to repeat what they did the previous academic year (Barth, 1981). They use the same books, same room, same curriculum, teach the same subjects and the same grade level. Only the pupils are different from one year to the next, hence teachers do not face any substantive challenges for professional improvement.

In the teaching of mathematics, most teachers are ill-equipped for their job and therefore their attitude to the subject is not encouraging. According to Mr. John Ushie, an NYSC (National Youth Service Corps) mathematics teacher in a secondary school in Apapa-Lagos, "government is to blame for not doing much in the retraining of teachers of mathematics. The greatest problem with the teaching of mathematics in Nigeria is teachers themselves," Ushie asserted (Alibi, 1985). He observed the negative attitude of many teachers to the teaching of mathematics, and therefore concluded that a good number of teachers do not know the subject.

The Western education system adopted by Nigeria in the nineteenth century tended to place too much of a premium on literacy - the art of reading, writing, arithmetic (the 3 R's) and the acquisition of knowledge for its own sake. The need for exactitude, precision, and accuracy, which mathematics is all about, has been underplayed in the society (Nigeria Task-Force, 1977).

Statement of Problem

In the national outcry in Nigeria over the poor standard of instruction in the elementary schools, there is no area of study that draws the attention of the general public as the perception of teachers' performance in the teaching of mathematics (Alibi, 1985). The awareness of the importance of the knowledge of mathematics in the technological development of a country by the public has increased the demands of parents over their children's achievement in the subject of mathematics. According to Alibi (1985), mathematics is described as the base of all the science and environmental professions. Mathematics is needed by the arms industry in the production of missiles. It is useful in communication and in the aerospace technology. "In fact, the knowledge of it is desirable in every aspect of life," he stated.

This investigator, therefore, does not wonder that there is a national outcry over the poor quality of instruction in the Nigerian Primary schools especially in the teaching of mathematics. According to Alibi, the reason Nigerian society is not mathematically literate is because of the nation's inherited Western education system which places too much premium on literacy (the 3 Rs): the art of reading, writing,

and arithmetic. After the independence of Nigeria in 1960, enlightened Nigerians and other Africans felt that arithmetic was inadequate to serve the development needs of the society and therefore saw the need to improve the contents of mathematics curriculum in African countries. That move led to the introduction of modern mathematics which soon faced serious criticisms such as "Modern mathematics is a repressive campaign mounted by imperialists against African scientific and technological development" (Obi, 1976). Another serious problem was that the teachers themselves did not understand the mathematics concepts in the text books; hence, they could not impart knowledge that they did not possess. The nations therefore, reverted to the "arithmetic" the missionaries had handed over to them.

At the root of the mathematics problem is what can be described as "mathematics syndrome" or "mathematics fright" or "mathematics phobia" to which mathematics learners are prone (Alibi, 1985). Dr. E.A. Kalejaiye of the Department of Education, University of Lagos, an acclaimed authority on the teaching of mathematics, is quoted as saying "Twenty four years after independence, our governments have not shifted emphasis on arithmetic, which, it should be noted, deals mainly with numbers - calculation, addition, subtraction, division and multiplication, as opposed to mathematics, which stresses the understanding of concepts and places more focus on fundamental ideas and tries to inform the learner about his environment."

As a result of the above criticisms and challenges, the then military government of General Obasanjo, in 1977, decided that arithmetic and/or modern mathematics be phased out over the next two years

(1979) in primary and secondary schools throughout Nigeria. In its place, the government charged a task-force with the development of a mathematics curriculum relevant to the needs of the country. The National Task-Force was set up by the Nigeria Educational Research Council (N.E.R.C.) in consultation with states' Ministries of Education and University Institutes and Faculties of Education in July, 1976.

After careful analytic deliberations, the Task-Force agreed that the task of teaching mathematics has been further aggravated by the inadequacy of teachers and increased enrollment at the primary and the secondary levels of the system far in excess of the nation's capacity to produce teachers (Nigeria National Task-Force, 1977). The conference also agreed that most of the arguments advanced against the modern mathematics had been advanced on sentiment, personal biases, and isolated cases, and had not been advanced by people who had made a sound study and evaluation of the situation. The criticisms should, therefore, be evaluated in the light of the background and related experiences of the critics. The Task-Force examined its task in two groups.

After its plenary session in early 1977, the Task-Force worked in two groups independently, with particular emphasis on the following tasks:

- (1) To examine the topics in the curricula in current use and identify the topics which were essential and desirable in a mathematics curriculum and designed to achieve the objectives as set down in the National Policy on Education;

- (2) To highlight the problems and issues which obstruct the achievement of the national objectives in mathematics; and
- (3) To recommend courses of action aimed at reducing and, if possible, eliminating these problems.

After examining the problems and issues involved in mathematics education in Nigeria, the Task-Force recognized the most pressing issue as that of deciding what mathematics should be taught and how it should be taught in Nigerian schools and colleges. The body made an examination of several curricula guides and syllabi. At the primary school and training college levels, it was relevant to contrast the arithmetic then taught in the majority of schools and colleges with the recommended N.E.R.C. (Nigeria Educational Research Council) guidelines.

With the objectives of National Policy on Education in mind, the Task-Force listed the topics which can be usefully taught at the primary, teacher training (Grade II) and secondary levels. Bearing in mind that most of the practicing teachers had completed their teacher education before the introduction of the new curriculum for primary and teacher education in mathematics, it appeared to them imperative that math teachers should be provided with inservice education on this subject to enable them to perform and update their expertise.

Being aware of pupils' problems with regards to the study of mathematics, the Task-Force indicated the problems as follows

The increases in school population had entailed:

- (1) a corresponding increase in the range of pupils' interests, abilities and levels of intelligence;

- (2) a noticeable decrease over the past years in pupils' desire and incentive to learning;
- (3) a highly differentiated range of environmental background; and
- (4) the unquestioning acceptance of authority inherent in Nigerian culture which conflicts severely with the critical questioning attitude required in mathematics or any progressive learning situation (Nigeria Task-Force, 1977).

The Task-Force identified communication barriers between teachers and pupils as a result of verbalization which constitutes the teaching process in mathematics. It also observed that it is difficult to express many of the terms and concepts required for precise understanding of the subject matter in the Nigerian languages (Nigeria Task-Force, 1977).

Concerning evaluation, the Task-Force observed that most teachers were without appropriate training or knowledge of evaluation techniques and advised:

that teachers must be taught sound evaluation techniques, since it is only then that they will be able to assess accurately the learning problems and achievements of the pupils and so build up the pupils' knowledge and competence in the subject (N.E.R.C. Task-Force, 1977).

It is the opinion of this writer that the call for giving teachers training in evaluation is not only timely and desirable, but indispensable if the teachers are to achieve anything in their delivery of service, particularly in mathematics.

Other problems identified were teacher-related. In the first place, it has been observed that the prestige of teachers in the society is low and, consequently, the majority entering the profession do so because they have failed to obtain employment or training for more prestigious positions. They, therefore, lack the necessary motivation for teaching which further contributes to the high rate of attrition and instability in the profession. Secondly, the standard of quality of teacher preparation in teacher training colleges is rated low and inadequate (Taiwo, 1980). Thirdly, the proportion of untrained teachers in Nigerian primary school is viewed as critically high. Fourthly, there is a serious shortage of qualified tutors in both mathematics and mathematics methodology in the training colleges. Fifthly, the lack of a well-defined and coordinated program for on-the-job improvement of teachers is also a big factor. Sixthly, many of those given in-service training are often deployed to other services unrelated to the ones for which they were trained (Taiwo, 1982).

Nigerian educational authorities in general and other experts in the field of mathematics education in particular, have made the following observations:

- (1) That Nigerian society is not adequately informed about changes in school mathematics and the problems attendant for the teaching of the subject, given the increasing importance and relevance of mathematical knowledge to everyday living.
- (2) That a major consequence of poor performance in mathematics is the serious limitation of career-choices.

- (3) That mathematics is the tool for science and technology and consequently poor performance in the subject is causing the public serious concern, as this is viewed as a major impediment to the technological transformation of the country (National Task-Force in Mathematics Education, 1977; Alibi, 1985).

This writer, having examined the type of teacher education and support system available to teachers, believes that those who value public education should be worried at the discouragement and inadequate personal professional development of teachers and, therefore, solicit the provision of inservice education especially in the essential subjects.

Purpose of the Study

The purpose of this study is to ascertain from a sampling of Ikwuano/Umuahia elementary teachers, teacher trainers and Imo State Ministry of Education inspectors their perceptions of elementary teachers' needs as they relate to the teaching of mathematics to children in their elementary schools - grades one through six.

It is the intent of this study to provide guidelines for making the teaching of mathematics more effective in Ikwuano/Umuahia elementary schools after soliciting the definition of teachers' problems from the categories of educators mentioned above.

Over the past two decades, reports, articles, evaluations, programs and criticisms, all pointed out the fact that students' performances in

mathematics had been very poor due to the fact that the standard and quality of teacher preparation in the colleges was low and inadequate, that the proportion of untrained teachers in the primary schools is still critically high, and that there are no well-defined and coordinated programs for on-the job improvement of mathematics teachers.

Educational innovators feel that schools will not change unless educators change. One way educators can change is by updating their knowledge through exercises such as the in-service education for teachers in mathematics. The cry for direction of continuing education for teachers which has mounted over the years has been summarized above by Wagstaff and McCollough (1973).

Significance of the Study

Learning is a lifelong process that does not end with state certification; certification is only a minimal statement of acceptance. Cruikshank et al. (1980) suggests that inservice education should be viewed as a means of narrowing the differences between preservice and inservice education. "Learning to teach and teaching to learn" better exemplifies the image of the professional educator. There is a consensus of opinion among educators concerning the positive effects of inservice education for elementary school teachers internationally. Authors like Hanson (1969), Uche (1975), Ukeje (1974), and Toll (1974) all agree that inservice programs have made positive differences in teachers' behavior and performances.

The low standard of knowledge of mathematics on the part of the

The low standard of knowledge of mathematics on the part of the personnel in Nigerian society has been a handicap in the discharge of their duties. For example:

The militant labour leader who just finished addressing the Press Conference and was emphatic about his Union's demand by making an ultimatum to his clients' employers thus: "ten percent increase in workers' salaries". And when it was question time, "Sir, what will ten percent increase of workers' pay in your union amount to?", a reporter shouted. "How much does each employer need to pay?" asked another. "Sir, could you please tell us the call-up of capital of each of the companies that is one of your employers?" And yet another reporter asked, "If your union's demands are met, what will be the effect on our economy and how many workers, if need be, stand to be retrenched?" (Alibi, 1985)

To all of the above questions, the labor leader had no ready answers.

Many authors agree to a common definition of education as: one or a series of planned instructional programs available to a specified group(s) of professional staff members for purposes of promoting participant knowledge base growth and increasing job competence (Hall and Jacques, 1983). According to the findings of Moore and Hanley (1982) in this study entitled "An Identification of Elementary Teacher Needs", elementary school teachers perceived a more than moderate need for help in six need areas. These six need areas include:

1. developing effective learners and a mastery of the basic skills;
2. guiding children to set up and achieve realistic goals

4. establishing and maintaining discipline;
5. identifying and understanding readiness factors that affect learning; and
6. motivating children to learn.

It is the opinion of this writer that one of the means of meeting elementary teacher needs is by planning and implementing an ongoing inservice education for the teachers.

Traditionally, teachers have been seen as recipients of inservice education which has always been organized by educational administrators, either on district or state level. However, many teachers including Nigerian teachers perceive inservice programs as administrative whims: "one-shot" processes for solving all (or perhaps more accurately, none) of their problems; experiences to be tolerated and forgotten (Mangieri, 1983). This writer believes that one way of breaking this traditional way of carrying out inservice education is by coordinating the efforts (educational expertise) of consultants, school administrators and competent elementary school teachers in order to launch an effective inservice program. Therefore, the teachers should be actively involved in the planning and implementation of the program. The writer recognizes the need to involve teachers in the planning, implementation, and evaluating of their inservice education programs. This involvement should be collaborative. Some of the guidelines perceived by this writer after examining articles and reports on inservice education are:

1. That the committee or task-force responsible for planning an

inservice program should include adequate teacher representation. Teachers should be selected on the basis of their skill, experience, and enthusiasm for the task.

2. That teachers should understand that the inservice program is not punitive, rather that it is an effort to improve the overall effectiveness of the educational system.
3. That there should be stated goals for every inservice program and its design must be around the stated goals and objectives of the organization responsible for the program.
4. That teachers should be instrumental in determining the purpose of the inservice program.

This writer further believes that with the guidelines suggested above, an inservice education for teachers conducted along the guidelines recommended will have the effect of changing teachers' attitude towards an inservice program in mathematics conducted by and for them. Hopefully this study will help to provide the machinery for a more effective inservice mathematics curriculum.

More specifically, the research is significant in the sense that all school personnel concerned with the instructional development will organize the program jointly (as a team) thereby ensuring full participation on the part of every educator in the school system. Hopefully, it will make all educators in the system more aware of the need for and the purposes of many inservice education programs conducted for instructional improvement. According to reports of the 1984 Imo State Ministry of Education, Primary school branch, Mathematics workshop program, the participants were made to understand that "Math is a

player's game, not a spectator's game". The study should lead both teachers and students to new discoveries.

Limitations

To avoid creating misconceptions, and the unnecessary expectation of miracles from the research in the minds of the general public, this researcher has set out the following limitations which must be kept in mind by the readers this study:

1. Concentrate on a survey of primary school teachers from six Ikwuano/Umuahia elementary schools - three urban schools and three rural schools concerning the teaching and learning of mathematics at elementary school level (Elementary grades 1 through 6).
2. Defines the needs for a model mathematics in-service program by (a) the chief Inspector of Education (Imo State Ministry of Education), (b) selected teacher trainers, (c) zonal inspectors of Education, (d) administrators and teachers.
3. Does not deal with the administrative and financial problems of the Imo State elementary school teachers.
4. Because of a limited time and financial resources available to this researcher, uses a manageable sample of respondents and schools.

Definition of Terms

Accountability: Educational accountability programs are designed to measure educational progress made by educators in a

school system. Accountability policy accepts with the notion that students progress is measurable and controllable. That can be done through the evaluation of educators' performances (inspection of records of work, students' scores in standardized tests, and students' testimonies). The exercise is instituted to ensure that the huge sum of money always allocated to education is judiciously used.

Inservice education: One or a series of planned instructional programs (workshops, seminars, conferences, etc.) made available to a specified group(s) of professional staff members for purposes of promoting participant growth and increasing job competence.

National Youth Service Corps: A scheme by which every Nigerian graduate of a higher educational institution gives one-year of national service.

Needs assessment: A device of finding a discrepancy between an existing set of conditions and a desired set of conditions.

Normal teacher education period: The recognized teaching qualification for primary school teachers is the Teachers' Grade II Certificate. The duration of training for candidates with First School Leaving Certificate (Standard Six graduates) is four years. For those with West African School Certificate, the duration is two years.

C H A P T E R I I

LITERATURE REVIEW

As the main focus of this study is on "Inservice education program in mathematics education for Ikwuano/Umuahia elementary school teachers in Imo State of Nigeria", this writer believes that the consideration of the following areas is relevant and necessary to the study:

1. Needs assessment and its relationship to program development for instructional improvement,
2. An overview of mathematics education in Nigeria considered under the following headings:
 - (i) Teachers and students' perception of mathematics as a subject in the school curriculum,
 - (ii) The importance attached to the subject by the public, and
 - (iii) Changes that have taken place in its curriculum and the methods of teaching it over the years.
3. The history of teacher education in Nigeria and the place of inservice training for elementary school teachers in mathematics education.

Nigeria is a vast and diverse country, and a federation of nineteen states. It comprises nearly two hundred and fifty cultural and linguistic groups, of which the Hausa, the Ibo and the Yoruba are the largest. It is an agricultural country which produces cattle, goats, poultry, fish and a variety of food and cash crops. The mineral resources are

oil, tin, coal, iron, limestone and columbite. The Nigerian agricultural, mineral and industrial resources have a great potential for raising the low level of the economy of the majority of the people.

In Nigeria, education is recognized as a weapon against ignorance, disease, squalor and poverty and as a means of raising an enlightened and industrious citizenry and of producing a prosperous nation (Taiwo, 1982). The reaction of the people to Western education varies from passion and insatiable thirst to indifference and antipathy. This has created an educational imbalance between one part of the country and another. In the light of the above characteristics of Nigeria, it is necessary to conduct a needs assessment of the Ikwuano/Umuahia elementary school teachers on instruction as a first step in developing an appropriate inservice education in mathematics for the teachers.

Educational Needs Assessment

A need is usually defined as a discrepancy between an existing set of condition and a desired set of conditions (Borg and Gal, 1983). For example, suppose an educator makes the assertion, "We need to place more emphasis on Science education in our elementary school curriculum." the educator is saying, in effect, that there is a discrepancy between the existing curriculum and a desired curriculum (Borg and Gall, 1983). A statement of need reflects a judgement about the present merit of the curriculum. For this reason professional evaluators are interested in the determination of need states in education.

Two general definitions of need have been popularized during the past 15 years. In the one definition, democratic need is considered a change desired by a majority of some reference group (Scriven and Roth, 1978). This method of identifying need has been used in educational settings for some time. One of the more pervasive problems associated with this as well as other needs assessment approaches is making certain that the process correctly distinguishes needs from wants.

To distinguish "need" from "want", the definition of need should be spelled out as a factor or element without which a person cannot function satisfactorily (Scriven and Roth, 1978). Need - the lack of something which according to the best information available is necessary for self-actualization or the improvement of the quality of life (Kuh, 1980).

Meeting students' needs encompasses much of what student affairs staff do; therefore, needs should be assessed periodically for staff to determine how to best serve their clientele. Indeed, the importance of assessing students' needs before designing interventions has been underscored numerous times (Lenning and McAleenan, 1979; Pace and Friedlander, 1978). Accurate assessment of needs is thought to increase the likelihood that activities and programs can be more efficiently mounted, that students' needs will be satisfied, and the subsequent improvement in students' behaviors and degree of satisfaction will be evidenced (Kuh, 1980; Scriven and Roth, 1978).

Systematic needs assessments are necessary to ensure accurate needs assessment procedure which can be used for that purpose periodically. According to Kuh (1980) the benefits to be realized from a systematic

needs assessment process are related to the degree to which the following conditions are met: (a) the assessment is conceptualized as a process; (b) the concept of need is adequately defined and (c) clarity is achieved concerning the purpose(s) of the needs assessment.

Most persons who advocate the use of needs assessment in the planning process suggest that the results of such assessments be used to generate goal and objective statements for subsequent interventions (Kaufman, 1972). While needs assessment can be used to identify goals or objectives, perhaps it has greatest utility when viewed as a problem-focusing strategy. In this way, the primary purpose of the needs assessment is to identify unsatisfactory conditions and/or challenging situations with which students must contend. In a problem-focused assessment, parameters are placed on the data gathering to minimize the risk of accumulating a good deal of general but not necessarily usable information.

A number of different purposes may be served through assessing needs. The challenge to the administrative staff is to determine the purpose for which the assessment is required and use data gathering strategies compatible with the purpose. Myers and Koenig (1979) have suggested that five different purposes often are addressed in needs assessment (see Table 1). In practice, these are not pure categories; that is, when assessing needs, several different purposes may be intended simultaneously, and therefore, two or more of these approaches may be used in combination.

Needs assessments in the field of education are important to be understood because they are broad in scope. The experience and the

resulting literature regarding needs assessments in education was sufficiently vast to provide guidance in the development of a framework for conceptualization of needs assessments (Scriven and Roth, 1978). Educational needs can be assessed systematically using needs assessment research methodology. This type of evaluation research is important because assessment of needs provides the foundation for developing new programs and for making changes in existing programs. The substantial resource expenditure typically required for program development will be wasted if they are based on a faulty needs assessment.

Numerous definitions of needs assessment can be found in the literature of this field. However, in general, the term is used to designate a process for identifying and measuring gaps between what is and what ought to be, prioritizing the gaps, and determining which of the gaps to work on to obtain closure. In the educational setting, this process yields information which can be used in educational planning, in problem-solving for making educational decisions, for accountability, and for supporting applications for funding. In educational systems development, the information and data obtained from needs assessment are used to design, implement, and evaluate instructional products or programs.

To many people, needs assessment and evaluation are very similar terms; in fact, some people use them synonymously. Others, as will be shown later in the models analyzed in this study, use evaluation as an integral part of the needs assessment process. Although the two concepts are very alike (that is, some of the same theories and techniques are used in the processes), one of the biggest differences is the time

TABLE 1

PURPOSES OF NEEDS ASSESSMENT			
Kind	Purpose	Advantages	Disadvantages
Monitor stakeholder perceptions.	Generate ideas and document perceptions about various issues.	Exploratory in nature; relatively threat-free.	Needs and wants may not be differentiated, not linked directly to action.
Program policy justification.	Estimate relative acceptability of various alternatives.	Allows input, helps identify potentially controversial issues.	Tends to emphasize may generate support for questionable or controversial issues
Participative policy making.	Select the most acceptable policy or program from alternatives	Allows stakeholders to influence institutional response to needs.	Potential to generate support for questionable or controversial issues.
Measurable improvement.	Determine whether needs have been met.	Document effectiveness of unit, assess client functioning.	May not attend to present problems or needs or focus on concerns previously identified.

element. Since needs assessment looks at "what is" and compares to "what should be," it is looking from the present to the future. However, evaluation looks from the present to the past as it asks, "what has been the impact" of a given program or product on student learning, or "what was done" and "what was expected to be done" (Witkin, 1975).

Elementary Teachers' Needs

According to Moore and Hanley (1982), elementary school teachers have certain needs which limit their effectiveness in the classroom. To identify these needs, an assessment of teacher needs was conducted.

The findings of the study was that the elementary school teachers indicated a high priority need for help in six factor need areas: (1) developing effective learners and a mastery of the basic skills; (2) guiding children to set up and achieve realistic goals; (3) locating materials and inservice support for more effective teaching; (4) establishing and maintaining discipline; (5) identifying and understanding readiness factors that affect learning; and (6) motivating children to learn. Additionally analyses of variance were performed to test for relationships between the identified factor needs of elementary teachers and selected teacher variables. No statistically significant (0.05) relationships were found to exist.

The omnipresent challenge in American elementary education has been to organize instruction so as to facilitate learning for the majority of children in the elementary school classroom. Research in this area has resulted in changes in elementary school curricula, materials and media as well as changes in the understanding of the learning process. Yet,

while many changes have occurred in materials and methods, pessimists question whether these changes have resulted in any improvement in teaching and learning. Many researchers feel that the changes that have been implemented in elementary education have not met the actual needs of elementary teachers (Gallup, 1977; Gorton, 1973; Olivero, 1976; Pigge, 1978). Subsequently, the desired improvement in elementary school learning has not been achieved. In light of this past failure, it seems desirable that attention be directed toward the identification of those areas of need which elementary teachers felt would improve their classroom teaching and learning, as well as their relationship to selected teacher variables.

To identify the specific needs that elementary teachers felt were limiting their classroom teaching effectiveness, an elementary teacher needs assessment was conducted. The teachers surveyed were a random sample of 600 elementary teachers employed in the public schools of Oklahoma. These teachers were drawn from large metropolitan school districts as well as from small agricultural community school districts. (See Table 2).

Instrumentation

The Teacher Assessment Profile (TAP) (Hanley and Moore, 1979) was the instrument used to assess the elementary teacher needs. The TAP consists of a list of ninety-eight teacher-validated need statements which are designed to identify a wide range of elementary teacher needs. Following each statement represents an area of no need, little need, moderate need, or much need. Reliability and construct validity of the

TAP were established by the authors in a separate study (Hanley and Moore, 1979). A general information sheet was included as part of each assessment profile to obtain data to be utilized in the data analysis. The elementary teachers were asked to indicate the grade level taught, years of teaching experience, highest degree earned, and their gender.

Results

Factor analysis was used to make an accurate identification of those factors underlying the needs of elementary school teachers. The factor analytic procedure (Kerlinger, 1973, pp. 659-664) was selected as a variable method for making an accurate identification of elementary school teacher needs because the procedure produces categories of items that result from empirically obtained relationships. For the analysis, the teachers' responses to the TAP were assigned a weighted value, one through four, which corresponded to the four columns on the assessment profile. The resultant weighted responses were submitted to factor analysis using principal components factor extraction followed by orthogonal rotation by the Varimax criterion. This analysis resulted in 13 high-factor needs that are interpretable.

Those factors with factor mean scores greater than 3.00 (more than moderately needed) were then judged to be the high priority needs of elementary school teachers. The factor needs ranked from greatest need to least need, are presented in Table 3.

An examination of Oklahoma Elementary Public school teachers' responses to the high-loading items of each of the 13 identified factor needs indicated that the elementary school teachers had a high priority

need (more than moderate need) for help in six factor need areas. The six high-priority factor needs, factor I - VI, identified by the elementary teachers are listed in Table 3.

The findings of this study indicated that elementary school teachers perceive a more than moderate need for help in six need areas. These six need areas include: (1) developing effective learners and a mastery of the basic skills. (2) guiding children to set up and achieve realistic goals; (3) locating materials and inservice support for more effective teaching; (4) establishing and maintaining discipline; (5) identifying and understanding readiness factors that affect learning; and (6) motivating children to learn.

Student teaching is considered by many educators as the most valuable element in the development of the professional teacher (Silberman, 1971). The importance with which student teaching is viewed does not mean that student teaching experiences are perfect. That there exists a need for redirecting and refocusing student teaching experiences as a part of teacher education is a topic of much comment (Hurd, 1973; Munte, 1974). Silberman (1971) may have best summarized this need by observing that compared with the kind of clinical training teacher should and could receive, practice teaching falls woefully short of the mark.

TABLE 2

Distribution of Elementary School Teacher Sample Returns

Teacher Variable	Categories	Sample size
Grade level	Kindergarten	36
	First Grade	36
	Second Grade	35
	Third Grade	26
	Fourth Grade	36
	Fifth Grade	34
	Sixth Grade	32
	Reading	12
Experience	0-3 years	28
	4-6 years	56
	7-9 years	63
	10-12 years	36
	12 years	64
Degree	Bachelor's	164
	Master's	82
Gender	Male	22
	Female	224

TABLE 3

Factor Need	Factor Need Names Ranked by Priority Name	Mean Score
I	Developing effective learners and mastery of the basic skills	3.49
II	Guiding children to set up and achieve realistic goals	3.16
III	Establishing and maintaining discipline	3.10
IV	Identifying and maintaining discipline	3.10
V	Identifying and Understanding readiness factors that affect learning	3.07
VI	Motivating children to learn	3.02
VII	Designing assessment devices and interpreting the resulting data	2.95
VIII	Supporting teaching with technological methods and materials	2.89
IX	Understanding interpersonal factors that influence the child's educational goals	2.82
X	Developing a greater understanding of human behavior	2.78
XI	Updating in curriculum content areas and methodologies	2.78
XII	Improving multipurpose classroom grouping techniques	2.73
XIII	Administrative assistance with instructional planning	2.37

The idea that needs of people (individuals and organizations) should be identified and/or determined by experts (evaluators) exclusively has been proven unsuccessful. Teachers' can be trained to conduct needs assessment on both pupils and other teachers. That can be done through interview, questionnaire or a combination of both. In order to make needs assessment exercises meaningful and useful, the gathering of data on this topic should come from both student and teachers. The literature on inservice education almost always recommends a thorough assessment of teacher needs before staff development efforts. The need for doing this has been well established, but planners of staff development programs and persons conducting research on staff development may wrongly assume that statement of needs made by teachers are their needs rather than symptoms of needs that must be diagnosed more completely.

Trainers, like any other group of professionals, have their blind spots regarding the logic of their practice. Several examples of the trainers' blind spots related to needs analysis include:

1. Failing to distinguish between what the firm says it wants, versus what it really needs. That is, the training function uncritically assumes the chief executive and senior staff must know the needs of their firms, otherwise they would not be in these high positions.
2. Failing to distinguish between training needs and organization needs; that is, failing to relate training to the goals and objectives of the firm's business plan. A variation of this

trap is to assume that all problems of the firm must be training problems.

3. Disregarding needs analysis completely in the design of programs; that is, training content is generated solely on the basis of what trainers have lesson plans for, hoping that at least a basic need or two of the firm will be addressed.
4. Depending totally upon staff intuitions or current training literature to define needs, without ever consulting the line organization for their perceptions.

Needs assessments are conducted especially in education for a variety of reasons. Among the most common objectives are: planning, problem identification or diagnosis, evaluation, and accountability (Scriven and Roth, 1978; Witkin, 1975).

Needs assessments are components of several evaluative approaches such as Alkin's CSE (Center for the Study of Evaluation) model. One other way that needs assessment and evaluation are closely related is in the systems approach to educational development, mentioned earlier. Whereas in many of the systems models, needs assessment is the first step through which goals and general directions are established, in many of these models, evaluation is the last step and tests the effectiveness of the goals and actions set by the needs assessment.

Many needs assessments are mandated (Roth, 1978; Witkin, 1975), and the results are used to hold institutions accountable for their effort. The concept of needs assessment became of interest to educators and trainers shortly after the notion of accountability was introduced in

school systems in the 1960's (Morgan, 1978). As a result of this interest, hundreds of needs assessment models, kits, procedures and tools have been developed.

As the literature shows, a lot of work has been done on needs assessment in education. It is so much that it is not possible to talk all about it here.

Among the models for needs assessment or needs analysis, the author has chosen to address a few of them as follows: Rath and Metcalf's (1945) "Wishing Well Needs Assessment", Kaufman's "Needs Assessment", Coffing and Hutchinson's "Client Need Assessment", Lee's "Needs Assessment", and Harless' "Front-End Analysis."

Rath and Metcalf (1945). developed what they called, "The Wishing Well" needs inventory. The authors made up a long list of "I wish..." statements and asked children to check off the ones that applied to them. These authors felt that "the special wishes of a sampling of children are related to more general needs of all children (p. 71)." The list of needs developed included a feeling of belonging, sense of achievement, economic security, a feeling of esteem, a share in decision making, etc. This investigator wonders how the authors could have come up with these high levels of needs for children. These authors did not state the age of the children as to know if these needs would actually be their concerns at that age. Some of these items of needs look like the needs of adults and not children. Rath and Metcalf could have allowed the children to suggest to them what they felt their needs were.

Another one developed by Kaufman is called "The Kaufman Model". Needs assessment, according to Kaufman, is a formal process for determining gaps between present and desired outcomes (Kaufman, 1975). It is not the means or procedure to fill those gaps, although he feels that education at all levels has been dominated by those who sell procedures and magical solutions (Kaufman, 1975). It is his concern that educational personnel learn to define problems correctly before jumping to solutions. He also hopes to assist in defining the problems so that available solutions do not predetermine means or ends that are unrelated to real problems. Through all of this process, he hopes to help others avoid poor decisions in designing a curriculum and thus improve the effectiveness of educational planning. In addition, he feels that if a needs assessment is to be truly useful, it should include the survival of the learners after they legally leave our educational agencies.

Kaufman suggests that needs data be collected by standardized tests, criterion-referenced test, observations (direct and/or unobtrusive), interviews, Delphi techniques, critical incidents, census data, employment data, and polls. In addition, he suggests that the needs assessment data be summarized, emphasizing that the data must come from three partners - learners, educators, and the community - and not be based simply on how the assessor "sees it" (Kaufman, 1975). According to him, a needs assessment "harvests" all the gaps for all the partners, places the gaps in priority order, and selects the highest priority gaps for closure.

Coffing and Hutchinson Model

A needs assessment model that is similar in many respects to Kaufman's is Coffing and Hutchinson's Client Need Assessment Model. Similarities can be seen in the fact that they both are discrepancy, concerned with gaps, both are geared towards educational change, both are concerned with available resources (although Hutchinson and Coffing, perhaps more so than Kaufman); both emphasize planning stages, and both involve essentially the components of learners, educators and the community (although Coffing/Hutchinson groups all of these under "clients" and then also discusses decision-makers and needs assessors as separate roles within the model). In addition, both models are cyclical in nature, although Coffing/Hutchinson puts more emphasis on this than Kaufman.

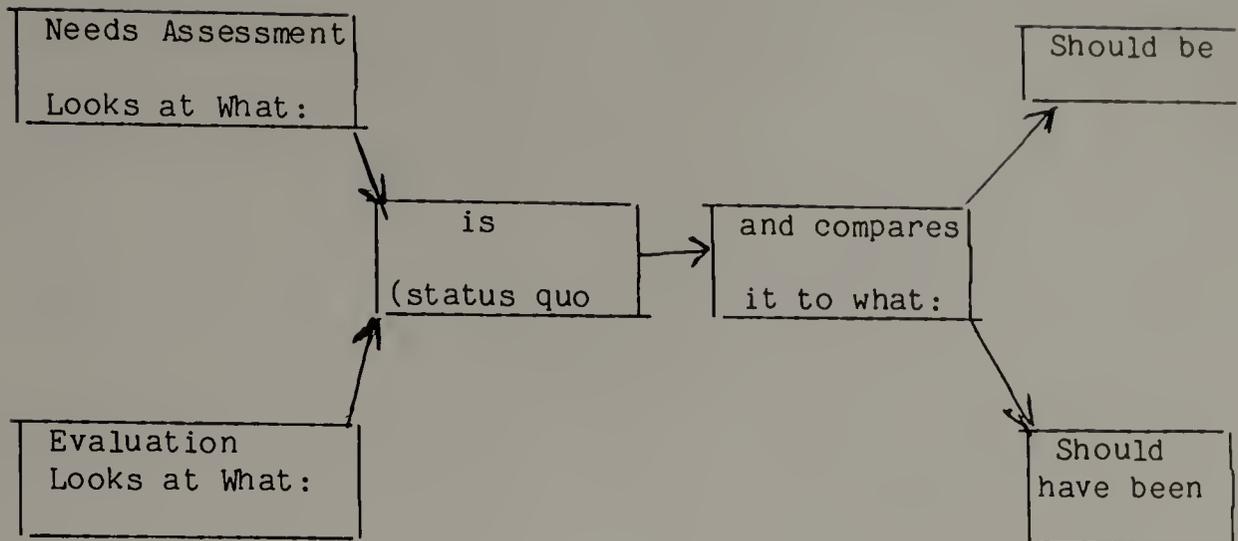
Although more similar than dissimilar, the models do differ in that Coffing/Hutchinson puts more emphasis on decision-making, whereas Kaufman emphasizes problem-solving (which, of course, eventually involves making decisions - but his emphasis is not much on this aspect). Coffing/Hutchinson also puts much more emphasis on the client's perception of needs, rather than the assessor's perception.

The explanation that follows is summarized and excerpted from a 25-page paper, written by Dr. Hutchinson, with bibliography and appendices, prepared for the symposium on "Methodologies under Development" at the annual meeting of the AERA, Chicago, April 17, 1974.

Needs assessment is becoming one of education's "hot topics." One reason for this is that the clients are restless. Students, parents, employers, tax payers, and others are demanding educational services that meet their needs, and they are less willing than they were in the past to have educators define their

FIGURE 1

KAUFMAN NEEDS ASSESSMENT MODEL



needs for them. Accordingly, it is becoming politics for educators to learn and to respond to their clients' conceptions of what the needs are. A second reason for interest in needs assessment is that educational agencies are adopting more systematic decision making strategies. Consequently the formal assessment of needs is coming to be viewed as essential information input to educational management at all levels from the classroom to national programs. (Hutchinson 1974).

Clearly, people's needs ought to be among the basic criteria for designing and the evaluation of educational services.

The Lee Model

Yet another needs assessment model is that developed by Lee. Like Coffing/Hutchinson, Lee is interested in the client, as he states "an important principle in human systems is that those who receive from the system should participate in determining what those services should be" (Lee, 1973). Also, like Hutchinson/Coffing, he is concerned with decision-making. He feels that "traditional practice appears to be the major criterion for decision-making. He sees a need for assessing the relationship of changed inputs to organizational outputs. He also feels that the basic purpose of assessing educational needs of students is to provide data or information base for educational decision-making" (Lee, 1973). Like Kaufman, he is concerned with problem solving, although he points out that:

There are several differences between the problem-solving approach suggested in this model and the more usual approach to dealing with problems in educational systems. There is an attempt to shift many of the emphases of the traditional school management model. The

approach to problems in this model is from the educational needs of the students, not from the maintenance needs of the evaluation system. Rather than attempting to avoid problem recognition, an attempt is made to seek out problems and resolve them before they become significant or of crisis proportions. Monitoring devices should be planned into the system to identify problems at the earliest possible opportunity (Lee, 1973).

One of the ways that Lee differs from the three previous models is in his emphasis on the effective, as well as the cognitive aspects of education, suggesting that objectives should be developed for both domains.

The Harless Model

Harless' Front-End Analysis Model is in several ways similar to the other models, however, states that for a given performance deficiency there are only three categories of remedies: (1) Training, (2) reengineering of the environment, and (3) incentive manipulation (Harless, 1975). Like Coffing and Lee, Harless is concerned with decision-making and goes into it in great depth as it relates to performance problems. He suggests the following essentials of decision-making and recommends drawing up a matrix to assist in the decision-making:

1. List the ALTERNATIVES and ASSUMPTIONS.
2. Determine the FACTORS to be considered in assigning priorities, based on the nature of the organization, the subject matter and the student population.
3. Determine a VALUE SCALE for each factor.
4. Determine a WEIGHT for each factor.
5. For each problem, select a factor value from the value scale.

6. Multiply the FACTOR VALUE by the weight of the factor.
 7. Repeat steps 5 and 6 for each factor and all problems.
- (Harless, 1975).

The Interview

Most models used in projects are based on live interviews and questionnaire surveys. The process the interview takes will be addressed. Quite a few projects use interviews only, Krebs and Steven (1971) in "An Assessment of Needs Related to the Education of Indian Children in the State of Washington," reported one of these cases using interviews only. Here, the authors selected informants from different groups, namely; parents, students, community organizations, tribal council, etc. Field interviews were conducted with each member of the group participating. The interview was structured because prepared questions under general topics were asked. But the discussion was expected to be informal. The tapes of the interviews were analyzed by a group of experts, who turned the data obtained into problems and these problems in turn were seen as needs. Finally, they were turned into programs for meeting the needs.

By the use of interview in carrying out needs assessment, the designers of different models have tried to involve those whose needs are concerned in defining their needs. But, in as much as this is a strength on their part, they gave too much power to the experts. These experts now have the power to say what data are to be translated into needs or not. This is one aspect in the literature where prioritizing

is not used. Again, there is no measurement of how far the present needs are being met. So the discrepancies are not known.

Generally, the steps in conducting an interview study are essentially the same as those for conducting a study that uses the mailed questionnaire as the primary data collection tool. The first step is to write a statement describing the general purposes of the research. In writing this statement, the researcher should be aware of the various research designs that make it possible to describe the distribution of the sample's responses on a single variable, to make differentiated descriptions of selected groups (e.g., male vs female, college-educated vs. non-college-educated), and to study time-bound and time-ordered relationships.

Next, a sample of respondents should be selected using appropriate survey sampling techniques. A serious weakness of interview studies done by graduate students is the usual necessity of using small samples. In order to obtain a reliable data in a needs assessment exercise, sample size should be made very considerable.

The interview as a research method in survey research is unique in that it involves the collection of data through direct verbal interaction between individuals. This direct interaction is the source of both the main advantages and disadvantages of the interview as a research technique. Perhaps its principal advantage is its adaptability. The well-trained interviewer can make full use of the responses of the subject to alter the interview situation. As contrasted with the questionnaire which provides no immediate feedback, the interview permits the research worker to follow up leads and thus obtain more data and

greater clarity. The interview situation usually permits much greater depth than the other methods of collecting research data.

The Questionnaire:

The questionnaire is another tool that can be used in conducting a needs assessment survey. Interview system of needs assessment usually go hand in hand with questionnaire. But there are many cases where questionnaires have been used without interview. When questionnaires are used, the most common type is a list of prepared statements to check. Dunnette (1982) developed a questionnaire for National Association for Foreign Student Affairs. The purpose of this needs assessment was to determine the needs of foreign engineering students for management skills. The survey instrument was mailed to 197 deans of engineering schools at United States universities offering graduate engineering programs. A variety of possible academic solutions was given to deans to be rated as to how well it would prepare their foreign engineering students for a managerial position in their home country.

It should be noted that in this case, it was not only checking off what one feels but respondents were asked to rate some of the questions. Again, this is another case where prioritizing was not used. The measurement of the data showed that the needs of foreign engineering students for management skill are not being met. The main disadvantage of the questionnaire instrument is that many respondents may choose not to return the questionnaire. Dunnette did an extensive literature review from where he decided what should be in the questionnaire. This method

of defining peoples' needs seems to be very prevalent among the professionals. But doubts do exist as to how much this actually addresses the people's actual needs. Twelker, et al. (1972) developed another survey questionnaire at the U.S. International University in Corvallis, Oregon. The survey asked seven groups (teachers, department chairpersons, curriculum coordinators, media specialists, etc.) to sort several items of information about an instructional system into the categories representing levels of importance. Respondents were given one hundred 3" x 5" cards relating to what information one would like to have before selecting a set of instructional material to sort in one hour. The cards were to be divided into three piles - important, neutral, unimportant, in the first sorting. Second sorting respondents were to take each pile and sort as before. Finally, the nine piles were put in envelopes and sent to decision-makers.

The Interview-Questionnaire:

A combination of interview and questionnaire makes up for either of the two and both of the deficiencies. An interview-questionnaire method was developed by Borg and Gall (1983). In this method a structured interview utilizing questionnaires was used. The purpose was to determine vocational needs of secondary special education students. The basis for data collection was the special education enrollment in San Diego City Schools for tenth, eleventh and twelfth grades. The authors interviewed teachers, student, and their parents.

This needs assessment project seems to be quite interesting. These students were given a part in determining what their needs were. Also

parents were given the chance to contribute what they felt were their children's needs. Teachers who teach the children were allowed also to help in defining the children's needs. This method has the advantage of generating a needs data that is quite broad based.

Another interview-questionnaire was used in assessing the educational needs of students in the state of Washington. Boyd (1970) reports that the procedure is of two kinds. Phase I consisted of a mailed, self-administered questionnaire asking each individual respondent to check off from a large list of possibilities those that concerned him/her. Phase II was made up of 34 focus interviews. In both cases, the random sampling went further to represent different ethnic, geographic and school district sizes within the state.

The result of the mailed questionnaire and the taped material which was transcribed into thirteen hundred pages, were given to the officials in the superintendent's office. But there was no report on what they did with the materials because no data was reported.

This needs assessment has the following advantages: (a) it covers a wide spectrum of the community, (b) it used random sampling which allows for objectivity and validity; (c) it also involved several different individuals in defining students' needs, and (d) interviews were used to get clarification and potential operationalizing of needs.

Educational needs assessment in Nigeria:

The colonization of Nigeria by Britain for a long time and the effects it had on the majority of the citizens who were illiterates during that period enhanced the importance of education to the people.

Between 1940's and 1950's people with School Certificates (high school diplomas) had executive posts after a few years' experience on the job. Many people who could not go to school and whose only prerogative was manual labor vowed to do everything in their power to see that their children would not suffer the same fate. By 1957 the regions of Nigeria gained self-government from Britain. Without any loss of time the Western and Eastern regions of Nigeria declared universal primary education for all children. That exercise brought about a school population explosion in Eastern Nigeria to which the school system in question belonged.

From then on, the elementary school population had been increasing at an alarming rate. So had the teaching staff of elementary schools been increasing in number. In order to meet the demand for trained teachers at the elementary school level, "crash programs" had been authorized by the governments of the different states. "Crash program" is a device whereby training was offered to as many as possible and at a shorter duration. Teachers produced under this program were not fully trained. Such a program helped somehow to provide the average competency needs of teachers.

Like other parts of the world, countries of Africa have their own traditional education which needs development. The aim of traditional African education is multilateral and the end objective is to produce an individual who is respectable, skilled, cooperative and one who conforms to the social order of the day (Fafunwa, 1974). It is the opinion of this writer that the use of an appropriate needs assesment model will provide teachers the opportunity of developing a curriculum that will

afford the students the resources necessary to attain the goal of traditional African education.

In a study conducted on the "institutionalization of the program in professional education", Dr. Glen Taggart, the second Vice Chancellor of the University of Nigeria at Nsukka, in his 1964 Report recommended that the university give priority to a program in education which would both provide for teachers and educational leaders and also assist in reconstructing the Nigerian educational system (Hanson, 1968 p. 36). That recommendation, in this writer's opinion, emanates from the fact that the then Nigerian educational system, which was British-oriented, was not addressing the Nigerian educational needs.

The commitment of the University to gearing programs to meet the "needs" of Nigeria implied either (1) prior knowledge of what those needs were, or (2) some process of ascertaining them.

The introduction of the Plan for the Development of the College of Education (February 21, 1961) justified the proposed plan in terms of the "knowledge base" the investigators had by that time acquired and indicted the sources from which they were then collating ideas. It reads as follows:

One of the most distinctive features of the land-grant philosophy of education is the important place it accords to the applied fields of learning. It is thus of extreme importance that those branches of the University of Nigeria which relate most immediately to meeting the pressing needs of Nigeria should be given careful attention and, indeed, a degree of priority..." (Hanson 1968).

The committee charged with developing a plan for the College of Education was unusually fortunate in having a number of sources upon which it could draw in structuring a plan for its development. In order

to carry out the needs assessment of the above educational plan, those concerned with the plan had to consult with indigenous educational leaders who were familiar with the people's culture and values. The interviews held with such leaders gave investigators a lot of useful ideas. The Carnegie Seminar on Education brought together outstanding school people of Nigeria, leaders of thought in related fields, and educational experts from the United States and the United Kingdom. The team was specifically oriented towards advancing suggestions for the College of Education of the University of Nigeria.

The report of Ashby Commission and the supporting data published with it provided an analysis of education throughout Nigeria, and was of tremendous help to the committee during its planning exercise.

It should be noted that many people have expressed concern about various aspects of the field of education in recent years. Rising costs, inequality of educational opportunity, and the relevance of existing programs are only a few of the concerns that have been voiced (Lee, 1973). However, Price et al. (1977) in their publication, "Comprehensive Needs Assessment," makes a distinction between a "concern" and a "validated need";

People have many concerns which are not supported by facts. . . These are then rated or ranked according to pre-determined criteria.

To them, a "concern" is a hypothesis or belief that there is a difference between existing and desired conditions. It is through the needs assessment process that this hypothesis is validated or refuted (Price et al., 1977).

It is the belief of the writer that accurate assessment of needs will increase the likelihood that activities and programs can be more efficiently mounted, and that students' needs will be satisfied, and the subsequent improvement in students' learning attitudes and degree of satisfaction will be evidenced (Kuh, 1980; Scriven and Roth, 1978).

According to Kuh (1980) the benefits to be realized from a systematic needs assessment process are related to the degree to which the following conditions are met: a) the assessment is conceptualized as a process; b) the concept of need is adequately defined and c) clarity is achieved concerning the purpose(s) of the needs assessment.

Elementary Mathematics Needs Assessment

According to an article published in the January 15, 1985 issue of The Nigerian Sunday Times, by a mathematics professor on "Problem of Teaching Mathematics in Nigerian Schools", mathematics is referred to as the terror of students and worry of teachers (Alibi 1985). He stressed the importance attached to the subject by the public by describing it thus; "As a subject, the lack of its knowledge has shattered the dream of many an ambitious student; its non-possession or non-use has hurt society in a way it may not have been readily conscious of." (Alibi, 1985, p. 5).

The story of mathematics is seen by Nigerian educators as the story of the inherited Western education of Nigeria. The writer of the article quoted above, in his view said: "But of all the defects of our imported education system, none is, perhaps, more serious than the teaching of mathematics in our school system, especially at the primary

and secondary levels - the levels that matter most in the acquisition of any formal knowledge."

Other mathematicians like Prof. Iya Abubakar and Prof. Chike Obi share the same opinion with Alibi. The findings of a study made on the problems of teaching mathematics in Nigeria revealed that at the root of the mathematics problem is what can be called the "mathematics' syndrome", "mathematics' fright" or "mathematics phobia" which mathematics learners or prospective learners of the subject are prone to. This fear is instilled in the young minds by adults (their elders, teachers and parents) who had suffered from defeatist and inhibiting attitude which leads to a vicious cycle of false fear and living true to the fear. According to Alibi's findings, "the students being psychologically defeated, they proceed not to "know" the subject."

One Mr. Odey who was interviewed on his opinion about the subject, said, "If I had listened to what people say about mathematics, I would not have been heading for a dreamed medical career today; I found out that mathematics is not as difficult as people say it is; mathematics is easier than English literature, history and the arts." (Alibi, 1985, p. 5).

Unlike Mr. Odey, many students gave up on the subject because of the tale that the subject is only for a few gifted ones. Others got discouraged by the way it was handled by teachers who themselves did not know the subject and ultimately could not teach it effectively. This writer believes that if the teaching of mathematics is made optional, many teachers will be glad.

By their teaching approach, some mathematics teachers instill hatred for the learning of mathematics in the minds of their students. Others simply mystify the subject by the way they handle the teaching due to the fact that such teachers are not conditioned to the proper psychological approach to the teaching of mathematics. They therefore scare students away to cover their shortcomings, commented one Mr. Ushie, a mathematics teacher.

Some teachers who feel inadequate to teach mathematics because of their educational background and training lack the confidence they very much require in order to perform effectively. The result is that the same old story of mathematics' syndrome continues. It is not unusual to see student teachers selling their mathematics text books soon after their certificate examination in mathematics is over, an indication of relief from the "monster" (mathematics).

Also, in the United States, the effectiveness of mathematics instruction is being examined on various levels due to the growing concern that the nation's children, as well as adults lack competence in the subject. Factors thought to be related to success in mathematics were investigated by educational researchers (Clark-Meeks et al. 1982).

According to their findings, one of the factors which receives much attention in relationship to mathematics instruction is mathematics attitude, and one of the groups which is steadily being investigated is prospective teachers. The prospective teachers were assessed for mathematics attitude with a Likert-type scale as education majors.

The purpose of the study was twofold. The primary objective was to determine if there was a difference in mathematics attitude among

prospective teachers interested in different concentration areas, such as early childhood (preschool), early childhood (K-3), intermediate (4-9) and special education (Clark-Meeks et al. 1982). The second objective of the study was to determine the validity of a Likert-type scale such as the Revised Math Attitude Scale for the particular groups that were included in the study. The Revised Maths Attitude Scale was constructed by Lewis Aiken and Ralph Dreger. The instrument measures attitude toward mathematics with opinions ranging from strongly disagree to strongly agree. The scale consists of 10 items which express negative attitudes and 10 items which express positive attitudes. The reliability of the test was found to be 0.94 (Aiken and Dreger, 1961).

The results of the study in general indicate that, for the most part, prospective teachers have unfavorable attitudes toward mathematics. The four groups continue to experience strain, dislike, fear, insecurity and confusion when confronted with mathematics (Clark-Meeks et al. 1982).

The Effects of Innovation in Mathematics

With the investment always made to education as a source of bringing about the much needed development by many African states such as Nigeria, the need for accountability became obvious. That led to the evaluation of programs in education. In the process of the evaluation, the educational needs of Nigeria were enumerated especially in the areas where the country lagged behind such as in the industrial and technological sectors. The causes of such lag were discovered and one of the reasons for the backwardness of the nation in the field of industry

and technology was that the Nigerian society was not a numerate one. To promote interest in industrial and technological improvement in the society, much emphasis has been laid on the importance of more work in mathematics education as a tool for bridging the wide gap which exists between the industrial and technological heights attained by developed countries and the Nigerian Society.

National experts in the field of mathematics highlighted the following points that express the importance of mathematics as a subject in the school curriculum thus: "Mathematics is at the base of all the science and environmental professions. In the arms industry, math is needed for the production of guided missiles and is also useful in aerospace technology. In communication, mathematics is also very useful. One who is mathematically literate can communicate precisely and present his argument in a logical manner because mathematics helps one in logical thinking. Indeed, there is hardly any field where mathematics is not useful. The farmer, the hunter, the carpenter, the mason, the housewife, etc., all use mathematics although they may not be aware of this fact" (Alibi, 1985).

Because of the imported western education which Nigeria inherited from her colonial master (Britain) which places too much premium on the literacy (the art of reading, writing and arithmetic, "the 3 R's", and the acquisition of knowledge for its own sake), the need for exactitude, precision and accuracy, which mathematics is all about, was underscored in arithmetic curriculum at the primary school level. For decades Nigeria continued with the curriculum which did not include other important branches of mathematics such as algebra and geometry. The result

was that when students enter into secondary schools where they encounter these important branches of maths for the first time, they have difficulty in understanding the mathematical concepts involved.

After Nigerian independence in 1960, and even before it, enlightened Nigerians and other Africans felt that arithmetic as indeed were other subjects in the curricula, was not adequate for the needs of the country and that there was the need to improve the contents of mathematics curriculum in Africa. As a result of this move, the idea of another mathematics was hatched. It was called "Entebbe mathematics."

Entebbe mathematics is so-called because the writers of the texts met at Entebbe, Uganda. It was introduced with the aim of improving the content of mathematics curriculum in Africa and to make the numerate subject more relevant to the needs and aspirations of the developing African states. The project was mainly funded by the United States Agency for International Development. As story has it, there were some misgivings about the American aid (Alibi, 1985). Some felt that America undertook the project in order to counteract the influence of USSR in African states as "Yuri Gagarin" of the USSR then had gone to space. Others felt that America had selfish reasons for aiding the project, that she undertook it so as to sell her math-related products like computers to her client (African states).

Before the move for the revision of mathematics curriculum, there were a lot of pitfalls in the teaching of arithmetic which constituted mathematics in Nigerian elementary schools. In the 1940's arithmetic was taught to beginners (primary classes) in abstract forms. At this stage, when the children are not ready to handle abstracts, it is unfair

to expect them to follow any abstract teaching. This writer believes that early introduction of abstracts to children is the reason why many children get lost during arithmetic lessons. Their inability to understand any computations done in an abstract form made them perceive arithmetic exercises as "a puzzle" which also led to their experiencing confusion each time they made computations.

The increase in turnover of trained teachers brought about a new direction in the teaching of arithmetic in Nigerian primary schools. The teachers who have been exposed to the psychology of learning realized that children learn from concrete to abstract, hence the introduction of the use of local materials as teaching aids. This change in the method of teaching arithmetic and other subjects made lessons more realistic to pupils. The change did not go without criticisms from conservatives who found fault with the new move. They criticized the idea of using counters (sticks, pebbles, skittles and seeds) in learning counting as an unrealistic approach since it would not be possible for the children to have enough counters for calculating larger numbers. They also maintain that it leads to slow calculation which eventually may affect students' speed in solving problems in future when they may not be using such concrete objects.

Over the years, many more subjects have been added to the curricula at different levels - primary, post-primary and tertiary - mainly because the aims of education in Nigeria have been undergoing changes. To live up to the expectations of these changes, curricula had to be updated. The response to changes has been slow, but such a situation is not unique to Nigeria alone. Factors like unrealistic objectives,

conservatism, competition, weak infrastructure, manpower shortage, and above all, lack of finances, have cojointly or individually militated against the updating of the curricula to meet the urgent needs of societies in many developed and developing countries.

The Entebbe mathematics, otherwise known as "modern mathematics" was not given a fair and enough trial before it was ousted. The year long controversy on modern mathematics in the Nigerian schools ranged from the call that "modern mathematics is a repressive campaign mounted by imperialists against African scientific and technological development" (Obi, 1976) to emotional statements such as modern mathematics is "modern-muddle" (Tomori, 1976). According to the report of a Task-Force appointed by the Federal Government to examine the curriculum in mathematics and make recommendations for its improvement, the body was unwilling to believe Professor Obi's assertion in view of the well-known facts concerning the origin and the spread of these reforms, some aspects of which has been reiterated earlier. if the fault is not that of the imperialists' theory, it is the opinion of many enlightened Nigerians that the fault is that of the many Africans - educators who went to Accra, Mombasa, and Entebbe between 1961 and 1969 and closed their eyes to such anomaly (Nigeria Task-Force, 1977). The issue of "modern muddle" was dismissed as an ecstasy in ignorance. It asserted that if the author has greater information and understanding of the background to the modern mathematics movements, of its points of view and its content, this confusion would not have arisen. This throws a challenge to educational authorities on the importance of educating

classroom teachers and the public on the point of view of a viable mathematics curriculum

In addition, it was noted that in some parts of the world, where new curriculum in school mathematics has been introduced, especially in the United States, some discontent has also been voiced after an appraisal of the programs (Snowmass Conference Report, 1973). Among these are that a proper balance has still not been achieved in mathematics curriculum: (1) between abstract concepts and arithmetic skills, (2) between mathematical content and applications, and (3) between the needs of the university-bound students and the general student population.

The issue of whether or not set theory should be taught to elementary school children raised by Professor Obi was shared by other mathematicians. The following is Professor Obi's remark:

Another thing we must do now is to examine how mathematics is being taught in our schools, colleges and universities - - - whether it is proper to teach set theory to elementary minds which have not yet been used to the ordinary words of everyday life (Obi, 1976).

In July, 1976, a National Task-Force was set up by the Nigeria Educational Research Council (N.E.R.C.) in consultation with states' ministries of education and university institutes and faculties of education and was charged with the following assignment;

1. To examine the different aspects of the controversy on the teaching of "modern" or "traditional mathematics" in Nigerian schools.
2. To examine the existing school mathematics curricula in the light of this controversy and spotlight the problems and issues; and

3. To make concrete proposals for the development of appropriate mathematics curricula for the different levels, including suggestions for their implementation.

The Task-Force met in the University of Ibadan from February 21 to 23, 1977, during which it worked on two sub-committees, namely:

1. Primary (Elementary) and Teacher Training
2. Secondary: Low and Upper levels

In the first plenary session after discussion on the issues and the problems relating to mathematics education, the Task-Force reaffirmed the recommendation of the Benin Conference, namely, that the Federal government should introduce mathematics, not just arithmetic into all Nigerian schools.

Furthermore, the conference, after very careful analytic and painstaking deliberations, agreed:

1. that there would have been no controversy if there had been adequate information and publicity about the rationale behind the modernization of the mathematics curriculum;
2. that the core of mathematics is the same in both the so-called "traditional" and "modern mathematics. And that the difference is the shift in emphasis from rote learning and heavy computation to learning with understanding and with an eye on its applicability to everyday life;
3. that the task of teaching mathematics has been further aggravated by the inadequacy of teachers and increased enrollment at the primary and the secondary levels of the system far in

excess of the public capacity to produce adequately qualified teachers;

4. that most of the arguments advanced against the "new" mathematics have been based on sentiments, personal biases, and isolated cases, and have not been advanced by people who have made a sound study and evaluation of the situation. It concluded that the criticisms should, therefore, be evaluated in the light of the background and related experiences of the critics.

After the plenary sessions, the Task-Force worked in two independent groups with particular emphasis on the following three tasks:

1. To examine the topics in the curricula in current use and identify the topics which are essential and desirable in a mathematics curriculum which is designed to achieve the objectives as set down in the National Policy on Education.
2. To highlight the problems and issues which obstruct the achievement of the national objectives in mathematics.
3. To recommend courses of action aimed at reducing and, if possible, eliminating these problems.

The Task-Force identified the most pressing issue as far as that material situation of mathematics education was concerned as that of deciding what mathematics should be taught and how it should be taught in Nigerian schools and colleges. At the primary and training college levels, the Task-Force recognized that it was relevant to contrast the arithmetic currently taught in the majority of schools and colleges with

what is now being recommended in the N.E.R.C. new mathematics curriculum.

Bearing in mind the objectives of education as enunciated in the National Policy on Education, the Task-Force listed the topics which can be usefully taught at the elementary teacher training colleges (Grade II), and secondary school levels. The topics selected are necessary, useful and relevant for the pupils at the levels indicated. It is on this basis that the Task-Force strongly supported the Benin resolution that mathematics must be taught in all schools and colleges in Nigeria.

The goals of the new mathematics program are incorporated in the guiding principles that were used in preparing the programs, most of which are readily acceptable to all. Some of those guiding principles are summarized and outlined as follows:

1. That mathematics should be taught as an integrated development of algebra and geometry;
2. That mathematics should be taught for understanding, not merely for manipulative skill;
3. That the first approach to each topic should be intuitive and that many approaches to illuminate a topic from many sides should be used;
4. That drill for drill's sake should be replaced by the use of past learnings in new meaningful situations;
5. That suitable problems that give opportunities for pupils to explore and make discoveries that are within their reach should be developed;

6. That the use of spiral approach in which the subject arises at different times with increasing degrees of complexity and rigor should be practised;
7. That fuller use be made of the historical background of topics in order to develop an appreciation of how it arose and why it is studied;
8. That many significant mathematical topics can be approached through exciting games and puzzles and that this recreational aspect of mathematics should be exploited, especially in the primary grades;
9. That mathematics lessons should provide more opportunities for logical inferences in particular at the elementary classes and develop a growing awareness of the nature of logical reasoning at all school levels;
10. That in the development of postulational thinking, excessive delicacy and austerity should be avoided. For instance, if proofs are too long, and seem to be only laborious ways of arriving at what seems obvious to the student, the deductive method is not likely to look either attractive or powerful.
11. That mathematics programs should show how mathematics is applied in the physical sciences or to other studies of the real world. However, the program or instruction must keep in mind that many important applications of mathematics are internal and limited to mathematics itself;

12. That supplementary materials should be used by individual students who are ready to pursue a topic more broadly and deeply.

With the help of the guiding principles and goals, the new curriculum in mathematics was drawn and completed in 1978.

According to Taiwo (1982), there are factors and circumstances that influence, shape and determine the Nigerian educational system, such as;

1. The historical factor which gives the system its history: how it began and how it grew, its failure and successes;
2. The political factor which determines the place of education in the priorities of the nations, the national goals of education, the process of decision-making and the pattern of administration;
3. The economic factor which determines the supply of schools, attendance of children at school, the quality and quantity of equipment, transportation and roads, employment opportunities, and the supply and quality of teachers;
4. The social factor: the traditions and culture of the peoples, their attitudes and religions, family life, occupations and leisure, the status of teachers, social strata and the general social atmosphere of the community, all of them influence the educational system of Nigeria.

Overview of Teacher Education in Nigeria

The Pre-Statutory System

The pre-statutory system of the western type of education was the result of the activities of the Christian missions, which started in 1842 in the coastal areas and gradually spread to the hinterland of the territory which later became the colony and Protectorate of Southern Nigeria. The aim of education at that time was mainly religious. It provided for the children and the adult converts who had to learn to read the bible, the prayer book and the commentaries and to sing hymns. A number of the children were sufficiently proficient in reading and writing to become teacher or catechists in the church and clerks and interpreters in the government services and commercial houses (Taiwo, 1982).

The statutory system: The first statutory system of education in Nigeria was the Education Ordinance No. 3 of 1887 for the promotion of education in the colony of Lagos, which derived from the English system. The colony comprised Lagos Island and its mainland, Badagry, Lekki, Epe and Ikorodu. The territory corresponding to the present Lagos State (Protectorate of Lagos). In 1903, there was the Education Proclamation No. 19, which was applicable to Protectorate of Southern Nigeria, the territory which later became the provinces of Calabar, Owerri, Onitsha, Warri, Benin, Ogoja and Owo district of Ondo province. The Proclamation mission with its background of the Scottish educational system brought the establishment of the Church of Scottish Mission Schools. Industrial education and the district primary school which emanated from this proclamation was later known as "government schools".

The aims of the Christian mission schools generally were the teaching of the Bible and the plough. According to Buxton (1851), "It is the Bible and the plough that must regenerate Africa", as well as the development of the local languages and the identification and training of evangelical leaders. The boarding school was a feature of the mission house. It brought the children under the maximum influence of the missionaries who were able to select the best of them for special training and positions of responsibility in the church. The children in the boarding school did some gardening and occasional farming around their dormitories.

The first attempt made in the way of teacher training in Nigeria was the Church Missionary Society Training Institution at Abeokuta which was founded in January 1853. The church placed a lot of importance on the selection and training of its missionaries as well as the selection and training of African evangelists and teachers. The Education Ordinance, and later the Board rules made provision for encouraging teachers to qualify and improve themselves. The inspection reports of the period constantly drew attention to the weakness of the teachers and suggested that the remedy lay in teachers' certificate examinations. There were four grades of teachers' certificates, the lowest being the fourth. There was no special requirement or training in becoming a candidate for the examinations.

The teacher's first grade examination included School Management.

The Collmer 1890 inspection Report read as follows:

Next in order comes the actual result of the examination of teacher for certificates. The examinations were held on January 27th and the two following days; Grades II, III, and IV, from the nature of the examination, taking only one day in each case; Grade I took

three days. The results are not so good as one would like to represent. For example:

1. Three sat for "Grade I"; all failed.
2. For "Grade II" six have been recommended for certificates.
3. For "Grade III" five have been recommended.
4. For "Grade IV" only three passed, two being females (Golmer, 1890).

The writer believes that any arrangement of teacher certification based on the passing of examinations only is inadequate and completely misplaced.

Two major problems of teacher education for primary school teachers were the low output of teachers from the training colleges and the poor quality of teachers produced. Efforts were made to provide additional Grade II training colleges and extra streams in the existing ones and to upgrade some Grade II training colleges, but the numbers produced did not meet the needs of the schools. In 1963 teachers with the Grade II or a higher certificate were 15,976 out of a total staff of 94,176 in the primary schools. The inadequacy of the ratio of trained teachers to that of the untrained teachers affected the standard of primary education and the intake of the training colleges. The rate of failure at the Grade I examination was high, reaching 55 percent, which received a serious comment by the 1960 Banjo commission. Although many of the elementary school teachers in the primary system (including the Grade III and the uncertificated teachers), were dedicated to duty, their personal deficiencies in academic background and professional competence set a limitation to their performance and the children's achievement. The Grade II teachers needed new techniques and approaches and additional knowledge to cope with updated curricula (Taiwo, 1982). The

Grade III teachers and others with lower qualifications needed further general education and training, commented Banjo's commission.

The Ashby Commission of 1959 recommended the establishment of teachers' Grade I colleges for the improvement of primary education. Unfortunately, the recommendation was not implemented. Except the Rural Science centers, the Ohio Project of the Western Region and the Government Teacher Training College, Surulere, Lagos, with an annual intake of less than twenty, there were no Grade I colleges (Letter C.M.S. Y2/1(3), 1882-1898 National Archives, Ibadan).

Because of the failure to implement the Ashby recommendation of the establishment of Grade I colleges as a means of improving primary education, the annual refresher courses, popularly called the Ashby courses, and the short in-service courses became popular. They improved the quality of teachers and their teaching and that helped to retain such participants in the school system (Taiwo, 1982). The Grade I teacher who qualified by obtaining passes in two subjects in the General Certificate of Education at the Advanced level was usually lost to the system. It almost became a policy to exclude Grade I teachers from the primary schools because of their high salaries. It was an unfortunate incidence since the original idea of advocating for Grade I teachers was for the improvement of primary education by such qualified (Grade I) teachers.

The development of primary education in Nigeria which was guided by the Ashby recommendations, was designed to advance the primary school system towards the Universal Primary Education (UPE). Already the Eastern and the Western Regions were achieving quantity through their

respective UPE programs but were becoming apprehensive of the teething effects of the programs: dilution of staff, automatic promotion, wastage on children who dropped out, falling standards, and the high cost of the programs.

In the Eastern Region of Nigeria, the main emphasis of the development program in primary education was on teacher training with a view to quality of work in the schools. In the Western Region, the emphasis was also on quality. "With the successful operation of the universal free primary education scheme launched in 1955, the attention of the region was not concentrated on raising the standard of teaching in the schools. The primary school population which was then about 1.2 million is expected to rise to about 1.5 million in 1966/67" (Western Region, 1959). This writer holds the opinion that the foregoing issues raised by the two regions of Nigeria indicated that there has been and there is an urgent need for sound teacher education and the retraining of teachers (inservice training).

The huge and sudden increase in the demand for qualified teachers which has been brought about by UPE is obliging many countries to develop alternatives to conventional initial training, for example: "Distance programs" and the use of headmasters as trainers of their staff. Universal primary education implies changing the contents of the training curriculum. All these innovations should not be viewed as threatening constraints but as opportunities for progress towards a policy of lifelong professional development. Features of such a policy would include a review of the respective contributions of initial induction and in-service training, school-based school-focused alternatives

to "the course", a concern with the cost-effectiveness of different strategies, and the active involvement of teachers in their own training (Thompson & Greenland, 1983).

Where massive expansion of school systems is taking place, the limited capacity of those systems, either to redeploy serving teachers or to train fresh entrants to the profession, has resulted in the employment of large numbers of unqualified or poorly qualified teachers. According to Thompson and Greenland (1983), to expand existing teacher training facilities may not provide the solutions since the pace and scale of the growth of school together with high rates of wastage from the profession may place an insupportable burden upon resources of finance and staffing and upon the pool of potential teachers available. Some countries have tried to modify their training programs by cutting down their length, as in Tanzania up to 1981 and in the pivotal Grade II courses in Nigeria," asserted Thompson and Greenland.

While it is true that UPE is intended to provide greater equality of opportunities in a society, there are also conflicts of function while carrying out the program. For example, the program may demand a common curriculum leading to a common examination/selection procedure or it may demand adaptation of curriculum and teaching methodologies to the various local conditions of the society. Decentralization as the later alternative demands implies a greater decentralization of decision-making and involvement of local communities in the financing and management of their schools.

Some writers and bibliographies on teacher education such as Thompson and Greenland (1983), are of the opinion that teacher education

should become more diverse and specialist process, no longer simply concerned with equipping teachers for currently conventional classroom teaching in a process of systems maintenance, but rather a process of preparing a wider range of categories of educationists to serve as agents of change. Integrated teacher education programs need to be conceived which embrace initial training for the new classroom - both for new entrants to the profession and for serving but untrained teachers; upgrading of categories of serving staff whose qualifications have become obsolete or inadequate for new purposes; retraining for the growing range of posts being created by the greater application and scale of the educational enterprise; and updating to enable staff in all categories to cope with changing concepts of education and of the teacher's role.

There are newer techniques being used by some countries presently in which permanent services of experts are required. In such cases, the closer focusing upon the specified needs of particular groups of staff are taken into consideration. The importance of training administrators, which has been widely recognized, has resulted in such institutions as the national Institute for Educational Planning and Administration in India and the Ministry of Education Staff Training Institute in Malaysia. A National Institute for Educational Administration and Management which is to be set up in Bangladesh, and a similar institute is proposed in Thailand. In other places, the responsibility of teacher inservice training is being heaped on specialist institutes and colleges such as the National Teachers' Institute in Nigeria, the Malawi Institute of Education, the Kenya Education Staff

Institute, the Korean Educational Development Institute, the Bangladesh Education Extension and Research Institute, the National Inservice Training College in Zambia, and other specialists colleges in Uganda and New Guinea.

The idea of specialist centers is very popular in developing countries. Thompson and Greenland (1983) express the danger that their existence may lead to the functional separation of initial from inservice training or inhibit the development of school - or field-based approaches which are of particular importance in distant rural areas.

One training approach which can enable teachers to apply their training efficiently is to involve the teachers in the design and provision of their own training. An APEID study of In-service teacher education in the context of universalizing first level schooling (APEID, 1979) not only concluded that such training fostered the concern of teachers to develop professionally as well as academically and positively teacher behavior and confidence to make low-level decisions, but commended the value of the maximum practical involvement of the teachers in the process. It also noted that "whole staff" training resulted in high professional growth. In some countries like Sri Lanka, Hong Kong, Gambia, Ghana and Singapore, teachers' organizations are active in promoting staff training. In most countries, teacher involvement is largely nominal at present. In some new teacher education programs such as the practicum-based teacher education curriculum project in the Philippines, the development of the teacher's self-confidence, sense of purpose and professionalism is being clearly defined as an objective.

some educators (Smith and Haley, 1981). Through his study on "Institution building among the modern Ibo" and his findings, Hanson came to a conclusion that a solid response can now be given to the question, "What makes for an effective staff development program?" One of his findings was that teachers committed themselves to inservice training when their input was solicited.

Within the literature, some authors make a clear distinction between staff development and inservice education; others use them interchangeably. For purposes of this study a distinction is made. Staff development is defined as all activities carried out by the district or individual school to promote staff growth and renewal. Staff development activities have personal role, and institutional dimensions (Bishop, 1976). Staff development is an umbrella concept with "inservice" as a subset.

Inservice education is defined as one or a series of planned instructional programs available to a specified group(s) of professional staff members for purposes of promoting participants' growth and increasing their job competence. While inservice is not synonymous with staff development, it is an important subdimension of the concept.

Development activities can be informal or formal. Informal activities are those day-to-day functions which have developmental effects upon staff. These activities include: implementation of district personnel policies; administration of the personnel evaluation program; involvement of staff in program planning, and day-to-day interactions. In one sense, informal activities constitute the most important of staff

development programming. They shape the perspective brought by staff members to formal program efforts.

Formal activities are planned program efforts that are personalized to the growth needs of individual staff members. They encompass a broad range of activities including conferences, school observation, curriculum committee involvement, consultation with peer, and inservice participation. The stages of the formal staff development are planning, implementation and evaluation (Rogus, 1983).

A unified plan of action is an essential to a successful staff development plan. Without a useful plan, development activities are disjointed and programs are without power. Developing program goal statements can be an effective starting point toward developing a comprehensive plan. The following set of staff development program goals can constitute the basis for dialogue in the planning committee:

1. To establish and carry out a plan for strengthening personal professional performance.
2. To demonstrate increased competence with elected teaching skills.
3. To develop/refine curricular programs to improve student learning.
4. To develop the knowledge and skills essential to implementing newly adopted programs.
5. To develop increased problem solving and communication skills while addressing organizational problems.
6. To carry out action-research on important teaching problems.

Agreed upon goal statements can serve as the source for holding the needs assessment that must follow. A needs assessment is simply a

process for gathering data for which specific program objectives can be gathered.

Data collection procedures can be derived logically from the established goals. If "to demonstrate increased competence with selected teaching skills" is a goal selected for focus, for example, a means for identifying which skills should be focussed on must be developed.

The need for teacher inservice education arises for various reasons. For example, in developing countries where there are still teachers who are not qualified to teach but because of the shortage of qualified teachers, they are hired to teach temporarily. In other words, such teachers did not have any pre-service training before teaching. Some others were not adequately trained for the job.

There are also teachers who have not involved themselves with any additional courses for professional improvement nor done any refresher courses since after their teacher training which took place ten or more years ago. In order for such teachers to be effective and up to date in their practice, staff development plans should be effected in schools. Teachers' needs assessment exercises are indispensable if effective inservice training for teachers is to be launched successfully. Staff development plans and inservice education among teachers help to bring about cooperation among teachers and create a favorable learning atmosphere for students.

In addition to each teacher's individual needs, a second key influence must be regarded as a planning consideration. Ephemeral articles and substantial text books emphasize the necessity for the program planner to assess the needs of his intended learners as a first

step in the modern, or for that matter traditional, practice of education program planning.

Staff development and teacher inservice education plans should take into consideration the need for information about the potential user's attitude toward the proposed plan(s); the goals and objectives of the school district or individual schools concerned and the appropriate personnel to be involved in the planning and implementation of the programs. The committee or task-force responsible for planning an inservice program should include adequate teacher representation. Ideally, teachers will be selected on the basis of their skill, experience and enthusiasm for the task.

Inservice education should be designed so that programs are integrated into and supported by the organization within which they function. Inservice education programs should be designed to result in collaborative programs. They should be grounded in the needs of the participants. In other words, inservice programs should respond to assessed needs, including the interests and strengths of participants. The development of problem-solving skills should be made a part of inservice training.

Inservice education programs for teachers should be responsive to changing needs. Inservice education program built on identified needs are adaptable to changes in curriculum, personnel, and conditions, both internal and external. The implementation strategy should include continued professional growth activities and the local development of collaboratively prepared materials.

Programs designed for inservice education should be accessible. Accessible programs take into account unique local problems and opportunities. The school site should be the focus of inservice education activities. Inconvenient times or locations or other factors that would discourage participation should be avoided. On-site demonstrations with students should be included when appropriate to the experience. Inservice education activities should be compatible with the underlying philosophy and approach of the district.

An inservice education program of a wide dimension will succeed only if there is specific task orientation and positive leadership at the district level. Constant evaluation can be used to strengthen planning and implementation activities. Decisions concerning the inservice education program should be based on the findings from continuing program-evaluation by program participants and others affected by the program.

The provision of sufficient time for inservice education, as well as other forms of support from a central office and building-level administrators, is critical during the initial planning stages and during implementation of inservice education programs. Furthermore, the school administrator must play a central role in inservice programs if they are to be successful. Teachers who normally are the participants should also be a part of the planning and execution of such programs. Historically, many teachers in the United States in the past perceived inservice programs as administrative whims: "one-shot" processes for solving all(or perhaps more accurately, none of their problems: experiences to be tolerated and forgotten.)

Contemporary teachers in the United States, unlike their historical counterparts, have become less passive and more directly involved in matters affecting their professional lives. Developers of inservice programs in Nigeria must recognize the need to involve teachers in the planning, implementation and evaluation of inservice efforts. This involvement must be truly collaborative in effort, not just a token gesture intended to placate potentially vocal teachers. To ensure adequate teacher involvement in, and satisfaction with inservice programs, the committee responsible for planning an inservice program should include adequate teacher representation. The teachers should not be given the impression that such programs are planned because they are perceived to be incompetent. Inservice programs should be models of the same high quality educational practices that teachers are expected to provide. The programs should be designed around the stated goals and objectives of the school district as well as the specific instructional goals and objectives of participating teachers. Teacher should be instrumental in determining the purpose of the inservice program, in its content and staffing plan.

There are several approaches to in-service training such as:

The Central Office Approach to Inservice

The superintendent as the central office administrator usually is directly responsible for the planning of development programs especially when they are organized on district level. According to the writer's experience, the inservice programs that have been carried out in Imo State of Nigeria were initiated and organized from the central office

(the Superintendent's office). Seeing inservice an imposition from above, the teachers naturally felt resentful and uncooperative. The success of programs organized solely by the superintendent and his staff have been very limited. The superintendent is to be involved in the plan in order to make it official, and the input of teachers should be considered indispensable.

In the central office staff development program, leadership is typically provided as a major responsibility by an administrator with some related background. Needs assessment is conducted through central office staff, with the focus on institutional program needs and concerns and input from other administrators and supervisory personnel. Because there is little or no contact with the potential participants about their personal/professional needs, this approach can be referred to as "quasi-staff development."

The program content is selected to convert curriculum or other institutional deficiencies usually with heavy reliance on outside experts. In this approach, program evaluation efforts are usually minimal. They are limited to participant ratings of the content, presenter, organization and other aspect of the program sessions. In the approach, the staff development program is the responsibility of the Assistant Superintendent for Curriculum and Instruction, who works closely with the director for testing, school principals and curriculum consultants.

Actually, the Assistant Superintendent in cooperation with the other administrative staff develops an inservice thrust. The program plan is designed for the forthcoming year, with product goals defined

and consultant retained. This approach fails to meet the requirements for a complete staff development program because, initially, administrators are typically involved in the program as planners and supervisors. Seldom do they actually participate in the developmental process.

The Principal

The task of the principal, which involves professional judgement with respect to individual teacher's needs, would be examined in order to see how it can be implemented in a school system.

Steering Committee

The task of the committee is to initiate, implement and evaluate the workshop plan that is the cornerstone of the inservice program. Under the leadership of the project coordinator, the committee not only plans but continuously monitors the program and provides feedback to the building and central administration.

Moreover, the committee provides credibility and assurance for the faculty that the activities will evolve from legitimate teacher concerns and needs. If the committee achieves staff understanding and willing participation, its other more rudimentary responsibilities will be simplified and facilitated.

The School-Improvement Approach to Inservice Program

The school-improvement approach is more complete approach to staff development than the other methods because it sets out to provide growth

experiences for both the instructional and administrative staffs based upon assessment of the personal professional needs of individuals and determined needs of the institution. This approach is classified as both high institutional and high individual. It is assumed that if the individually identified needs of professional staff are within the content of institutional goals, the best possible education can be provided for the students. The school-improvement approach to staff development mandates district support.

Governance for the staff-development program is provided by central office administration in cooperation with the full-time program coordinator and an advisory committee representing the program governance and service is compensated through released time or district-provided stipend.

In the school-improvement approach it is assumed that individuals are competent to identify their own needs and that this can best be done after the individuals have participated in the identification of institutional needs. A variety of data sources for needs determination provide a highly diversified set of program offerings.

Through this data-based nature, evaluation is built into the process through participant responses to each activity and systematic periodic institutional assessment. Additional evaluation data are sometimes obtained through pretest-posttest assessment of individual program and through "case study" follow-up research.

The main advantage of the school-improvement approach to staff development is that it involves both the administrative and instructional staffs in district and school evaluation and planning for change.

A systems approach is used periodically to examine student, teacher, and community data to set goals and establish individual personal and professional needs. For this type of program to function, the district administration must accept the value of identifying institutional and individual needs, see the preparation of school goals as a priority activity, and view staff development as a means through which the individual and institutional needs can be met.

Mazzarella's review of studies that examined inservice education programs offers seven guidelines for designing effective programs. JoAnn Mazzarella (1981) suggests that inservice programs should: 1) be concrete, dealing with specific skills rather than theories, 2) provide both demonstrations and opportunities for the participants to try out the new skills and receive feedback, 3) address the on-the-job needs of each individual, 4) be ongoing, 5) occur at school, 6) provide opportunities for observing models, and 7) allow principals to take part in the inservice training program but not to take full responsibility.

Teacher organizations should be involved in the professional development of their members because they are best able to offer teachers the necessary assistance, motivation, and leadership. Any effective program of professional development requires a degree of commitment from those individuals whose behavior is to be affected by it. To realize such commitment from teachers, the organization that sees to the welfare of teachers should be involved in such activity.

The educational needs of Ikwuano/Umuachia School system teachers and student should be identified and prioritized before indulging in any teacher development plans. Teacher organization(s) should be involved

in such development plans for teachers, otherwise, the rate of participation will be poor.

Cruikshank et al. suggests that inservice education should be viewed as a means of narrowing the differences between preservice and inservice education. "Learning to teach and teaching to learn better exemplifies the image of the professional educator, hence the need for teachers' in-service education", he further expressed.

Finally, inservice education is not solely a personal obligation. Teachers simply do not have the time to plan to seek and receive feedback and to reflect or inquire on new and different ways of teaching. Inservice education should be viewed as an organizational innovation that shifts the burden of growth from the individual to the professional group and the institution. Inservice education is an organizational tool to increase the effectiveness and relevance of education for all students. Yet, the value of innovation is directly related to the individual. For an innovation to be of value to a professional, it must be relevant (in tune with his or her perceived needs), applicable (readily put to use), and experimental (building on the individual's personal experience).

Education is viewed as a low-status profession; therefore, the most qualified persons are not interested in becoming teachers. An active program of staff development is necessary to insure that current teachers are challenged and new teachers are provided with the information and skills they need to succeed - and that both old and new teachers remain in the profession.

Precarious financing and the low level of public confidence in education make it difficult for educators to take charge of their own professional development and to promote innovation that prompts the organizational hierarchy in the schools to support new initiatives. Any investment in inservice education should be modeled upon proven practices that lead to positive results. Educators should refuse to participate in ill-conceived, symptom-oriented, narrowly focused activities that will simply frustrate them, sap their energy and waste tax-payers' money (Barth, 1981).

In-service training in every area of work is considered desirable for improving the performance of personnel. The need for ongoing inservice training for teachers may take various forms with different target groups. It will include updating, upgrading and retraining for new roles. In some cases it may demand the utilization of a wide range of techniques which have not usually been regarded as training activities and which too often have not been thought appropriate for primary school teachers. Such techniques would include participation in decision-making, in seminars and workshops and in on-the-job problem-solving activities by teachers.

In recent years, inservice teacher education has become a topic of increasing concern for public school administrators and teachers, as well as for university faculties involved in teacher education. With a trend of decreasing numbers of new teaching positions in many countries, the teaching faculties seem to experience less turnover, and that directs attention to teacher re-education and continuing education.

There are factors that have contributed to the new focus such as increased technological knowledge and the widespread utilization of statistics and computer science. In the 75th yearbook of the National Society for the Study of Education, Morris L. Cogan stated, "The rapidity and complexity of these changes - as well as the weaknesses of preservice education - all require intensive programs of inservice education for teachers" (Cogan, 1975).

Recently educators have shown concern about elementary pupils understanding mathematics. They have strongly advocated that teachers use all types of instructional materials. According to Sowell (1974) there have been numerous journal articles, workshops, and conferences devoted to instructional materials, but what seems to be missing is the transition from reasons why materials are important to sequences for using them.

Because of Piaget's studies of children's intellectual development which have given impetus to the use of manipulative learning experiences, a source of supplying the missing link in the teaching of mathematics in elementary schools can be found. Stating it briefly, it was found that most elementary children are in the pre-operational or concrete operational stages of development. A major characteristic of these stages is that children do not think abstractly. They need something to see or feel in order to understand an idea.

Pupils should be introduced to the number property of groups of objects after many experiences of discriminating between objects. Mathematics educators believe that children learn to discriminate between groups or sets of objects on the basis of the number of objects in

much the same way that they distinguish groups by colors or shapes. Pupils in higher elementary grades must learn to use the operations of addition, subtraction, multiplication and division in order to express how they understand the concept of "number". In order to do so, they need to understand the meaning of each operation. For most pupils an initial approach other than the abstract is best.

Materials that pupils can use for mathematical operations are of three kinds: concrete, pictorial and abstract. There is something more important than being able to classify materials and that is the ability to use the materials effectively. Experts like Piaget have pointed out that children should have a fairly wide range of concrete experiences before they are asked to work abstractly. Pupils' learning experiences should enable them to move towards abstractions. In the following figure, the line represents degrees of abstractness. At one end of the continuum is a learning experience which is completely abstract. Two practical examples are: first graders writing sums to basic addition facts and sixth graders using a formula to calculate the volume of prisms. Both behaviors represent abilities that children should acquire eventually. However, being able to operate at the abstract level usually happens over a period of time and after a number of experiences at other levels.

Concrete Concrete-Abstract Pictorial-Abstract Abstract

Figure 2: Degree of Abstractness in Learning Experiences

With the increased concern regarding inservice education, there has been a concurrent increase in proposed models for successful inservice programs and in studies which evaluate existing programs (Haley, 1980). Some critics think that approaches to in-service education are restricted to giving inservice teachers more of what they received as undergraduates. Other approaches rely more on the lessons available through research. In successful inservice programs, component such as collaborative planning by university faculties and local school personnel, teacher leadership, relevance of the program to actual classroom activities, and convenient location of the inservice classes are said to be present. For better development of a cohesive model for inservice education, additional research in the planning, implementation, and evaluation of inservice programs is needed.

Description of a Successful Inservice Program

In 1977 and 1978, school administrators from eight Phoenix area elementary school districts, in cooperation with two faculty members of the Department of Mathematics at Arizona State University (ASU), selected mathematics coordinators and talented mathematics teachers from their respective districts to serve as District Resource Leaders (DRLS) in the districts. The DRLS in conjunction with the administrators conducted surveys among their teachers and identified inservice needs of their respective districts. They formulated programs that supposedly would meet the specific needs and objectives of their respective districts. During the two summers (1977 and 1978) the two ASU faculty members worked with the DRLS in three-week sessions to prepare the

materials and outlines for the inservice programs to be conducted by the DRLS during the 1978-1979 academic year in their respective districts.

About 800 elementary and junior high teachers, with 24 DRLS participated in the program. Arizona State University provided leadership and support for the DRLS during the academic year and offered workshop credit for the participating teachers. The districts scheduled their own inservice classes and publicized those classes among their teachers. Funds were available to defray registration costs of those teachers seeking university credit.

During the Fall and Spring semesters, individual district classes met weekly in one of their own elementary schools. They met for three hours on a week day evening of their own choice. The different district inservice programs had the same goals in mind. The goals and objectives common to most of the district programs were: increasing teachers' understanding of district minimum competency standards, sharing of teaching strategies between teachers, and introducing classroom teachers to interesting applications of mathematics. Another common objective was to provide in-class opportunity to construct games and activities appropriate for giving computation drill, and instructing teachers in the utilization of these activities as an alternative or an addition to traditional worksheets. A typical class meeting of a district inservice program consisted of a formal presentation by the District Resource Leader, a film, or a guest lecturer followed by a sharing of mathematical strategies, games or activities by the teachers. Time was provided for construction of materials for some activity for actual classroom use.

Evaluation Procedure

The evaluation procedures employed were in the form of a field study to measure teacher response to the program and achievement of students as a result of teacher participation in the program. The evaluation instruments were a questionnaire administered to teacher participants, and the Stanford Achievement Test, Math Battery, Intermediate Level I, which was administered to a sample of students from the school districts. The DRLS from the seven area districts that participated in the inservice program during the Spring of 1977, were provided with evaluation forms and were requested to give the questionnaires to their teachers for their anonymous responses. The teachers were asked to note changes resulting from the program, in their attitudes towards mathematics and in their teaching styles or methods. They were also asked to rate the inservice activity as Excellent, Good, Fair or Poor.

The administrators in the districts were very much involved in all the phases of the program, and they were responsible for directing the testing of students in their respective districts. Students of their inservice teachers were regarded as "experimental". Comparable classes of other non-inservice teachers were identified by the administrators and were regarded as "control".

The variable of initial differences in mathematics achievement between experimental and control students was considered to be of importance with respect to the internal validity of the study. The variable could be statistically controlled through an analysis of covariance by using a preservice Stanford Achievement Test score. The scores were

available only for the fifth-grade students of the target population (the Arizona State Department of Education tests all fifth-grade students in the state with the Stanford Achievement Test, Intermediate Level I). The use of the October scores as a means of evaluation was considered more advantageous than sampling.

Teacher response to the inservice project was evaluated by the completed evaluation forms of 127 teacher participants. Changes in both understanding of and attitude toward mathematics were reported and the overall rating of the program was positive. A new enthusiasm in mathematics was noticed and the district minimum competency standards was raised. Seventy-five percent of the evaluation forms indicated changes in teaching methods or styles in mathematics classes. Changes brought about by the program were the addition of mathematical games and activities for computation drill, and an increase in preparation time (ASU 1977 and 1978 coordinated inservice program).

One hundred and one of the evaluation forms rated the program as "Excellent" or "Good" while only two of the forms rated the program as "Poor". Student achievement which was evaluated only in one-grade level could only be obtained through teacher response. Favorable teacher response to the inservice program and its significant positive effects on student achievement suggests a strengthened model for inservice planning and implementation. An important feature was the cooperation planning by district administrative personnel, selected teachers, and university faculty. The increased use of teacher leadership in the planning as well as in directing the programs, as suggested by Rubin

(1978), was an important component of this successful inservice exercise.

Apart from the United States, many other countries have engaged in trying new ways and methods of teaching mathematics. An example is the change that has taken place in the teaching and learning of mathematics as described by Fishman (1974). According to the report, the ambition of English educators is to reorganize the classroom, to allow the children to work both individually and cooperatively with a greater variety of homemade and commercial materials designed to aid them in discovering all sorts of things about the world. Under this situation, learning is regarded as a cooperative effort of child and teacher, in which the total personality of the child is given recognition. The teacher helps to construct and organize the environment and helps each child to be an independent learner. The teacher's role is that of a guide, encouraging the children to carry on their own discovery process giving them recognition for success and acting as a consultant when problems arise.

In the report, the author described what he saw in English mathematics classes as a living representation of the English film titled, "Maths Alive", which, according to him, is worth showing mathematics education classes. In the infant schools were children measuring boxes with cuisenaire rods, timing various activities with 10 second timer, doing operations with different price postage stamps, measuring volume with various sized sand buckets, making larger and larger squares with different shapes, investigating elementary ideas of logic with toy animals, dolls and other attribute materials. Several excellent series

of modern elementary mathematics books were in the rooms, however for purposes of occasional formal work and for individual work. Individual teachers made activity cards for children's use.

To make mathematics real, the subject is integrated with writing, reading, history, art, etc.; and is not so much treated as an isolated subject. Instead of engaging in solving of problems, children record all their work and experience. A review by the teacher of the students' notebooks rather than the use of lesson grades or standardized tests, is the principal means of evaluating the work of each child.

A major influence on development in the English primary schools which was felt as far back as the 1930's has been the psychological research of Jean Piaget. Educators concluded from his work that children learn mathematical concepts and operations most effectively by their own activities with a great variety of concrete materials. According to Fishman (1974), Piaget demonstrated that children in the early years cannot learn solely by drills, neither can they go too early to abstractions. They must engage in their elementary school years in guided activities that leave them free to discover the reasoning of operations and mathematical concepts. Only after this can drill have any value. The maxim, "I hear and I forget; I see, and I remember; I do, and I understand", was drawn from the new developments in primary school mathematics (Fishman, 1974).

The guided use of sand, water, clay, wood materials and junk of many shapes and colors from the earliest years of preschool education in England led to significant ideas in mathematics, and may allow for progress beyond the usual trivial arithmetic which is the limitation

imposed where the general fare is offered to primary school children. Since it is believed that children progress through certain stages of learning, each at his own pace; the English educators have devised a means whereby a new mathematics curriculum has been drawn on a rich source of ideas dealing with number relationships, measure, geometry, logic and algebra in order to provide for greater opportunities for individualized learning. This sort of curriculum, which attempts to rise through stages of concreteness to eventual abstractness is suited to children with a wide range of abilities. Even though most children might not become mathematicians, they will still be conversant with elementary mathematics and be able to use it in their everyday lives. The support of headmasters who have enormous influence in determining the character of their individual schools was crucial to the success of reforms. The headmaster is as much a teacher as an administrator. Sometimes a primary school is small enough to permit a headmaster to teach in class. In the latest development in mathematics education in English schools, recognition is given to the fact that there are many things that children between the ages of five and seven can learn before handling number with understanding. Examples of such things are sorting, matching, ordering, comparisons, length, area, shapes, intersection and size.

The Mechanics of Reform in English Primary Schools

About one third of all primary schools in England are open or informal schools (Fishman, 1974). The reason for such a rapid reform is found in the structure of the British educational system, and in the

history of the educational reform movement. In 1963, the Minister of Education commissioned the Central Advisory Council for education to consider primary education in all its aspects, and make general and specific recommendations for change. The Report, which became known as the "Plowden Report", was issued in 1966 at a time when the Labour Government was determined to restructure the entire education system so as to make it more egalitarian. This reform favored a more comprehensive school system which would eliminate select private education and early "streaming" enforced by the "11-plus" examination.

The overall reform efforts were supported by those who had already been working on curriculum reform in mathematics. As early as 1959, members of Her Majesty's Inspectors (HMI) had begun to organize courses and conferences for teachers. Local education authorities and college faculty members joined in organizing local study groups to introduce primary teachers to new ideas, test these ideas out in the classroom, and discuss and evaluate the experiences. In 1964, the major results and proposals culled from this program were published in the bulletin, "Mathematics in Primary Schools." This manual discusses children's actual learning experiences in mathematics providing a picture of what is possible in mathematics education. That was followed up by the publication of an influential series of booklets very much influenced by the 1964 Bulletin by the Nuffield Foundation (a British equivalent of the Ford Foundation). The Nuffield series present new ways for teachers to think about mathematical concepts and present them to children and continue to emphasize children's work and activities.

It should be noted that no reforms in education succeed if the teachers are not regarded as having a key role to play in their planning and implementation. When the stimulus for change came in England, it came from outside the schools; as it did in the United States. However, the English teachers were involved in the reforms to a far greater extent and on more levels than were their counterparts in the United States.

In the effort to prepare teachers for their changed role, to help them to understand the new mathematics curriculum and to encourage them to contribute from their experience, ideas for accomplishing the goals of the reform movement, an institution known as teachers' center was first established as part of the effort to popularize the Nuffield mathematics program. It has since spread throughout England and become the main source of inservice education as well as centers for curriculum development. Several hundred of these centers are now leading the primary schools in reorganizing the form and content in elementary mathematics education. Residential centers, where teachers can devote their full and concentrated attention to short courses for several days also became important aspects of inservice education. The centers issue bulletins which include discussions of concepts, methods, materials, suggestions and announcements of courses. The above supplement the center programs.

Parallel with the programs of the center, continuing assistance to teachers also takes place. Groups of teachers in each local education authority are said to have formed study panels to consider ways of helping their colleagues to use the series of guides published by the

Nuffields Mathematics Project. They have produced a number of guides that suggest to teachers ways of presenting many excellent ideas found in the Nuffield works. In addition, there is constructive supervision of the teacher by knowledgeable head teachers who provide much assistance and encouragement. As a result, teachers who may have had little knowledge of mathematics or even a fear of the subject are gradually changing their attitudes toward this subject and transmitting interest and enthusiasm to the students (Fishman, 1974).

A Conference on Assessment in Mathematics which took place at Durham University in July, 1971, provided excellent evidence of the teachers' views on the assessment of students progress. Standardized tests are no longer valued very highly in the British primary system. This was clearly the feeling of most of the educators at the conference. The participants pointed out the dangers of standardized tests to open education, even when they are utilized in the form of teachers' examinations on the classroom level.

Mathematics reform efforts in the United States differ from those in England in both conception and execution. In the United States, mathematics reforms, beginning in 1951 with the University of Illinois Committee on School Mathematics, and later with the school mathematics study group were mainly concerned with college preparatory mathematics in the secondary schools. Programs of reform were heavily financed by the Federal government for the purposes of increasing the supply of mathematicians and scientists after Sputnik in 1956. For that reason at the beginning, the curriculum reforms in the United States were directed at the mathematically talented population. Little or nothing was done

in the field of elementary mathematics throughout the 1950's and during the first part of the 1960's.

Finally, the reforms in the United States turned their attention to elementary mathematics but they carried over the same emphasis on a conceptual and structural approach to the subject as was used for secondary school students, ignoring the teaching of Piaget and others as to how children learn; that new concepts presented to children should be based on an adequate background of concrete experience and that premature, informalization may lead to sterility. Elementary teachers had a very difficult time using the traditional classroom techniques to communicate the new approach which is being taught to their students. The teachers themselves did not understand the new concept and were unable to deal with abstractions entirely new to them. They are said to have struggled with a vocabulary that had little meaning to them. The ultimate result was mechanical work in misunderstood abstractions as well as computation. Teachers were presented with a new curriculum and pressured to re-educate themselves by attending inservice programs and graduate programs. The courses were conducted in the traditional school setting with teacher questioning and pupils (i.e., the school teachers) answering.

Unlike the English, the Americans did not involve elementary teachers in the development of the curriculum. According to Fishman (1974), the reformers put little trust in the ability of teachers to contribute to these reforms, and ignored the institutional structure and social relationships in the schools.

More recent developments in the United States, such as the Madison Project, indicate that much has been learned from the English experiences with elementary mathematics education reform. These programs which have their roots in the elementary schools, have come closer to recognizing the nature of learning of young children, the important leadership role of the teachers and the effect of the entire educational atmosphere within the school.

In the United States, Plowden educators have offered continuing education programs which seek to correct the lack of excitement in learning mathematics. The programs do not attempt to force a teacher to a particular model, but to help him understand the virtues of informal education and to acquire an enthusiasm for the method. In practice, the teachers are encouraged to exercise freedom in determining their own style of teaching. Plowden people also encourage joint planning of programs, the pooling of efforts and talents of several teachers, and the directing of their attention to small groups of students, it is actually less demanding for the individual teacher than is the traditional approach where each teacher has to prepare a number of different lessons in each area of different abilities.

Development of a Mathematics Laboratory

A review of the literature indicated that many people emphasize the importance of the laboratory in promoting meaningful mathematics instruction. The teaching of mathematics which is primarily concerned with memorization of facts and the mental imagery required for concept formation is best provided by concrete examples.

These writers are of the opinion that a laboratory can be established in the corner of a classroom to provide an enrichment center for a particular class. The objective of the laboratory is to meet the needs of the entire school population on continuing basis. The laboratory also provides instruction and guidance on several levels simultaneously.

The laboratory room can be equipped with tables, chairs, good shelving, goeboards, chips, beans, Dienes blocks, pattern blocks, cards, tangram puzzles, people, one-inch cubes, counting frames, wheels, scales, different games, graph paper, rulers, dice, elastics, crayons, scissors, colored paper and paste. It will also serve as a resource center for the teaching of mathematics. While some of the materials can be purchased commercially, many could be made by a group of creative teachers or parents. A teacher can be responsible for the laboratory during the functioning hours. He can act as faculty coordinator of the laboratory. Other teachers who need help can receive assistance from him or her. Teachers are encouraged to visit the laboratory regularly in order to acquaint themselves with new developments.

It is the opinion of this investigator that elementary school teachers in Imo State of Nigeria should have a new approach to the teaching of mathematics in the elementary schools. Such an approach should take into consideration Piaget's theory of learning which encourages children learning from concreteness to concreteness/abstractness and then to abstractness. It is through such an approach that a negative attitude to mathematics which is prevalent

among teachers and pupils in Nigerian elementary schools can be eradicated. The approach provides an open classroom atmosphere which encourages free activity on the part of students thereby placing the teacher's role to that of a guide or facilitator. It will also inspire creativity in the services that teachers deliver to their pupils.

C H A P T E R I I I
THE DESIGN OF THE STUDY

The previous chapter introduced research problems on inservice training for elementary teachers. An overview of teacher education in Nigeria was explained. A review of an inservice training organized in "modern math" in many African countries and its shortcomings was also made. Some examples of research studies done in education by the use of questionnaire, interview and or interview-questionnaire techniques were examined. Needs assessment methodology as data collection technique was also examined.

The purpose of this chapter is to:

- Present the design of the study
- Describe the process of administering questionnaire-interview instrumentation

Study Design

The design of this study was primarily modeled after a study conducted by Aiken and Dreger (1961). In their study, Aiken and Dreger used a Likert-type scale such as the "Revised Math Attitude Scale" for the particular groups that were included in the study. The instrument measured attitudes towards mathematics with opinions ranging from strongly agree to strongly disagree.

In the Aiken and Dreger study, there were sixty-four subjects involved. The respondents were sophomore students enrolled in one section of the course entitled "Philosophy of Creativity," and the other

section of the course "Understanding the Elementary Child." These courses were used because they were requirements for students interested in all four concentration areas. The data was collected during the regular class period by the instructors and the researcher.

The concentration areas in Aiken and Dreger included 19 students who chose Early Childhood (Preschool); 17 students who chose Early Childhood (K-3); 16 students who chose Intermediate (4-9) and 6 students who chose Special Education. Six of the questionnaires had to be discarded because the students failed to identify a concentration area. The scale was distributed and collected before class. All the students participated and it was later found that the students responded to all the items.

The statistical package used in the analysis of the data in Aiken and Dreger was the Statistical Analysis System (SAS). Analysis of variance was used to test the differences between the means of the groups, with a probability level <0.05 .

Methodology

In this study a structured questionnaire-interview was utilized as the major instrument for data collection. Since a descriptive methodology provides the researcher the opportunity for making systematic description and analysis of the facts, and the characteristics of a given population (Francis and others, 1979). The researcher has utilized it in the study. A descriptive assessment of the needs of elementary teachers in mathematics education through questionnaire and interview surveys described the present outcomes and the expected

achievements of the teachers in the teaching of mathematics in the schools included in the study.

After examining the different models of ascertaining the needs of a professional group from the literature, the writer chose a combination of questionnaire and interview survey as the best method.

In the opinion of this writer, questionnaire-interview survey is appropriate for this study because it yields a normative description which provides important leads in identifying needed emphases and changes in school curricula and methods of teaching (Borg, 1983). Questionnaire-interview survey research is considered as a method of systematic data collection and therefore deemed feasible for this study. This methodology was preferred because it (1) serves the purpose of easy identification of needs and needs fulfillment, and (2) it allows for sampling, prioritizing and comparison of techniques, (3) it involves various persons in defining elementary teachers inservice training needs and (4) interviews were conducted to get clarification and potential operationalizing of needs.

Instrumentation

According to Borg and Gall (1983) most questionnaire studies conducted in education are aimed at specific professional groups. In this study, the researcher used a sample of educators (teachers, administrators, teacher trainers, student teachers and inspectors of education) from Imo State of Nigeria.

In conducting the questionnaire survey, the first step the researcher considered was to list specific objectives to be achieved in

accordance with Borg and Gall (1983), hence, the first step in carrying out a satisfactory questionnaire study was to list specific objectives to be achieved by the questionnaire. They were;

- (1) To identify the importance attached to mathematics as a subject by the Nigerian Teacher respondents,
- (2) To determine the perception of educators as to what the training needs of elementary teachers were in mathematics education,
- (3) To prioritize such needs and,
- (4) To measure the attitude of educators towards mathematics education.

In carrying out the survey, the researcher administered two sets of questionnaires. The first questionnaire embraced self identification of participants, subject assessment for purposes of comparison of the participants' opinion of their training needs in the different subject areas of the school curriculum, and the participants' opinion of how the teaching of mathematics is currently being handled in elementary schools. The following table illustrates an example of the questionnaire format used as Pre-test Questionnaire. (See Appendix B for complete Questionnaire).

TABLE 4

Questionnaire I (Pretest Instrument)I Self Identification

Please read each statement carefully and respond by marking the most appropriate space:

- . What is your sex?
(1) Male _____ (2) Female _____
- . My teaching experience has been in:
(1) Urban schools _____ (2) Rural Community _____

II Subject Assessment

- . In which subject do you think that teachers need more preparation so as to be more effective?
(1) Mathematics _____ (2) English Language _____
(3) Science _____ (4) Social Studies _____

III Mathematics Opinion

Indicate with one of the following responses, your answer to the questions below:

- (1) SA = Strongly Agree (2) A = Agree
- (3) D = Disagree (4) SD = Strongly Disagree

- . The teaching of mathematics at the elementary level should be done at those who are good in the subject. SA A D SD
- . I feel that the curriculum in maths needs some modification. SA A D SD

Respondents were introduced to the Questionnaire with a cover letter. The cover letter tries to lay out the objectives of the study. (See Appendix B).

The first questionnaire which was administered to about two hundred and five respondents served as a pre-test instrument. As a result of the pre-test, a second Questionnaire emerged which included more items because the pre-test revealed some omissions in the first Questionnaire. Like the Pre-test Questionnaire, the revised Questionnaire started with a transmittal letter which introduced the purpose of the study to the respondents. A copy of the transmittal letter can be seen in Appendix D.

The following table illustrates an example of the revised questionnaire format used in Questionnaire 2.

Table 5Questionnaire 2 (Revised Questionnaire)

Directions: Please read each statement or question carefully and then respond by marking the most appropriate answer

I Self Identification

- . Sex: Male _____ Female _____
- . For how many years have you been a teacher?
 0-4 years _____
 5-9 years _____
 10-14 years _____
 15 or more years _____
- . What class are you currently teaching?
 not applicable _____
 Elementary 1 _____
 Elementary 2 _____
 Elementary 3 _____
 Elementary 4 _____
 Elementary 5 _____
 Elementary 6 _____
 Higher class _____

II Mathematics Self-Assessment

When you were an elementary school student, which of the following subjects did you like the least?

- English _____
 Mathematics _____
 Science _____
 Social Studies _____

As a teacher, in which subject do you consider yourself the most effective?

- English _____
 Mathematics _____
 Science _____
 Social Studies _____

In your opinion, in which subject do Imo State elementary school children tend to perform the poorest?

- English _____
 Mathematics _____
 Science _____
 Social Studies _____

Table 5 (con't)

III Mathematics Improvement Assessment

In which subject do you think you have the most effective teaching materials?

- English _____
- Mathematics _____
- Science _____
- Social Studies _____

Which subject do parents and others in the community where you teach regard as the one they are the most concerned about student's poor performance?

- English _____
- Mathematics _____
- Science _____
- Social Studies _____

IV Teacher opinions

For each of the following statements or questions, indicate by circling the response that best reflects your own opinion

- SA = strongly agree
- A = agree
- NO = no opinion
- D = disagree
- SD = Strongly disagree

. I feel that the following subjects are adequately taught in my school:

English _____	SA	A	NO	D	SD
Mathematics _____	SA	A	NO	D	SD
Science _____	SA	A	NO	D	SD
Social Studies _____	SA	A	NO	D	SD

. The plan inservice training for mathematics teachers should involve greater teacher participation

SA	A	NO	D	SD
----	---	----	---	----

IV Mathematics Attitude Measurement

For each statement indicate by encircling the response which best fits your attitude.

- SA = Strongly agree
- A = Agree
- NO = No opinion
- D = Disagree
- SD = Strongly disagree

. I feel a sense of insecurity when attempting mathematics	SA	A	NO	D	SD
. I feel at east in mathematics, and I like it very much	SA	A	NO	D	SD

Construction of the Questionnaires

The literature review in Chapter 2 helped the writer to discover the perceived and expressed needs of elementary school mathematics teachers. Through the literature review of inservice programs in mathematics education, the writer was able to learn the concerns of the elementary teachers over the teaching and learning of mathematics in public schools. There were noted gaps in the inservice programs already carried out such as the mandated inservice program organized in 1971 to introduce "Modern Mathematics" in Nigerian Public Schools. The different gaps discovered in some previous inservice programs helped this researcher to construct the first and second questionnaires taking into consideration the need to include such questions that deal with situations and circumstances that limit the effectiveness of inservice programs.

Prior discussions with some educators on inservice programs highlighted some other problems faced by participants of inservice training for programs. Examples of such problems were the lack of awareness by the teachers of the goals and objectives of inservice programs, lack of commitment to the programs on the part of the participants and the absence of objective evaluation of such programs. The knowledge of the lacks in the programs already carried out served as further basis for the construction of the questionnaire.

Population

The selection of subjects for a questionnaire study was a very important consideration for the writer because he had to choose people

who could supply the information needed. The location of the schools involved in the study was another important consideration made by the researcher while choosing his sample.

The subjects finally selected for the study included: the Chief Inspector of Education for the Imo State Ministry of Education, 182 elementary teachers and administrators from six elementary schools, 6 teacher trainers from Teacher Training Institutions, and two Zonal Inspectors of Education. The sample for the study was drawn from a random sampling of six elementary schools in Kwuano/Umuahia School System in Imo State. Before travelling to Nigeria to conduct the Questionnaire-Interview Survey, the researcher wrote to the Chief Inspector of Education of Imo State of Nigeria, indicating his intent of undertaking the study in his area of jurisdiction and at the same time soliciting his cooperation and help. On arrival in Nigeria, this writer met the Chief Inspector of Education who introduced him to a panel of educators assigned with the responsibility of writing text books for elementary mathematics.

The following grades I-VI Schools were chosen for this study to provide a diverse population. The grades and schools selected represent both urban and rural schools and educators at all levels.

TABLE 6

<u>Schools and Location</u>		<u>Number of Participants</u>	
Teachers		Administrators	
Amuzukion Community	Urban	2	48
Library Avenue	Urban	1	25
Urban II	Urban	1	23
Afugiri Central	Rural	2	30
Nkwoegwu Central	Rural	1	25
Orieamaenyi Central	Rural	1	23
Uzuakoli Teachers College	Rural		10
Women Teachers College Umuahia	Urban	<u> </u>	<u>10</u>
Total		8	194
<u>Other Educators</u>		<u>Number of Participants</u>	
Chief Inspector of Education		1	
Teacher Trainers		5	
Zonal Inspectors		<u>2</u>	
Total		8	

A total of 210 questionnaires were administered to the different categories of educators listed above. All the teachers from the six elementary schools participated in the survey.

Administration of the Questionnaire

This researcher drew a sample of 210 subjects out of a population of 1587 Ikuauano/Umuahai School district elementary teachers. The investigator received prior permission to conduct the survey with the chosen population from the Chief Inspector of Education for Imo State of Nigeria. He visited each of the six schools and met with the headmaster or headmistress of each of them and introduced himself and the object of his visit. Through the help of each head teacher, the writer got the accurate number of teachers in the school. With the help of the head teachers or their assistants the researcher administered the questionnaires to all the teachers in each of the six elementary schools and set time limits for the return of the questionnaires to an appointed research assistant in each of the schools. The researcher delivered the questionnaires through the head teachers instead of mailing them.

In the case of the student teachers from Uzuakoli Teachers' College and Umuahia Women Teachers' College, the subjects were randomly selected from alphabetized lists of all students. The questionnaire were distributed to the twenty respondents from the two Teachers' Colleges by my research assistant. Time limit was set for filling out the questionnaire and returning it to the designated research assistant in the person of the mathematics instructor of each school. With the help of

the mathematics tutor in each school, the return rate of the questionnaires was increased.

The researcher allowed a period of one week between the date the questionnaires were administered in each school and the date he went back to collect the completed instrument. In each of the schools, it was not possible to collect all the questionnaires. He returned to all the schools to collect the ones not yet returned. Despite the subsequent visits, it was not possible to have one hundred percent return. Finally, about 184 questionnaires were returned.

Interview and its Administration

A direct interview survey was used as a follow-up to compliment the written questionnaire. Out of a sample of 210 subjects that participated in the questionnaire survey 22 subjects were selected for the interview survey. That constituted approximately 10 percent of the questionnaire participants. The interviewees were randomly selected but with considerations of the interviewees' locations and roles.

The first set of interviews were done by the use of a structured stimulus question administered on interviewees. Each interviewee was required to put down in space provided what he/she would expect to see in every effective inservice training program for teachers in mathematics education. Because of time factor and the busy atmosphere that surrounded these educators offices, the investigator made the interview as brief as possible by putting down the interviewees' answers and having them transcribed later.

However, it was very difficult to have audience with some of the officers the investigator intended to interview. Some other officers did not find it convenient to respond to the stimulus question because they were not used to such a question. Yet others perceived the question as being more of an academic exercise than practical experience type and for that reason were not willing to respond to the question.

One of the objectives of the interviews was for the researcher to observe the attitudes of the interviewees over inservice training needs of elementary teachers in mathematics education. Any attitude observed was noted. Because of the poor response received from interviewees, the writer decided to use the same questions contained in the questionnaire for the interview so as to have a solid basis for comparison of responses.

The following table illustrates an example of the interview format used in the discarded instrument.

TABLE 7

Stimulus Question Sheet for Educators

(Chief Inspector of Education, Zonal Inspectors,
Administrators and Teacher Trainers)

Demographic Information

1. What is your sex?
(a) M _____ (b) F _____
2. What position do you occupy in the school system?
(a) Chief Inspector of Education _____
(b) Zonal Inspector of Education _____
(c) Teacher Trainer _____
(d) School Administrator _____
3. How long have you occupied the position?
(a) 1-3 years _____
(b) 4-5 years _____
(c) 6-8 years _____
(d) 9 years and more _____

(See Appendix C for the stimulus question)

With the revised design, the writer interviewed 10 percent randomly selected of the number (210 subjects) supposed to have responded to the questionnaire. The data gathered from the interview served a useful purpose of comparison with the data gathered from the questionnaire survey analysed in the next chapter. The questions for the second interview may be seen in Appendix D. Responses from the twenty two interviewees were free and easy to the extent that they illustrated some of their responses with practical examples.

Administration of the Revised Interview

As previously explained, the twenty-two interviewees were randomly chosen from the 210 respondents to the questionnaire with the exception of the Chief Inspector of Education for Imo State and the 2 Zonal Inspectors who were included by virtue of their positions. The researcher learned from the participants that they as educators express needs for inservice training in general and instructional training needs in mathematics in particular as a means of improving participants as professionals.

The researcher arranged with each interviewee a convenient time when the interview would not be interrupted by other activities. The interviews with the inspectors of education were held in their offices by appointment. The interviews were cordial and fruitful since the Inspectors themselves view teaching and learning of mathematics as an area of priority need. Some inspectors held the opinion that little has been done with regards to inservice training in mathematics. The Chief Inspector of Education expressed satisfaction with what they have so far

offered elementary teachers in the way of inservice training in mathematics instruction.

The school teachers were interviewed in their homes to avoid interrupting their school work. By this arrangement, the teachers were very much disposed to giving what appeared to be sincere and reasonable opinions concerning different aspects of their teaching career. They expressed need for on-going inservice programs both at area and building levels. They favor participatory plan for inservice training programs which makes for commitment on the part of educators with different roles. Some interviewees expressed the need for longer inservice programs periodically instead of holding one day workshop for teachers and expecting miracles from it. Other problems expressed by the participants concerning inservice programs were:

- (i) Time factor,
- (ii) Lack of funds,
- (iii) Lack of resources,
- (iv) Lack of incentiveness to participants and,
- (v) Irrelevant programs to teachers' training needs.

The chief inspector of Education for Imo State who appeared to be keen in this project, provided the researcher transportation to a location where three mathematics teacher educators were busy writing a new mathematics text book series for all the elementary school classes in Imo State of Nigeria. Data gathered from these educators appeared to show that mathematics education received by most of the current elementary teachers was inadequate, highly abstract and void of relevance to the child's everyday life experience.

The teacher trainers highlighted areas of teaching methods that need some changes such as:

- (a) The need to make the teaching and learning of mathematics to be participatory instead of the teacher doing all the talking and other activities while the child sits as a spectator.
- (b) Teaching of mathematics especially at the elementary level should be made as practical as possible, going from practical to pictorial and from there to the abstract.
- (c) The need for teachers to possess qualities of initiative, sound scholarship, imagination, resourcefulness or creativity, clear thinking, and sound knowledge of child psychology that will make it possible for him/her to relate to the three domains of learning namely: (1) cognitive, (ii) affective and (ii) psychomotor.

The analysis of the questionnaire returns, and the analysis of the interview data provide the substance for Chapter IV which follows.

C H A P T E R I V

ANALYSIS OF DATA

Introduction

Up to this point the writer has discussed the concerns of parents and the general public in Imo State over the poor performance of their children in mathematics and their plea for competent and continually prepared teachers for their children and the response educators should make to this plea. Such a response should take the form of valid, reliable, practical and useful inservice programs in mathematics education. The second feature so far discussed is the rationale of a combination of questionnaire and interview surveys as the primary vehicle for ascertaining the instructional training needs of teachers in mathematics education, so that inservice programs may be designed and implemented that will address themselves directly to the area of teacher education that is applicable to what teachers are expected to accomplish in their classrooms. Third, this dissertation has reviewed the research that has already been done in the area of the improvement of mathematics competence in the state of Arizona State through a questionnaire survey. Fourth, some consideration has been given to the design of a useful questionnaire instrument which the writer believes could be used to assess the inservice training needs of elementary teachers in mathematics. Finally, the writer has described the administration of the self-administered questionnaire and interviews.

The two components that remain in the study for explanation are the analysis of the data obtained from the questionnaire-interview survey and the use of the data in suggesting guidelines for inservice education in mathematics for elementary school teachers. The main purpose of Chapter IV is to discuss the first component - analysis of the data.

Analysis of Data from the Questionnaire

The written questionnaire survey consisted of 210 questionnaires hand-delivered through the head teachers with the help of some research assistants. The writer decided to survey not only elementary teachers for the definition of their training needs in mathematics but also to include other persons as well. Those considered to be closest to the teachers' instructional needs and most capable of defining those needs were: administrators and inspectors of education. Instead of surveying the elementary school pupils another group was included - the student-teachers in two training colleges.

Out of the 210 questionnaires distributed, 184 questionnaires were returned yielding a return rate of 87.6 percent. As indicated in the previous chapter, the questionnaire itself is included as Appendix D.

The analysis is developed under four categories of questions, namely:

- 1.) Questions involving educators' math competence - self assessment;
- 2.) Questions involving math improvement assessment;
- 3.) Questions concerning educators; opinions of math education and
- 4.) Questions pertaining to teacher attitude toward math.

4.) Questions pertaining to teacher attitude toward math.

The four major research questions were:

1. How important is mathematics considered by educators in relation to other subjects and what effect has it on their self-assessment of their mathematics competence?
2. Do educators agree in their assessment of the appropriate mathematics improvement plans?
3. Are there differences of opinions among educators concerning teacher education in math in general and inservice training programs in math for teachers in particular?
4. What are the attitudes of elementary teachers towards mathematics education and how have they affected the teaching and learning of mathematics in Ikwuano/Umuahia elementary schools?

The data presented in this chapter were gathered from the 184 returned questionnaires and from the 22 individual interviews conducted by the writer from a random sampling of the participants from the six elementary schools that constituted the population for this study. The questionnaires were distributed to a random sampling of six schools in Ikwuano/Umuahia School System. Three schools are urban, while the other three are rural.

Simple descriptive statistics were developed to describe the pattern of answers for each question. Where cross tabulations were developed to assess the intersection of two variables, the chi square test of statistical significance was employed with a critical significance level of $p = .05$.

In the analysis of the questionnaire results which follows, all the specific questions on the questionnaire have been organized into the four major research questions cited above.

TABLE 8

SEX OF RESPONDENTS

Question	Sex	Frequency
1. What is your sex?	Male	64
	Female	142
	Total	<u>206</u>

TABLE 9

TOTAL NUMBER OF YEARS TRAINING

Question	Years	Frequency
2. For how many years have you been a teacher?	0 - 4 years	34
	5 - 9 years	65
	10 - 14 years	28
	15 or more years	75
	Not applicable	4
	Total	<u>206</u>

TABLE 10

TOTAL NUMBER OF YEARS ADMINISTERING

Question	Years	Frequency
3. For how many years have you been an educational administrator?	0 - 4 years	42
	5 - 9 years	28
	10 - 14 years	13
	15 or more years	21
	Not applicable	<u>102</u>
	Total	<u>206</u>

TABLE 11

PARTICIPANTS' QUALIFICATIONS

Question	Qualification	Frequency
4. What is the highest qualification you have attained?	School Certificate	4
	Teachers Grade 2 Certificate	144
	Associative Certificate/ National Certificate in Education	40
	Bachelor Degree or Higher	9
	No Response	9
	Total	206

TABLE 12

Question 5. SUBJECT WITH ADEQUATE MATERIALS

Sex	English	Mathematics	Science	Social Studies
Male	20	16	5	16
Female	44	38	19	32
Total	64	54	24	48

Test of significance: Not significant

TABLE 13

Question 6. SUBJECT I AM NOT EFFECTIVE IN IS:

Highest Qualification	English	Mathematics	Science	Social Studies
School Certificate	2	2	0	0
Teachers grade 2 Certificate	68	44	6	26
Associative Certificate or National Certificate Education	15	12	4	8
Bachelor Degree or Higher	3	3	1	2
Total	88	61	11	38

Test of significance: Not significant

TABLE 14

Question 7. NIGERIA'S MOST IMPORTANT SUBJECT FOR MASTERY

Employment now	English	Mathematics	Science	Social Studies
Teacher	38	43	93	1
Administrator	3	9	12	0
Total	41	52	105	1

Test of significance: Not significant

TABLE 15

Question 8. MY STUDENTS' POOREST SUBJECT IS:

Years taught rural	English	Mathematics	Science	Social Studies
0 - 4 years	5	41	8	1
5 - 9 years	4	35	7	0
10 - 14 years	0	21	2	0
15 or more years	5	30	3	1
Total	14	127	20	2

Test of significance: Not significant

TABLE 16

Question 9. MY STUDENTS' POOREST SUBJECT IS:

Years taught urban	English	Mathematics	Science	Social Studies
0 - 4 years	6	56	5	2
5 - 9 years	3	34	8	1
10 - 14 years	0	8	2	0
15 or more years	1	1	0	0
Total	10	99	15	3

Test of significance: Not significant

TABLE 17

Question 10. TEACHERS NEED MORE MATH TRAINING

Years Teaching	Yes	No	Row Total
0 - 4	25	9	34
5 - 9	46	19	65
10 - 14	16	12	28
15 or more years	57	18	75
Total	144	58	202

Test of significance: Not significant

TABLE 18

Question 11. MOST HELPFUL TRAINING FORM FOR TEACHERS IS

Years Teaching	Longer College Training	Inservice Training	Demonstrations	Teaching Aids
0 - 4 years	2	24	2	6
5 - 9 years	2	50	4	9
10 - 14 years	0	23	2	3
15 or more years	2	56	6	11
Total	6	153	14	29

Test of significance: Not significant

TABLE 19

Question 12. ELEMENTARY TEACHERS NEED SPECIALIZATION IN MATH

Employment	Yes	No	Row Total
Teacher	131	50	181
Administrator	19	6	25
Total	150	56	206

Test of significance: Not significant

TABLE 20

Question 13. SHOULD INSERVICE TRAINING IN MATH BE PARTICIPATORY?

Sex	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
Male	40	19	2	1	1
Female	87	42	2	6	5
Total	127	61	4	7	6

Test of significance: Not significant

TABLE 21

Question 14. TEACHERS NEED PLANS TO STRENGTHEN MATH

Years Teaching	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
0 - 4 years	17	11	3	1	1
5 - 9 years	34	20	4	4	2
10 - 14 years	13	15	0	0	0
15 or more years	40	24	1	5	5
Total	104	70	8	10	8

Test of significance: Not significant

TABLE 22

Question 15. MATH CURRICULUM NEEDS SOME CHANGES

Years Teaching	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree	Row Total
0 - 4 years	15	11	0	6	2	34
%	44.1	32.4	0	17.6	5.9	16.8
5 - 9 years	35	20	1	7	2	65
%	53.8	30.8	1.5	10.8	3.1	32.2
10 - 14 years	8	15	0	3	2	28
%	28.6	53.6	0	10.7	7.1	13.9
15 or more years	30	30	4	11	0	75
%	40.0	40.0	5.3	14.7	0	37.1
Total	88	76	5	27	6	202
%	43.6	37.6	2.5	13.4	3.0	100.0

Test of significance: Not significant

TABLE 23

Question 16. HOMEWORK SHOULD INVOLVE PARENTS

Years Teaching	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
0 - 4 years %	14 41.2	10 29.4	2 5.9	2 5.9	6 17.6
5 - 9 years %	18 27.7	19 29.2	3 4.6	11 16.9	14 21.5
10 - 14 years %	8 28.6	9 32.1	1 3.6	5 17.9	5 17.9
15 or more years %	22 29.3	28 37.3	5 6.7	9 12.0	11 14.7
Total %	62 30.7	66 32.7	11 5.4	27 13.4	36 17.8

Test of significance: Not significant

TABLE 24

Question 17. MATH HAS LITTLE PRACTICAL VALUE

Years Teaching	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
0 - 4 years %	8 23.5	4 11.8	0 0	13 38.2	9 26.5
5 - 9 years %	10 15.4	8 12.3	2 3.1	12 27.7	8 41.5
10 - 14 years %	4 14.3	4 14.3	0 0	12 42.0	8 28.6
Total %	41 20.4	22 10.9	5 2.5	68 33.8	65 32.3

Test of significance: Not significant

TABLE 25

Question 18. SUBJECT I AM LEAST EFFECTIVE IN IS:

Sex	English	Math	Science	Social Studies	Missing	Row Total
Male	3	17	31	9	4	64
%	4.7	26.6	48.5	14.1	6.2	31.0
Female	7	42	65	22	6	142
%	4.9	29.6	45.8	15.5	4.2	69.0
Total	10	59	96	31	10	201
%	4.9	28.6	46.6	15.0	4.9	100.0

Test of significance: Not significant

TABLE 26

Question 19. I HAVE ALWAYS ENJOYED TEACHING MATH

Sex	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree	Missing	Row Total
Male	3	7	1	25	28	0	64
%	4.7	20.9	1.6	39.0	43.8	0	31.0
Female	11	21	8	55	45	2	142
%	7.7	14.8	5.6	38.7	31.7	1.4	69.0
Total	14	28	9	80	73	2	206
%	6.8	13.6	4.4	38.8	35.4	1.0	100.0

Test of significance: Not significant

TABLE 27

Question 20. THE SUBJECT PARENTS ARE MOST CONCERNED ABOUT IS?

Method of Investigation	English	Math	Science	Social Studies	Row Total
Questionnaire	34	133	13	1	181
%	18.8	73.5	7.2	.6	89.2
Interview	10	10	2	0	22
%	45.5	45.5	9.1	0	10.8
Total	44	143	15	0	203
%	21.7	70.4	7.4	0	100.0

Test of significance: Significant

TABLE 28

Question 21. I AM NERVOUS WITH MATH

Method of Investigation	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree	Row Total
Questionnaire	14	29	7	72	61	183
%	7.7	15.8	3.8	39.3	33.3	89.3
Interview	0	2	0	13	7	22
%	0	9.1	0	59.1	31.8	10.7
Total	14	31	7	85	68	205
%	6.8	15.1	3.4	41.5	33.2	100.0

Test of significance: Not significant

TABLE 29

Question 22. MANY MATH TEACHERS MAKE MATH INTERESTING

Method of Investigation	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
Questionnaire	34	45	8	65	27
%	19.0	25.1	4.5	36.3	15.1
Interview	1	4	0	15	2
%	4.5	18.2	0	68.2	9.1
Total	35	49	8	80	29
%	17.4	24.4	4.0	39.8	14.4

Test of significance: Not significant

Table 8 indicated that a total of 206 respondents participated in this study. Out of the 206 respondents, 64 respondents were males and 142 participants were females.

Table 9 revealed the years of teaching experiences of the participants. The teaching experience of the participants ranged from 0-4 years through 15 or more years. There were 34 participants who had four or fewer years of experience were: those with 5-9 years of experience numbered 65, those with 10-15 years of experience numbered 29, and while those with 15 or more years of experience were 75. Four indicated no teaching experience.

Table 10 which contains information concerning the years of educational administration of the participants, indicated that 42 respondents have had 4 or fewer years of educational administration experience, 28 participants have had 5-9 years of administrative experience, 13 respondents have had 10 - 14 years of educational administration experience, while 21 participants indicated that they have had more than 15 years experience in educational administration.

Table 11 shows the academic qualifications of all the participants. The table indicates that 4 respondents have the West African School Certificate as the highest qualification attained; 144 respondents possess Teacher Grade Two Certificates as their highest qualification, 40 respondents possess either Associative Certificates of the National Certificate in Education, while 9 respondents possess Bachelor Degree's or a higher one. There were 9 participants who did not respond to the question (Question 4).

Self-assessment of Subjects on the School Curriculum

Question 5 in Table 12 which investigated the participants self-assessment of the subject with adequate teaching materials indicated that out of the 57 male participants that responded to the question, 20 respondents identified English as the subject with adequate teaching materials, 16 respondents indicated mathematics as the subject with adequate teaching materials: 5 respondents identified science as the subject with adequate: teaching materials whereas 16 participants perceived social studies as the subject with adequate teaching materials.

Question 6 in Table 13, "Subject I am most effective in," investigated the discipline in which respondents perceive themselves to be most effective revealed that while a total of 88 respondents out of the 198 who responded to the question indicated that they are most effective in teaching English, while 61 respondents indicated their greatest teaching effectiveness to be in math. Eleven other respondents indicated their greatest teaching effectiveness to be in science; and finally 38 respondents identified social studies as the subject in which are the most effective.

Another question on participants' self-assessment of subjects on the school curriculum is seen in Table 14. The table indicated that 41 respondents perceived English as the most important subject to be mastered in order to meet Nigeria's development needs, while 52 respondents indicated mathematics as the one that should be mastered to meet Nigeria's development needs. A majority of 105 respondents perceived science as the most important discipline to be mastered in order to meet the development needs of the country, and only 1 respondent perceived

social studies as the most important subject to be mastered in order to meet the development needs of Nigeria.

Table 15 which contains data results of question 8, "My students' poorest subject is:", revealed that 14 respondents from rural schools indicated that teachers perceive English as their students' poorest subject, while 127 respondents from the same locality indicated that mathematics is their students' poorest subject. Other response in the table show that 20 respondents perceived science as their students' poorest subject, and only 2 respondents expressed that their students' poorest performance can be seen in social studies classes. Out of 55 responses from educators with four or fewer years of experience, 5 respondents indicated that their students' poorest performance is in English, 41 respondents indicated that mathematics is their students' poorest subject, whereas 8 respondents expressed that their students perform the poorest in science. Only 1 respondent indicated that students perform poorest in social studies.

The majority of educators with 5-9 years of experience who teach in rural schools also indicated mathematics as the subject in which their students perform the poorest. The other two groups of teachers with different years of experiences -- 10-14 years and 15 or more years -- by a wide margin identified mathematics as the subject in which their students perform the poorest.

Similarly, Table 16 revealed that a majority of urban teachers also indicated that mathematics is the subject in which their student perform the poorest. The respondents' responses to their students performances in the other discipline were also similar.

Table 17, question 10 relates to the first major research question "How important is mathematics considered in relation to other subjects, and what effect has it on educators' self-assessment of their mathematics competence?" indicated that out of 202 responses, 144 respondents perceived a need for more instructional training need for elementary school teachers. Only 58 responses did not see any need for more instructional training for elementary teachers.

Teachers' Improvement Assessment

Table 18 containing question 11, "The most helpful training form for teachers is:" indicated that of a total of 202 respondents a majority of 153 indicated that "Inservice training" is the most helpful training form for improving teachers competence in mathematics instruction. Other responses include 6 respondents who indicated "longer college training", 14 respondents indicated "Demonstrations" and 29 respondents indicated that "Teaching aids" is the most helpful training form for elementary teachers competence improvement. Examining Table 18, one can observe teachers' different levels of experience did not have any effect on the responses of participants.

Table 19, like Table 18, examined the second major question, "Do educators agree in their assessment of the appropriate mathematics improvement plans?" It revealed that out of the 181 teachers who responded to the question, 131 indicated that teachers need to specialize in mathematics in order to be competent in mathematics instruction. On the other hand, 50 teacher indicated no need for specialization in

mathematics. Out of the 25 administrators who responded to the question, 19 responded positively to the need for specialization, while only 6 administrators indicated no need for specialization.

Educators' Opinion of Math Instruction

Data in Table 20, question 13, "Should inservice training in mathematics be participatory?" show that out of 63 male respondents to the question, 40 indicated, "strongly agree" while 19 agreed that mathematics inservice training should be participatory. On the whole, 59 male respondents agreed that inservice training in math should be participatory.

The table also indicated that out of 142 female respondents, 87 strongly agreed and 42 agreed, bringing the number of female respondent who responded positively to the question to a total of 129. The number of both male and female respondents who gave negative responses to the question was negligible.

Data contained in Table 21, question 14, "Teachers need plans to strengthen math," indicated that out of a total of 200 responses to the question, 104 responses indicated "strongly agree" while 70 responses indicated "agree". On the whole 174 respondents agreed that there is need to strengthen mathematics instruction in elementary schools. Conversely, only 18 respondents indicated no need to strengthen math instruction in their elementary schools.

The two tables examined above were employed to investigate the third major research question, "Are there differences of opinions among educators concerning teacher education in mathematics in general and

inservice training programs in mathematics for elementary teachers in particular?" Some other questions used to investigate educators' opinion of mathematics instruction follow immediately.

In Table 22 and question 15, "Math curriculum needs some changes," respondents are required to check any of these responses: "Strongly agree", "Agree", "No opinion", "Disagree" and "Strongly disagree". According to data in the table, 88 respondents (43.6%) of all respondents indicated "Strongly agree", while 76 respondents (37.6%) of all respondents indicated "Agree". On the whole, 164 respondents out of a total of 202 respondents agreed that there is a need to effect some changes in elementary school mathematics curriculum. It means that 81.2% of all respondents agreed that there is a need to effect some changes in elementary school mathematics curriculum. It means that 81.2% of all participants responded favorably to the statement that math curriculum needs some changes. On the other hand, 33 respondents disagreed that there is a need to make some changes in math curriculum.

Another mathematics opinion question, question 16, "Home work should involve parents" can be seen in Table 23 which indicated that 62 respondents strongly agreed with that opinion, while 66 respondents indicated "agree", thereby bringing the total number of favorable responses to that view to 128 responses (63.4%). Conversely, 36 respondents strongly disagreed with the opinion, while 27 respondents disagreed with the opinion. The total number of respondents that disagreed with that opinion is 63 (31.2%). Eleven respondents (5.4%) did not indicate any opinion about the statements.

Data contained in Table 24, question 17, "Math has little practical value", indicated that out of 201 total response, 41 responses (20.4%) indicated "Strongly agree" while 22 responses (10.9%) indicated "Agree", thereby bringing the total number of favorable responses to the opinion to 63 (31.3%). Conversely, 63 responses (32.3%) indicated "Strongly disagree", while 68 responses (33.8%) indicated, "Disagree", thereby bringing the total unfavorable responses to the statement to 133 (66.1%). Their responses indicated that many educators have discovered the relevance of mathematics education to everyday life. A negligible number of responses indicated "no opinion".

Table 25, question 18, "Subject I am least effective in in:" has featured a second time for the purpose of comparing the responses of the male and female responses to the statement. The table indicated that a total of 96 respondents (46.6%) perceived science as the subject in which they have their least effectiveness, while 59 responses (28.6%) indicated least effectiveness in the subject of mathematics. Responses indicating least effectiveness in social studies are 30 responses (15.0%), while only 10 responses (4.9%) indicated least effectiveness in English language. Despite the indication that teachers perceive their least effectiveness in science, there is no indication that it is a concern, either on the part of teachers or parents.

Attitudes of Educators Toward Math

A question involving the fourth major research question, "What are the attitudes of elementary teachers toward mathematics education and how have they affected the teaching and learning of mathematics in

Ikwuano/Umuahia elementary schools?" can be seen in Table 26, as question 19. Data in the Table indicated that out of 206 respondents, 73 (35.4%) indicated, "strongly disagree", while 80 (38.8%) indicated "Disagree", which brings the total number of respondents that could not identify with the attitude of "have always enjoyed teaching math" to 153 responses (74.2%). On the other hand, 14 responses (6.8%) indicated, "strongly agree", while 28 responses (13.6%) indicated "agree", thereby bringing the total number of responses that identified with the attitude "I have always enjoyed teaching math" to 42 responses (20.4%). There were 9 responses that indicated "no opinion", while two answers were found missing.

Question 20, in Table 27 involves educators' self-assessment of their knowledge of their pupils performances in mathematics education. The Table revealed that 44 responses 21.7% out of a total of 203 responses perceived English as the subject in which parents are most concerned about. Only 15 responses (7.4%) perceived science as the subject parents are most concerned about. There was no indication of parents' concerns over the subject of social studies. The written responses differ from oral responses.

Table 28, question 21, "I am nervous with math," an attitude question used to examine the fourth major research question, revealed that 68 responses (33.2%) out of 205 responses indicated, "strongly disagree", while 85 responses (41.5%) indicated "disagree" and this brings the total number of responses that indicated disagreement to that attitude to 143 responses which is 74.6% of all responses. It also indicated that 14 responses (6.8%) strongly agreed while 31 responses

(15.1%) identified with that attitude by indicating, "agree". An interesting finding is that in oral interview, there was no room for the indication of "no opinion" which is common with written responses. On the whole, 21.9% of all the responses identified with the attitude of being nervous with mathematics instruction.

Table 29, question 22, an attitude statement, "Many teachers make math interesting" revealed that 29 responses (14.4%) indicated "strongly disagree", while 80 responses (39.8%) indicated "disagree", which means that 54.2% of the responses did not identify with the attitude of many teachers making the teaching of mathematics interesting.

Conversely, 34 responses (17.4%) indicated that many teachers make math interesting by indicating "strongly agree", while 49 respondents (24.4%) indicated "agree" which means that they agree that many teacher have the attitude of making mathematics interesting. A negligible 8 responses (4.0%) indicated "no opinion".

The differences and similarities of responses can be seen in Chapter V which follows.

C H A P T E R V

INTERPRETATION OF DATA ANALYSIS

The purpose of this chapter is to separate the interpretation from the data analysis. In Chapter IV, data were analyzed by means of four major research questions along with 22 sub-questions. The results of the chi-square test of the relationship between males and females for each of the educators' self-perception of their mathematics competence questions were provided in Tables 12, 20, 25 and 26.

Secondly, the results of the chi-square test of the relationship between teachers with different qualifications and the effects of qualification on their instructional performance were provided in Table 13. Also, the results of the chi-square test of the association between teachers' years of experience and their opinions of mathematics education were provided in Tables 15, 17, 18, 21, 22, 23 and 24.

Similarly, the results of the chi-square of the relationship between educators with different roles and locations and the effects of these factors on their math attitude, if any, were provided in Tables 14, 15, 16 and 19.

Finally, the results of the chi-square test of the relationship between data gathered through written questionnaires and oral interviews were also provided in Tables 27, 28 and 29.

The following discussion on the interpretation of data analysis is divided into five parts namely:

2. Relationship between personnel qualification and his/her instructional performance;
3. Any relationship between a teacher's experience and his/her opinion of inservice training programs in math.
4. Influence of role and location of personnel on their attitude to mathematics instruction; and
5. Differences between the responses from written questionnaire and the responses from oral interviews.

Relationship Between Sex and Perception of Educator's Instructional Competence

Data results in Table 12, question 5, "Subject with adequate materials", indicated a more positive response to English language than mathematics. However, data in the table show that mathematics is considered to have more adequate teaching materials than Science and Social Studies. However, there is no significant difference between the responses of male respondents and those of female respondents.

In Table 20, question 13, "Math inservice training should be participatory", a majority of the participants responded positively to the question. Again there is no significant difference between the responses of males and females.

Table 25, question 1, "Subject I am least effective in" indicated that 26.6 percent of all male respondents perceived their least effectiveness in teaching math, while 29.6 percent of all females responded similarly. However, there is no significant difference between the responses of males and females.

Table 26, question 19, "I have always enjoyed teaching math", indicated a more negative response to the question than a positive response from both males and females. There is a difference in the degree of their positiveness. The difference, however, is not significant.

Examining the data results of the foregoing tables, it will not be out of place for the researcher to conclude that there is no relationship between the response of male and female participants in this study.

Relationship Between Qualification and Opinion of Inservice Training

The second discussion centers on the impact of a teacher's qualification on his/her opinion of inservice training programs.

Table 13, question 5, "Subject most effective in" indicated that 2 out of 4 respondents who possess the West African School Certificate perceive themselves most effective in the subject of mathematics. Data in the table also show that 44 out of 144 respondents who possess Teachers Grade 2 Certificate perceive themselves effective in math instruction, while 12 out of 39 teachers with either Associateship Certificate of Education or the National Certificate in Education perceived themselves most effective in mathematics instruction. Also 3 out of 9 respondents with college degrees perceive themselves most effective in math instruction. Apart from the uncertified teachers (holders of the West African School certificate) whose responses differed much from the rest of the qualified teachers, the other categories of qualified teachers had similar responses. However, data in the table indicate

that there is no significant difference between the responses of participants with different qualifications.

The self-perception of the participants' effectiveness in mathematics instruction alone cannot be used to conclude that there is no direct relationship between qualification and competence; nonetheless, data in this table have suggested this possibility.

Relationship Between Experience and Opinion of Teacher Education

The discussion of the relationship between a teacher's years of experience and his/her opinion of teacher education concerns the data presented in Tables 15, 16, 17, 18, 21, 23 and 24.

Table 15, question 8, "Students' poorest subject is:" indicated that 41 teachers with 4 or less years experience out of a total of 55 with the same number of years experience considered mathematics as the subject in which their students perform the poorest. Similar results are true of other teachers with different years of teaching experience; for example 35 out of 46 respondents with 5-9 years experience, 21 out of 23 teachers with 10-14 years experience, and 30 out of 39 respondents with 15 or more years experience, all considered mathematics as the subject in which their children perform the poorest.

Similarly in Table 17, question 10, "More math training for teachers", indicated that respondents with different years of teaching experience considered a need for teachers to have more training in math. A little difference is observed in the responses of participants with different years of teaching experience but no significant difference in responses is noticed.

The same is true of Table 18, question 11, "Most helpful training form is:" which indicated that a majority of all respondents -- despite the differences in their years of teaching experience -- considered inservice training as the most helpful form of training for practising teachers. In other words there was a consensus among teachers over the best form of instructional training for their professional growth. Data contained in Table 18 indicated that teaching experience is not a controlling factor in the identification and assessment of instructional plans for teachers' improvement. Again, there is no significant difference between the responses of individuals with different years of teaching experience.

Data contained in Table 21, question 14, "Need plans to strengthen math", indicated that despite the differences in years of teaching experiences of the participants, there was a consensus of opinion that there is a need for plans to strengthen mathematics instruction. The little difference observed lies in the degree of their positiveness. Again in this Table there is no indication of any significant difference in responses of participants.

In Table 22, question 15, "Math curriculum needs some changes", and Table 23, question 16, "Home work in math should involve parents" both questions express opinions about math instruction, data in the tables indicated positive responses from participants, teaching experience, notwithstanding. Here again, the difference in the responses of the participants with different range of experience is not significant.

Table 24, question 17, "Math has little practical value", indicated a consensus of more positive response from all participants with different years of teaching experience. No significant difference is expressed in their responses.

Roles and Locations of Educators and Their Effects on Their Mathematics Attitude

Table 14, question 7, "Nigeria's most important subject is:" indicated that 43 out of 175 elementary teachers perceived math to be the second in order of importance as far as the development needs of Nigeria are concerned. The same is true of the school administrators who also considered mathematics, second in order of importance, considering Nigeria's development needs. There is therefore no significant difference between the responses of elementary teachers and those of school administrators.

Table 15, question 8, "students' poorest subject is:", indicated that teachers in rural schools teaching experience expressed the view that their students perform poorest in mathematics. Similarly Table 16, question 9, "My students' poorest subject is:", also indicated that teachers whose experiences had been in urban schools perceived mathematics as the subject in which their students perform the poorest. Data results in this table show that there is no significant difference between elementary teachers in rural schools and those in urban schools in the way they evaluate their pupils.

Table 19, question 12, "Subject specialization for elementary teachers", indicated that 72.4 percent of elementary teachers affirmed

that there is a need for elementary teachers to specialize in the subject they teach especially mathematics. Similarly the table also indicated that 76.0 percent of the administrators support the need for subject specialization.

Differences Between Questionnaire and Oral Interview Responses

Data in Table 27, question 20, "Subjects parents are most concerned about", show that 73.5 percent of the questionnaire respondents perceived math as the subject in which parents express concern most, whereas 45.5 percent oral interviewees perceived math as the subject in which parents express their concern most. In this table, oral responses also indicated that 45.5 percent of the participants viewed English language as the subject in which parents express their most concern. Data in this table show that there is a significant difference between the responses of the written respondents and those of the oral interviewees.

Data in Table 28, question 21, "I am nervous with math", indicated that both written and oral responses disagreed that they (teachers) are nervous with mathematics. A majority of 72.6 percent written responses disagreed that teachers have the attitude of being nervous with mathematics, while 90.9 percent of oral responses indicated the same opinion. The difference in their responses is minor and therefore not significant.

In Table 29, question 22, "Many teachers make mathematics interesting", data responses disagreed with the statement that many

teachers make the teaching of mathematics interesting, while 77.3 percent of oral responses expressed the same view. The difference in their responses is significant. However both written and oral responses disagreed that many teachers have such attitude toward math instruction.

SUMMARY

The major research question examined the importance attached to math and its effects on educators' self-assessment of their mathematics competence and interest. The responses to the evaluative portion of the questionnaire indicated that a majority of elementary teachers perceived themselves interested in the discipline of mathematics. However, to the question of the teachers' effectiveness in math, there were no significant differences between the responses of males and females, teachers and administrators/inspectors, personnel with many years of work experience and those with fewer years of experience, and educators with urban experience and those with rural schools experience. There was a consensus opinion that mathematics is an important subject to be mastered in order to meet Nigeria's development needs.

The second research question assessed the mathematics improvement plans by comparing the responses of educators with different identities. The investigation revealed that a majority of the responses encouraged more math training for elementary teachers. They also indicated that inservice training programs are the most helpful form of training for improving math education. Also, a majority of the respondents expressed

the need for specialization in math as a means of improving math education. There was a consensus agreement among the respondents about making inservice training programs in math participatory (math specialists, inspectors of education and teachers).

The third research question studied the difference in math opinions of the participants. A majority of the respondents indicated that teachers are doing much teaching in math with the available teaching aids which they did not consider adequate. They also indicated a need for plans to strengthen and facilitate the teaching and learning of math. The majority of the participants advocated for modification of math curriculum and also encouraged working with parents in order to meet the needs of students in working math through math homework. There were no significant differences in the responses of the participants.

The fourth research question examined the attitude of educators toward mathematics. The results on question about, "my mind goes blank while working math", indicated a more positive attitude than a negative attitude to math by participants. A majority of the responses also indicated a positive attitude to math instruction. Questions expressing teacher's positive attitude toward mathematics, received very favorable responses from the subjects.

On the other hand, questions about teachers' insecurity with and dislike for math revealed that a majority of the subjects disagreed that elementary teachers in their school system have such attitudes toward mathematics. Generally, there seemed to exist in educators an enthusiasm for excellence in mathematics education considering the importance attached to the discipline by the National Policy on

Education. The summary of findings, conclusions and recommendations for future studies follows in Chapter VI.

C H A P T E R V I

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The goal of the study was to investigate the perceived instructional training needs of elementary teachers in mathematics education, and to establish guidelines for developing objective inservice programs aimed at facilitating mathematics instruction in the Ikwauno/Umuahia school system in Imo State of Nigeria.

Summary of Literature Review

A review of the literature relevant to math instructional training needs of elementary teachers supports the notion that teachers must be taught sound evaluation techniques, since it is only then that they would be able to assess accurately the learning problems and achievements of their pupils and so build up the pupils' knowledge and competence in mathematics (Nigeria Task-Force, 1977). Another important need of elementary teachers discovered in the literature review that limit their performance happened to be the lack of motivation for teaching and in this particular case the teaching of mathematics.

Thirdly, the standard of quality of teacher preparation in mathematics in teacher training colleges is rated low and inadequate and therefore teachers have need for updating their knowledge of mathematics and the effective methods of teaching it by means of inservice training programs in mathematics.

A review of research on teacher education in Nigeria revealed that the greatest stumbling block in bringing about smooth change in the teaching of mathematics in the schools lies in the fact that the teachers studied only arithmetic in the teacher training college. Therefore it is not in the interest of good teaching to make someone who learned only arithmetic in school and later in the teachers college suddenly revert to teaching a new area of knowledge with which he was not familiar even as a pupil.

While there was a need in the 1970's to develop guidelines and policies on the subject matter of mathematics, a greater need was seen in the process of teaching the subject. The method of teaching math adopted in schools was memorization. As a result of the expressed desires from government, industry and the people in general, Ministries of Education, particularly the Federal Ministry of Education developed guidelines and policies on Nigerian education including math education.

The writings of a number of authors support the belief that schools will not change unless educators change and that one way educators can change is by updating their knowledge of the subject matter and the effective methodology of teaching the subjects on the school curriculum by means of well organized inservice programs. The need for inservice education in mathematics has been stressed by many writers. Educators also pointed out that learning is a lifelong process that does not end with state certification which is only a minimal statement of acceptance and therefore encouraged continuing education in math.

A literature review on teacher education indicated that educators perceive a professional teacher as one who learns to teach and teaches

to learn. They also believe that the goals and objectives of any inservice program in mathematics or any other subject should be defined by planners and explained to recipients. The findings of a National Task-Force charged with the responsibility of facilitating teacher education in mathematics revealed the fact that inservice workshops, seminars and training projects in mathematics already organized in Imo State and at zonal levels were not well co-ordinated.

Both providers and recipients of inservice programs in mathematics agree that accurate assessment of teachers training needs provides opportunities necessary for mounting efficient inservice programs that have the effect of meeting elementary school students' needs in mathematics education or in any other subject.

Examination of relevant research in the literature on teacher education in mathematics, coupled with the survey conducted by this researcher, all revealed that elementary teachers perceive a more than moderate need for help in five areas namely:

- I Developing effective learners and mastery of the basic mathematics concepts and skills,
- II Guiding teachers to set up and achieve realistic goals,
- III Locating materials and inservice support in mathematics education,
- IV Identifying and understanding readiness factors that affect learning and,
- V Motivating children to learn mathematics.

The literature as well as the survey agree that effective inservice training programs in the mathematics education can be launched by coordinating the efforts (education expertise) of consultants, school administrators, inspectors of education and competent elementary school teachers. Therefore, the teachers should be actively involved in the planning and implementation of inservice programs.

A report of the NERC National Task-Force on mathematics observed that most elementary school teachers were without appropriate training or knowledge of evaluation techniques and therefore advised that teachers be taught sound evaluation techniques to enable them to assess accurately the learning problems and achievement of the pupils and so build up the pupils knowledge and competence in mathematics.

Most educators who advocate the use of need assessment in the planning process of inservice training programs suggest that the results of such assessments be used to generate goal and objective statements for subsequent interventions (Kaufman, 1972). They also believe that people's needs ought to be among the basic criteria for designing and the evaluation of educational services.

Relevant literature on teacher education in general, and continuing education for teacher (inservice training) in particular indicated that the idea of specialist centers is very popular in developing countries and expressed the danger that their existence may lead to the functional separation of initial from inservice training or inhibit the development of school-or-field-based approaches which are of particular importance in distant rural areas (Thompson and Greenland, 1983).

Examining effective programs from literature that helped to increase teacher participation in program planning and implementation, the writer noticed that there were two development activities that motivated teachers. These two development activities are classified under informal and formal.

Informal activities are those day-to-day functions which have development effects upon staff. They include: implementation of district personnel policies; administration of the teachers evaluation programs; involvement of staff in program planning, and day-to-day interactions of teachers. It is not an overstatement to say that informal activities constitute the most important aspect of staff development programs.

On the other hand, formal activities are planned program efforts that are personalized to the growth needs of individual staff members. They encompass a broad range of activities including conferences, school observation, consultations with peers, and active participation in inservice programs. The stages of a formal teacher development program are planning, implementation and evaluation.

The provision of sufficient time for inservice education, as well as other forms of support from a central office and building-level administrators is critical during the initial planning stages and during implementation of inservice education programs.

Among the different inservice program approaches, the writer favors the school-improvement approach because it is a more complete approach to staff development than the other methods. It sets out to provide growth experiences for both the instructional and administrative staffs

based upon assessment of the personal/professional needs of individuals and determined needs of the institution.

Mathematics educators encourage the idea that beginners (new students) should have a variety of experiences with qualitative characteristics of objects, such as color, size or shape which can be seen and touched. Another important strategy for mathematics education found in the literature is the need to create an atmosphere which makes learning mathematics a cooperative effort of child and teacher, in which the total personality of the child is given recognition. The teacher helps to construct and organize the environment and helps each child to be an independent learner.

Piaget's philosophy of mathematics education at the elementary school level, stated that children learn mathematical concepts and operations most effectively by their own activities with a great variety of concrete materials. Piaget's psychological research demonstrated that children in their early years cannot learn solely by drills, neither can they go too early to abstractions, and therefore they need to engage in their elementary school years in guided activities that leave them free to discover the reasoning of operations and mathematical concepts.

Agents of change in mathematics education advocate for mathematics laboratory in schools to serve as a resource center for every school. The objective of the laboratory should be to meet the needs of the entire school population (students and teachers) on continuing basis.

Summary of Survey

In order to determine the perceived instructional training needs of elementary teachers in mathematics education and how to develop objective inservice programs for teachers aimed at facilitating mathematics instruction in Ikwano-Umuahia school system, the writer investigated the following subsidiary research questions.

1. Who are in the best position to define the instructional training needs of elementary teachers in mathematics education?
2. What are the perceived instructional training needs of elementary teachers in mathematics education?
3. What is the best form of training support for elementary school teachers in mathematics and what is the right procedure for carrying it out successfully?

Subsidiary questions about the attitude of elementary teachers toward mathematics education were asked to investigate the effects teachers' attitudes toward mathematics have on their teaching of the subject.

The data for this study was collected from a random sample of 210 school educators (teachers, administrators, inspectors of education, student teachers and teacher trainers). The study included 174 elementary teachers, 8 administrators, 3 inspectors of education, 20 student teacher and 5 teacher trainers.

The instrument employed to investigate the questions above was the questionnaire-interview technique which comprised of a check-list of 45 questions. The questionnaires were delivered to respondents through head teachers, in the case of teachers. The other respondents received

their questionnaires directly from the writer. The scales of the test were numbered one through five with one representing the extreme positive position and five the extreme negative position. Significant differences in the responses of the groups were tested by a chi-square statistics. The level of statistical significance was set at the .05 level.

Discussion of Findings

With respect to the first subsidiary question (who is in the best position to define teachers instructional training needs?) research question, it was found that the data, in general provided some support for the contention that apart from the elementary teachers themselves, that there are other educators who are in a position to define the math instructional needs of elementary teachers. Despite the differences in the educational roles played by the respondents, their responses in most cases were similar. For example, there was a consensus of opinion on the subject considered to be the most important based on Nigeria's development needs. The majority of both school administrators (head teachers and inspectors of education) and the teachers identified science to be the most important followed by mathematics. Based on the more emphasis placed on mathematics at the elementary school level, a majority of the respondents indicated that elementary teachers should pay more attention to mathematics education than science education.

Secondly, data gathered from this study proved that a majority of educators, including those who are currently teaching, those on administrative positions and those responsible for supervision of math

education indicated a great need for more mathematics training for teachers as a means of improving teachers' effectiveness in mathematics education.

Thirdly, all categories of participants in this study agreed that the subject of mathematics is the one in which students perform the poorest.

With the second subsidiary research question, (what are the perceived instructional training needs of elementary teachers in math education?), data gathered on the subject in which parents are very concerned about, showed that most parents are more concerned about their children's performance in mathematics than they are in any other field. Parents, therefore demand more effort on the part of teachers to improve mathematics education in their schools.

Secondly, teachers expressed the need for more teaching materials for effective teaching in mathematics education.

Thirdly, the majority of the participants in this study believe that more training in mathematics should be given to teachers on the effective methods of teaching mathematics in the teacher training colleges.

Fourthly, there was a consensus on the choice of inservice training program as an effective means of updating teachers knowledge of mathematics subject matter as well as the methodology for teaching it.

On the third subsidiary major research question (what is the best training support for elementary teachers in math education?), the responses revealed that inservice training efforts made in mathematics education lacked co-ordination which signifies that the organizers may

not have defined the correct program objectives for such inservice training programs.

The participants advocated greater teacher participation in the planning and execution of mathematics inservice programs. Such teachers must be good at mathematics and zealous over helping their weaker colleagues. Participants in this study believe that the organization of inservice training programs in math should be done by a combination of teachers, specialists, school administrators and the central office administrator in order to ensure of its success.

A majority of the participants support the idea of specializing in mathematics education as a qualification for teaching it. The administrators pointed out a problem with that idea to be that of funds for its application.

The results of the investigation on the need for the modification of the math curriculum revealed that the Nigerian Educational Research Council introduced a new approved curriculum for mathematics in 1978. The objectives, the content and activities for each year of every level of education were clearly spelled out and in line with the national policy on education. Unfortunately, this study revealed that many school administrators as well as their teachers were ignorant of the new mathematics curriculum because they were not trained on how to apply it. They therefore need competence in defining math curriculum content.

There is a consensus on the need for parents' cooperation with teachers to achieve their objectives for their children's performance in mathematics through homework.

On mathematics attitude of educators, data gathered from the survey reveal that the majority of the participants indicated a more positive attitude toward mathematics than is generally thought of. On the other hand a negligible percentage of the participants expressed negative attitudes toward math.

Conclusions

Based on the writer's reviews of literature, he believes that the following guidelines for organizing inservice training for teachers in mathematics are essential for effective results:

1. There should be a committee or task-force responsible for planning an inservice program in math which should include adequate teacher representation. However, teachers should be selected on the basis of their skill, experience and enthusiasm for the task.
2. Teachers should be aware of the stated goals and objectives of every inservice training program.
3. Teachers should be instrumental in determining the purpose of the inservice program which will take into consideration their perceived instructional training needs.

The necessity for conducting a needs assessment of recipients of an inservice training program before mounting such a program was recognized in this study.

Data gathered from this study advocated that pupils should be introduced to the number property of groups of objects after many experiences of discriminating between objects. Mathematics methodology

specialists believe that children learn to discriminate between groups or sets of objects on the basis of the number of objects in much the same way that they distinguish groups by colors or shapes. They therefore advised that pupils in higher elementary grades should learn to use the operations of addition, subtraction, multiplication and division in order to express how they understand the concept of "number."

It has been pointed out that materials pupils can use for mathematical operations are of three kinds: concrete, pictorial, and abstract. Successful inservice programs examined in the study revealed the importance of Resource Leaders in the planning and implementation of inservice programs on mathematics.

The resource leaders co-ordinated inservice programs at state level by dividing their operations into zonal levels, later sub-divided to educational areas.

The need for making mathematics lessons interesting and practical at the elementary school level cannot be overemphasized, therefore recognition is given to the fact that there are many things that children between the ages of five and seven can learn before handling numbers with understanding. Examples of such things are sorting, matching, ordering, comparisons, length, area, shapes, intersection and size.

Any reform effort in mathematics education aimed at preparing teachers for their changed role, should help them understand the new mathematics curriculum, and to encourage them to contribute from their experience, ideas for accomplishing the goals of the reform movement. As a part of the effort an institution known as Teachers' Center should be established.

In every inservice training session in mathematics, the participants should be made to understand that "mathematics is a player's game, not a spectator's game."

Qualities necessary for effective teaching of mathematics should be developed in the participants through exciting activities. Such qualities include initiative, sound scholarship, imagination, resourcefulness (creativity), clear thinking and sound knowledge of child psychology.

For maximum success, each lesson in math should have a clearly stated objective which is attainable within the lesson period. Objectives should be stated in behavioral terms, for unless the child can perform correctly the task indicated, it will be assumed that no learning has taken place. Therefore, to ensure effective teaching in math, the right environment should be created and the necessary visual aids provided.

Strong emphasis should be placed on the need to understand mathematics as "ACTIVITY" (doing of things) which includes skill activities like paper folding, model making or taking of different measurements.

Evaluation

The following observable events are a few of the suggested events that are likely to feature after an inservice training program in math to indicate that the needs of the participating teachers are being met:

1. Teachers are able to define the objectives of their math lessons.

2. They are able to identify and select appropriate teaching materials.
3. Improvised teaching aids become a common practice among teachers.
4. Mathematics lessons become more activity-oriented and therefore interesting.
5. Teachers are in a better position to evaluate their performances and those of their students accurately.
6. There is now a positive attitude toward mathematics.
7. Interaction between teachers and pupils has increased.
8. Teachers' evaluation method now embraces open education instead of the traditional standardized tests.
9. The fear of and hatred for math which has dominated the school system is gradually fading away.
10. Pupils no longer regard mathematics as a punishment subject.
11. Teachers are now more confident and interested in teaching mathematics.
12. Local teacher panels for the construction of teaching aids are emerging.
13. Appropriate teacher and pupils activities for different mathematics topics have become the order of the day in math lessons.
14. Teachers are aspiring to do professional work in the teaching of mathematics.
15. Learning of mathematics has become real to both pupils and teachers alike since they can now see the relevance of every math lesson to everyday life.

16. There is now a smooth transition from practical lessons to abstract lessons in mathematics.

The above-listed results of the successful inservice training program in mathematics education for elementary teachers carried out in Ikwuano/Umuahia school system were supplied by the participants who evaluated the program.

This study has examined the perceived instructional needs of elementary teachers in mathematics education and the appropriate guidelines for developing inservice programs to meet those needs. It is hoped that the findings will provide school administrators, teachers and other personnel responsible for developing inservice programs in mathematics education, guidelines for developing effective inservice programs in mathematics.

Recommendations for Further Studies

Research is an area which has to be utilized more by service providers, in this case inservice training organizers. Some problem areas have surfaced as a result of this study and the researcher hopes that others will investigate them for the benefit of all elementary school educators.

This study, concentrated on assessing the perceived instructional training needs of elementary teachers with an intent to establishing criteria for developing inservice education programs to meet those needs. Other studies of teacher education in mathematics should examine the following aspects of inservice training programs:

1. An inservice training program that determines a smooth transition from teacher's pre-training into inservice training education.
2. A study on needs assessment as a means of determining instructional training needs of Imo State elementary school teachers.
3. A study should be conducted on how to effect a change of "teaching approach" through an inservice training program.
4. A study on the procedure for the implementation of inservice program evaluation results.

Planning of Teachers' Inservice Program

The findings of this study indicate that without a useful plan, inservice programs are disjointed and ineffective. On the other hand a unified plan of action is essential to a successful staff development plan. Developing program goal statements can be an effective starting point toward developing a comprehensive plan. The following set of inservice training program goals can constitute the basis for dialogue in the planning committee:

1. To establish and carry out a plan for strengthening personal, professional performance of elementary teachers.
2. To demonstrate increased competence with elected teaching skills.
3. To develop the knowledge and skills essential for implementing newly adopted programs.

Inservice training programs for teachers should be accessible. Accessible programs take into consideration unique local problems and

opportunities. The school site should be the focus of inservice education activities. Inconvenient times or locations or other factors that would discourage participation should be avoided. On-site demonstrations with students should be included when appropriate to the exercise.

Both the central office and school administrators must play a central role in inservice programs if they are to be successful. The superintendent is to be actively involved in the plan of inservice training programs in order to make the exercise official, and teachers input should also be considered indispensable.

The school improvement approach of inservice training program should be made an on-going activity in order to provide growth experiences for the instructional and administrative staffs based upon assessment of the personal professional needs of individuals and the needs of the institution.

Governance for the inservice training should be provided by central office administration in cooperation with the full-time program coordinator and an advisory committee.

Residential centers, where teachers can devote their full and concentrated attention to short courses for several days during long holidays should also become important aspects of inservice education in the local education areas. Parellel with the programs of the centers, continuing assistance to teachers also should take place. Groups of teachers in each local education authority should form study panels to consider ways of helping their colleagues to use the series of guides published by the Task-Force on math education.

Development of a Math Laboratory

The need for a mathematics laboratory cannot be over emphasized because of its invaluable role in the learning of mathematics concepts. The teaching of mathematics which is primarily concerned with memorization of facts and the mental imagery required for concept formation is best provided by concrete examples. Mathematics educators recommend the establishment of a laboratory in the corner of a classroom to provide an enrichment center for a particular class. The laboratory also meets the needs of the entire school population on a continuing basis. It serves as a resource center for the teaching of mathematics. A teacher can be responsible for the laboratory during the functioning hours giving help to other teachers.

A new approach to the teaching of math is desirable. The open classroom approach to the teaching of mathematics should be introduced. The approach provides an open classroom atmosphere which encourages free activity on the part of students thereby placing the teacher's role to that of a guide or facilitator. It also places the burden of providing commercially available teaching materials on the administration while the local ones be improvised by teachers.

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APPENDIX A

A Letter to the Imo State Chief Inspector of Education
to Introduce the Proposed Study



UNIVERSITY OF MASSACHUSETTS
AT AMHERST

Amherst, MA 01003

176

December 19, 1984

The Principal Education Inspector
Ministry of Education
Imo State
Nigeria

Dear Sir/Madam:

The bearer of this letter, Mr. Iheanyichuku D. Okoroafor is a graduate student at the University of Massachusetts in the School of Education, Division of Educational Policy, Research and Administration.

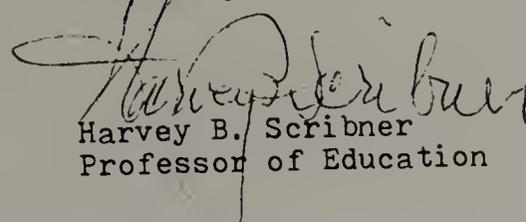
Mr. Okoroafor is currently working on his doctoral dissertation. The study he has undertaken requires him to travel to Nigeria to gather data for the research. Though the University and members of his committee, of which I happen to be chairperson, have not given him any financial support, they do give him both academic and moral support. They are enthusiastic about the study and are anxious to see the outcome.

Respectfully, I solicit your cooperation to this researcher whose goal is to establish and carry out a plan for strengthening personal professional performance of elementary teachers in Mathematics. It is our belief that your expertise and experience in teacher education will be of immense help in this exercise.

Please bear with us if you are in any way inconvenienced. Mr. Okoroafor needs your cooperation for him to succeed. Since our common goal is to provide learning opportunities and environments that will have the effect of increasing students' learning in the classroom, it is necessary for us to cooperate and carry out this inservice project.

The outcome of the study will be communicated to you if you so desire. Thank you for your cooperation.

Sincerely,


Harvey B. Scribner
Professor of Education

HBS:nk

APPENDIX B

The Initial Questionnaire Survey

School of Education
University of Massachusetts
254 Hills South
Amherst
MA 01003

December 7, 1984.

Dear

The attached survey instrument concerned with the instructional needs of Imo state elementary school teachers in Mathematics, is a part of my study on designing a suitable inservice training in Mathematics for Imo state elementary school teachers.

This study is concerned specifically with determining the instructional felt needs of elementary teachers in the area (Imo state) and how to design a suitable inservice programme for Mathematics teachers. The result of the study is expected to provide professional growth for the participating teachers.

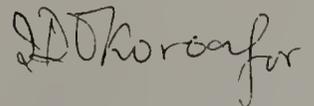
I am currently working on my Doctoral dissertation in which I hope to come up with an appropriate inservice training design for elementary teachers eventually.

As those who are directly involved in the elementary education process in Imo state, I am particularly desirous of obtaining your responses to the survey instrument because your experience in teaching will contribute significantly toward solving teachers' instructional needs.

It will be appreciated if you will complete the enclosed form and return it through the field research assistant.

I would welcome any comments that you have concerning any aspect of inservice education in Mathematics not covered here. Your responses will be held in strictest confidence.

Yours Truly,



Theanyi D. Okoroafor

Enc.

I. Self Identification

Please read each statement carefully and respond by marking the most appropriate space.

1. What is your sex?

(1) Male _____ (2) Female _____

2. Indicate your years of experience as a teacher.

(1) (1-4 years) _____ (2) (5-9 years) _____

(3) (10-14 years) _____ (4) (15 and over) _____

3. My teaching experience has been in:

(1) Urban schools _____ (2) Rural community _____

4. What class are you teaching presently?

(1) Elem I _____ (2) Elem 2 _____ (3) Elem 3 _____

(4) Elem 4 _____ (5) Elem 5 _____ (6) Elem 6 _____

II. Subject Assessment

5. When you were a student, which of the following subjects did you like the best?

(1) English Language _____ (2) Mathematics _____

(3) Social Studies _____ (4) Science _____

6. As a teacher, in which subject do you consider yourself to be the most effective?

(1) Mathematics _____ (2) Science _____

(3) English _____ (4) Social Studies _____

7. Which of the following subjects do you think is the most threatening to students?

(1) Social Studies _____ (2) English Language _____

(3) Mathematics _____ (4) Science _____

8. Which subject do you consider to be the most important for students to master, considering the overall needs of our country?

(1) Science _____ (2) Mathematics _____

(3) Social Studies _____ (4) English Language _____

9. In which subject do you think that teachers have the best (adequate) teaching materials for their work?
- (1) Social Studies _____ (2) Mathematics _____
 (3) English Language _____ (4) Science _____
10. In which subject do you think that teachers need more preparation so as to be more effective?
- (1) Mathematics _____ (2) English Language _____
 (3) Science _____ (4) Social Studies _____
11. What would be the best form that this preparation should take?
- (1) Longer training period _____ (2) Inservice training _____
 (3) Demonstration exercise _____ (4) More teaching aids _____
12. Who is in the best position to provide the help?
- (1) Administrators _____ (2) Other teachers _____
 (3) Specialist in the subject area _____ (4) Both 2 and 3 _____
13. Is there any need for subject specialization by teachers?
- (1) Yes _____ (2) No _____
14. Given the option of a choice of subject area of specialization, which subject would you prefer to specialize in?
- (1) English Language _____ (2) Science Studies _____
 (3) Mathematics _____ (4) Social Studies _____
15. Indicate the subject for which the general public expresses greatest concern over students' poor performance.
- (1) English Language _____ (2) Science Studies _____
 (3) Mathematics _____ (4) Social Studies _____
16. Do you think that there is a need for teachers' periodical inservice training?
- (1) Yes _____ (2) No _____

III Attitude: Measurement

Indicate with one of the following responses, your answer to each question:

SA = strongly agree

A = agree

D = disagree

SD = strongly disagree

17. I feel that the following subjects are adequately taught in my school:

1.	<u>English Language</u>	SA	A	D	SD
2.	<u>Mathematics</u>	SA	A	D	SD
3.	<u>Science</u>	SA	A	D	SD
4.	<u>Social Studies</u>	SA	A	D	SD

- | | | | | | |
|-----|---|----|---|---|----|
| 18. | The teaching of mathematics at the elementary level should be done by those who are good in the subject. | SA | A | D | SD |
| 19. | There is a need to establish and carry out a plan for evaluating and strengthening teachers' professional performance in maths. | SA | A | D | SD |
| 20. | The plan of inservice training for mathematics teachers should involve greater teacher participation. | SA | A | D | SD |
| 21. | The curriculum in mathematics is very adequate. | SA | A | D | SD |
| 22. | I feel that the curriculum in maths needs some modifications. | SA | A | D | SD |
| 23. | Homework in mathematics should involve the students' parents or other relations. | SA | A | D | SD |
| 24. | My personal feeling is that the curriculum in mathematics has very little to do with the practical matter of everyday life. | SA | A | D | SD |
| 25. | Many teachers make the teaching of maths interesting. | SA | A | D | SD |

Thank you for your cooperation.

APPENDIX C

The First Stimulus Question for Oral Interview



SCHOOL OF EDUCATION

The Commonwealth of Massachusetts
University of Massachusetts
Amherst 01002

Dear

There are a few articles already written about the problem and need for Inservice Education programmes for Nigerian teachers. One of them is by U.W. Uche on teacher educators' perception of Inservice Training programmes in Lagos State which points out the need for a more comprehensive programme development.

I am presently working on my Doctoral dissertation which is concerned with making an Inservice Training programme in Mathematics for Imo State elementary teachers.

Instead of assuming to have all the answers to the problems confronting teachers, I think that it is appropriate to find out the felt needs of the educators concerned with instruction before planning an appropriate Inservice programme for them.

As it is my intention to conduct an instructional needs assessment of educators, I have decided to address the exercise to the various personnel involved in school instructional activities. As one of the key people in the educational sphere, you are in a position to aid me in this vital task and to this end, I have drawn up a short question sheet. I would be very grateful if you would fill out the space provided on the attached sheet. Your experience and expertise are most valued by me.

The outcome of this study would be communicated to you if you so desire.

Sincerely yours,

Iheanyi D. Okoroafor

Stimulus Question Sheet for Principal Inspector
for Teacher Training, Imo State and Zonal Inspectors

Imagine that the Imo State Ministry of Education is facilitating an Inservice Education programme in Mathematics for Imo State elementary educators. Assume that the programme is actively in operation and is the best you can think of as meeting the needs of the teacher educators in Imo State.

Picture the situation closely, and write down on the space below those observable events which indicate to you that the needs of the teacher educators are being met.

Thank you.

Return to: Iheanyi D. Okoroafor
University of
Massachusetts
Amherst, MA 01003
USA

APPENDIX D

The Revised Questionnaire

University of Massachusetts
254 Hills South
Amherst, MA 01003

June 5, 1985

Dear Educator,

The attached survey instrument concerned with the instructional needs of Imo state elementary school teachers in mathematics, is a part of my study on designing a suitable inservice training in mathematics for Imo state elementary school teachers.

This study is concerned specifically with determining the instructional felt needs of elementary teachers in the area (Imo state) and how to design a suitable inservice programme for mathematics teachers. The result of the study is expected to provide professional growth for the participating teachers.

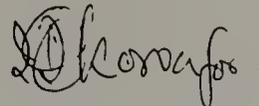
I am currently working on my Doctoral dissertation in which I hope to come up with an appropriate inservice training design for elementary teachers eventually.

As you are directly involved in the elementary education process in Imo state, I am particularly desirous of obtaining your responses to the survey instrument because your experience in teaching will contribute significantly toward solving teachers' instructional needs.

It will be appreciated if you will complete the enclosed form and return it through the field research assistant. Your responses will be treated with complete confidentiality.

I would welcome any comments that you have concerning any aspect of inservice education in mathematics not covered here.

Yours truly,



Iheanyi D. Okoroafor

Imo State Elementary School Mathematics Survey

Directions: Please read each statement or question carefully and then respond by marking the most appropriate answer.

I. Self-Identification

1. Sex: Male _____ Female _____
2. For how many years have you been a teacher?
 - 0 - 4 years _____
 - 5 - 9 years _____
 - 10 - 14 years _____
 - 15 or more years _____
3. For how many years have you been an educational administrator?
 - 0 - 4 years _____
 - 5 - 9 years _____
 - 10 - 14 years _____
 - 15 or more years _____
4. For how many years have you taught in rural schools?
 - not applicable _____
 - 4 years or fewer _____
 - 5 - 9 years _____
 - 10 - 14 years _____
 - 15 or more years _____
5. For how many years have you taught in urban schools?
 - not applicable _____
 - 4 year or fewer _____
 - 5 - 9 years _____
 - 10 - 14 years _____
 - 15 or more years _____
6. What class are you currently teaching?
 - not applicable _____
 - Elementary 1 _____
 - Elementary 2 _____
 - Elementary 3 _____
 - Elementary 4 _____
 - Elementary 5 _____
 - Elementary 6 _____
7. What is the highest qualification you have attained?

11. Mathematics Self-Assessment

8. When you were an elementary school student, which of the following subjects did you prefer more than others?

English _____
 Mathematics _____
 Science _____
 Social Studies _____

9. When you were an elementary school student, which of the following subjects did you like the least?

English _____
 Mathematics _____
 Science _____
 Social Studies _____

10. As a teacher, in which subject do you consider yourself the most effective?

English _____
 Mathematics _____
 Science _____
 Social Studies _____

11. As a teacher, in which subjects do you consider yourself the least effective?

English _____
 Mathematics _____
 Science _____
 Social Studies _____

12. In your opinion, in which subject do Imo State elementary school children tend to perform the poorest?

English _____
 Mathematics _____
 Science _____
 Social Studies _____

13. In your opinion, in which subject do Imo State elementary school children tend to perform the best?

English _____
 Mathematics _____
 Science _____
 Social Studies _____

14. In which subject do your own students tend to perform the poorest?

English _____
 Mathematics _____
 Science _____
 Social Studies _____

15. In which subject do your own students tend to perform the best?

English _____
 Mathematics _____
 Science _____
 Social Studies _____

16. Considering Nigeria's development needs, which subject do you regard as the most important one for students to master?

English _____
 Mathematics _____
 Science _____
 Social Studies _____

17. Considering Nigeria's development needs, which subject do you regard as the least important one for students to master?

English _____
 Mathematics _____
 Science _____
 Social Studies _____

18. Which subject do parents and others in the community where you teach regard as the one they are the most concerned about students' poor performance?

English _____
 Mathematics _____
 Science _____
 Social Studies _____

III. Mathematics Improvement Assessment

19. In which subject do you think you have the most effective teaching materials?

English _____
 Mathematics _____
 Science _____
 Social Studies _____

20. In which subject do you think you have the least effective teaching materials?

English _____
 Mathematics _____
 Science _____
 Social Studies _____

21. Should training for elementary school teachers include more mathematics even at the expense of training in other subjects?

Yes _____ No _____

22. If you were to begin your teaching career again, what form of training do you think would be the most helpful for you?

Longer training period _____
 Inservice training _____
 Demonstration exercises _____
 Teaching aids _____

23. For your own improved effectiveness as a teacher now, whom do you regard as in the best position to help you?

The administrator of your school _____
 Specialists in a subject area _____
 Other teachers in your school _____
 Other teachers in other schools _____
 Other teachers and specialists together _____

24. Should elementary school teachers specialize in the subjects they teach?

Yes _____ No _____

25. If your answer to No. 24 is "yes", which subject would you prefer to teach?

English _____
 Mathematics _____
 Science _____
 Social Studies _____

26. Which of the following best fits your opinion of inservice training programs?

They have been useful when well organized _____
 Generally, they are a waste of time _____
 They have not been available to me _____
 They are always helpful _____

IV. Teacher Opinions

For each of the following statements or questions, indicate by circling the response that best reflects your own opinion.

SA = strongly agree
 A = agree
 NA = no opinion
 D = disagree
 SD = strongly disagree

27. I feel that the following subjects are adequately taught in my school:
- | | | | | | |
|---------------------|----|---|----|---|----|
| a. English language | SA | A | NA | D | SD |
| b. Mathematics | SA | A | NA | D | SD |
| c. Science | SA | A | NA | D | SD |
| d. Social Studies | SA | A | NA | D | SD |
28. The teaching of mathematics at the elementary level should be done only by those who are good in the subject.
- | | | | | | |
|--|----|---|----|---|----|
| | SA | A | NA | D | SD |
|--|----|---|----|---|----|
29. There is a need to establish and carry out a plan for evaluating and strengthening teachers' personal professional performance in mathematics.
- | | | | | | |
|--|----|---|----|---|----|
| | SA | A | NA | D | SD |
|--|----|---|----|---|----|
30. The plan of inservice training for mathematics teachers should involve greater teacher participation.
- | | | | | | |
|--|----|---|----|---|----|
| | SA | A | NA | D | SD |
|--|----|---|----|---|----|
31. The curriculum in mathematics is adequate.
- | | | | | | |
|--|----|---|----|---|----|
| | SA | A | NA | D | SD |
|--|----|---|----|---|----|
32. I feel that the curriculum in mathematics needs some modifications.
- | | | | | | |
|--|----|---|----|---|----|
| | SA | A | NA | D | SD |
|--|----|---|----|---|----|
33. Homework in mathematics should involve the students' parents or other relations.
- | | | | | | |
|--|----|---|----|---|----|
| | SA | A | NA | D | SD |
|--|----|---|----|---|----|
34. My personal feeling is that the study of mathematics has very little practical matter of everyday life.
- | | | | | | |
|--|----|---|----|---|----|
| | SA | A | NA | D | SD |
|--|----|---|----|---|----|

35. Many teachers make the teaching of mathematics interesting. SA A NA D SD

V. Mathematics Attitude Measurement

For each statement indicate by encircling the response which best fits your attitude.

SA = strongly agree
 A = agree
 NA = no opinion
 D = disagree
 SD = strongly disagree

36. My mind goes blank and I am unable to think clearly when working math. SA A NA D SD
37. I feel a sense of insecurity when attempting mathematics. SA A NA D SD
38. Mathematics is fascinating and fun. SA A NA D SD
39. I really like mathematics. SA A NA D SD
40. Mathematics is a course in school which I have always enjoyed teaching. SA A NA D SD
41. It makes me nervous to even think about having to do a math problem. SA A NA D SD
42. I have never liked mathematics, and it is my most dreaded subject. SA A NA D SD
43. I am happier in a math class than in any other class. SA A NA D SD
44. I feel at ease in mathematics, and I like it very much. SA A NA D SD
45. I do not like mathematics, and it scares me to take it. SA A NA D SD

Thank you for your cooperation.

Your answers will be treated with strict confidentiality.

Please return your completed questionnaire to:

IHEANYI D. OKOROAFOR

