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THE IMPACT OF EXAMINATION POLICY ON TEACHING  
CHEMISTRY IN NIGERIAN SECONDARY SCHOOLS:  
A CASE STUDY

By

David Afolayan Alao

A DISSERTATION

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ABSTRACT

THE IMPACT OF EXAMINATION POLICY ON TEACHING  
CHEMISTRY IN NIGERIAN SECONDARY SCHOOLS:  
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This dissertation was designed to study an aspect of educational policy in Nigeria. The West African Examinations Council's (WAEC) policy and its impact on teaching was the main focus of the study. A tripartite design was used for data collection.

First, five selected public figures in Nigeria and at the University of London, England were interviewed concerning the formulation and implementation of examination policy. Second, five documents were selected for content analysis (Krippendorff, 1980). Third, field techniques were used to study the setting and the field research included in-depth interviews and administration of questionnaires to education officials, chemistry teachers and school administrators within Ibadan municipality. The field research also included an ethnographic study of the school and classroom level environments at one secondary school, Ibadan. The data base consists of field notes, interview data, and responses by teachers and students to questionnaires.

Qualitative research techniques were used because they yielded descriptive data of the setting and the research

findings. Simple statistical techniques were used for analysis.

Data showed that policy and practice exist as rather separate entities, with examinations forming an important link between them. Teachers were more responsive to WAEC's examinations than to syllabi and textbooks. Therefore, examinations appear to be an effective means of communicating educational policy.

Teaching practices in secondary school chemistry appear to be hampered by crowded classrooms and laboratories, lack of equipment and supplies, an insufficient number of qualified teachers, and inadequate supervision. Ministry officials should give attention to these issues and to improved instruction in English and mathematics as a way of improving achievement in chemistry.

The study showed that both WAEC's organization and operation have grown larger and complex. For these reasons, there is need to introduce computer hardware and software into WAEC's operation to facilitate its research activities and improve the quality of its service to the Nigerian populace.

WAEC is an effective agent in fostering stability and quality in the educational system of Nigeria. More effective coupling of supervision and budget allocation could further improve its effectiveness.



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## DEDICATION

To my friends and loved ones, who through their loyalty, selfless sacrifice and a fervent devotion of their love made the completion of this work possible.

David Alao

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This lengthy recognition is continued in Appendix F.

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## CHAPTER ONE

### THE RESEARCH PROBLEM

#### INTRODUCTION

Nigeria is a middle income<sup>1</sup> country located on the Atlantic coast of West Africa. It has a land area of 924,000 square kilometers and a population of 90.6 million people (mid-1980) (Appendix A). It was a former colony of Great Britain, which became an independent nation in October 1960. Like other independent African nations, it adopted developmentalism<sup>2</sup> as a national and educational philosophy, with an intent to effect changes in all aspects of her national life. The transformation of rural agrarian economy into the present mixed, agricultural and industrial economy was a formidable task at the onset of self governance.

However, with the discovery and exportation of crude oil<sup>3</sup> which boosted her foreign exchange earnings, Nigeria suddenly emerged as an affluent nation among the third world countries. The Per Capita Income (PCI) for Nigeria's GNP is \$860 (1984) compared with some other African countries such as Tanzania - \$280, Ghana - \$360, and Zaire - \$190. Nigeria is therefore considered a rich nation in Africa. On the other hand, when compared with developed nations like

the Netherlands with a per capita income of \$11,500, Nigeria is still poor. However, recent data show Nigeria with a 3.3 percent annual growth rate in its gross national product which suggests a great potential to develop a stable economy.

Testing and educational measurement are common features of educational systems around the globe. Varieties of tests and test batteries are utilized by teachers, and other professional practitioners for varied purposes. Teacher-made tests<sup>4,5</sup> are the most common, and there are myriads of standardized tests in use by professionals in the United States of America and Great Britain.<sup>6</sup> Test score usages range from ability grouping of a class of students to prediction of scholastic aptitude and college admission.<sup>7</sup>

In Nigeria, however, tests scores are used for three main purposes. First, to qualify for promotion from one grade level to another in a school. Second, to satisfy the requirements laid down by the West African Examination Council in order to obtain the paper qualification, a "passport" for securing a position in a public service department.<sup>8,9</sup> Third, many secondary school students in the country aspire to reach the apex of the national educational pyramid. Invariably, the gateway to this status is to matriculate at a Nigerian university or college. A satisfactory performance in the West African School Certificate examinations<sup>10</sup> strongly determines admission to any post-secondary institution in the country.

Examinations affect the character of education in many ways. First, the standard of education is measured by performance of students in the West African School Certificate Examinations. The "gradual deterioration" in the standard of education has been highlighted by some authors.<sup>11</sup>

Second, the road to a post-secondary career today is strewn with challenges, and many high school graduates are struggling to secure the limited admission offers to higher education.<sup>12</sup> The performance of students in the West African School Certificate examinations plays a significant role in determining the careers of students in general, and their admittance into post-secondary institutions in particular.

#### Policy and Philosophical Control of Education

In Nigeria, the power to control formal education is vested in the federal government. The administration and organization of schooling are controlled by the federal, state and local governments or their agencies, such as the federal and state Ministries of Education, the National Board for Technical Education, the Industrial Training Fund<sup>13</sup> and the Nigerian Universities Commission.

The Nigerian national policy on education spells out both the philosophy and objectives of education at different levels namely, pre-school, primary, secondary and higher education. Nigerian education is guided by an egalitarian philosophy based on the integration of the individual into

a sound and effective citizen and provides equal opportunities for all citizens both within and outside the formal school system.<sup>14</sup>

### Purpose of Education

The national purpose for education in Nigeria as in most other African countries is to equip people to participate in and contribute to the modernization process in the country. This comes under the umbrella of social change. Experts<sup>15,16</sup> argue that the process of change in most African countries cannot be fully described. In general a national society embraces three broad dimensions in its process of social change - its material culture and technology (human resources, natural resources, technologies and infra-structure), its social institutions (firm, school, family or lineage group, executive, judicial system and legislature) and its underlying complex of norms and values (rights and duties of individuals, expectation of leadership, relationship to God, respect for knowledge, etc.). These three dimensions of a society and the many aspects of each dimension are integral and interdependent part of the whole way of life of the society.

To effect social, political and economic changes, Nigeria's educational purpose is oriented towards these national goals. The orientation of education in a dynamic society such as Nigeria has always been toward the future.<sup>17</sup>

The main purpose of education is development (social, political, economic, and humane) and rural development has been placed at a high level on the political agenda of most governments (civil and military) in Nigeria.

### Primary Education

Primary education is for children of the ages 6-12. English is the official language of instruction in Nigerian schools. However, at the primary level, the native tongue is emphasized as a means of instruction. This is in compliance with the national philosophy of education. Until 1982 when the American system of education was formally adopted, the general curriculum for primary schools consisted of English language, arithmetic, geography, hygiene, nature study, gardening, singing, history, handi crafts, civics and domestic science.<sup>18</sup>

In keeping with the educational philosophy of developmentalism, the Nigeria Educational Research Council (N.E.R.C.) in 1980 states:

the primary school must initiate the endeavor to promote relevance and comprehensiveness in its curriculum offerings by promoting language development and communication skills, numerical ability, and integrated approach to science and technology, exposure to cultural, religious and political education, health habits to ensure spiritual and physical survival. The responsibility of primary education is to ensure the attainment of these objectives and thereby lay the foundation for national development.<sup>19</sup>



## Secondary Education

The schools are either government schools or voluntary agency schools.<sup>20</sup> Many of the latter have been taken over by the State governments during the first military rule (1966-1979). A few private schools still exist.

Students who enter secondary schools are highly selected. They must possess the First School Leaving Certificate and must pass the secondary school entrance examination and interview (screening).

The Nigerian secondary education is completed in five calendar years. The West African Examinations Council (W.A.E.C.) administers the final external examinations based on syllabi it has published and circulated nationwide.

Certain schools offer, in addition to the five year West African School Certificate, an additional two years of training for the Higher School Certificate (HSC).<sup>21</sup> This program is divided into two sections, Arts and Science. The curriculum includes: General Paper compulsory for both sections; and three subjects, in addition to General Paper, are taken from the following list:

<u>Arts</u>	<u>Science</u>
English Literature	Mathematics (Pure & Applied)
History	Mathematics (Pure)
Geography	Mathematics (Applied)
Mathematics	Physics
Bible Knowledge	Chemistry
	Zoology
	Botany
	Biology

## STATEMENT OF THE PROBLEM

The History of Examination Policy in Nigeria

The secondary school-leaving examination in Nigeria dates back to the colonial era. The British education officials in Nigeria introduced the Cambridge School Certificate examination in 1928. The Oxford School Certificate examinations were held for the first time in July 1929. The Cambridge Higher School Certificate examinations were introduced in Nigeria in 1947.<sup>22</sup> The above history depicts the decisive role of the English universities in the determination of syllabi and school curricula and the conduct of examinations in Nigeria. Omolewa goes further to say that:

The British Universities also played a decisive role in the introduction of the West African Examination Council and the West African School Certificate examination held for the first time in December 1955 at the Nigerian Centers. . . . the period up to 1955 may be described as a unique phase in the educational development when attempts were made to evolve a secondary education in Nigeria which would guarantee a high standard of scholarship. The exercise began with the import of Cambridge examinations and ended with the establishment of the West African Examinations Council (WAEC) which continued to remain under the guidance of Cambridge and London Universities . . . The West African Examinations Council enjoys the support of the Governments of Anglo-phone West African countries who do not wish to see the dismantlement of one of the remaining bonds of unity among West African countries. But their arguments are not based on academic grounds.<sup>23</sup>

Thus, the Examination Council has been the official organ that controls the standards of secondary education in these countries.

The West African Examinations Council consists of a chairman, and four members (nominated by the Government) from each of the following countries: Nigeria, Ghana, Sierra-Leone, The Gambia and Liberia. Two members represent the Universities of Cambridge and London. The registrar is the Chief Executive of the Council. There are five national committees (Nigeria, Ghana, Sierra-Leone, The Gambia and Liberia). There are nineteen states in Nigeria. The Nigerian Committee is constituted by representatives of the State and National Ministries of Education, the universities, the university colleges, the schools and training colleges.

The National Committees exercise in their respective countries such powers as the main council may delegate to them, and advise the Council on examination policy in general, with particular reference to the needs of the public and of the schools . .  
 . each National Committee elects a number of members to the Council.<sup>24</sup>

Detailed consideration of policy in regard to the Examinations is the responsibility of the Council's Examinations Committee. Its members are drawn from West African universities, university colleges, ministries of education and secondary schools. The Committee makes recommendations to the Council on matters of examination policy and receives reports from the various subject panels and the Chief Examiners.

### Purpose of the Study

This dissertation is designed to assess how examinations and examination policies affect the teaching and learning of science in schools. This research investigated the impacts of examination policy, school level environment and classroom level environment<sup>25</sup> in selected schools in Oyo State, Nigeria.<sup>26</sup>

The main research question to be answered is the following: How does examination policy influence teaching of chemistry in Nigerian schools?

Subsidiary questions which need to be answered include:

1. What are the factors controlling the formulation and implementation of examination policy in Nigeria?
2. What degree of influence does examination policy have on teaching chemistry in secondary schools?
3. What is the procedure for reviewing the WAEC 'O' level syllabus in chemistry?
4. What degree of correspondence exists between the elements which give substance to the curriculum including
  - 4a. National curriculum objectives in chemistry.
  - 4b. the contents of textbooks and other instructional materials which are available for use by chemistry teachers.
  - 4c. IUPAC chemistry textbook.
  - 4d. the WASC 'O' level chemistry examination papers 1 & 2 and
  - 4e. observed contents of instruction in selected classes?
5. How is the WAEC examination policy implemented at the school and classroom levels?

- 5a. How is the available class time utilized in the chemistry classes at Alanamu Secondary School, Ibadan?
- 5b. What instructional strategies are employed by chemistry teachers in the school?
- 5c. What is the quality of the teaching and learning environment in the school?

The current concern of the Nigerian public and stakeholders about public education is the apparent decline in student achievement in the West African School Certificate (WASC) examinations.

It has been indicated in the literature<sup>27</sup> that the implementation of science curricular packages is inadequate for teaching.

Communication problems may be among the major causes of the poor achievement in chemistry in Nigerian schools. The failure of teachers to teach according to the curricular guidelines may be due to their response<sup>28</sup> to the contents of the W.A.E.C. guide syllabuses and other curricular guides and components. Perhaps some communication problems also exist at other levels of implementing examinations policy.

### Procedure

This study began with a descriptive analysis of the process of formulating and implementing examination policy for secondary schools in Nigeria. Data were collected during interviews with five knowledgeable public figures, viz.,

educators, civil servants, and a former chief executive of WAEC now resident at the University of London, England.

Second, a series of content analyses of pertinent documents was conducted. This included the WAEC Guide Syllabus in Chemistry for School Certificate/General Certificate of Education (SC/GCE) 1985/86; the relevant sections of instructional materials (textbooks and workbooks) used in teaching 'O' level chemistry, the West African School Certificate (WASC) Examination papers 1 and 2 in chemistry for June 1985; and a teacher's notes for selected lessons. Data collected from content analysis provided a comparative framework for looking at contents of instruction in the classrooms.

Third, some descriptive statistics of the school selected for classroom observation were provided.

Fourth, a chemistry class at each level of the Senior Secondary School (SS-1 to SS-3) was observed in the selected school for a period of three weeks. Data collected in the school was used to develop a case study of the impact of examination policy on the teaching of chemistry.

A questionnaire (Instrument No. 2, Appendix B) was given to chemistry teachers located in several schools within Ibadan municipality. The instrument was designed to obtain the opinions of the teachers about the impact of WAEC's policy on their teaching.

### Significance of the Study

Even though most nations use centrally controlled external examinations as a key device for establishing and maintaining educational standards, relatively little is known about the ways in which external examinations actually influence teaching and learning. This study was designed to examine the effects of one external examination on chemistry instruction in one Nigerian city. However small, this study substantially enlarges our understanding of the manner in which policy makers and external examinations influence instruction and students' learning in chemistry. As a result of this study, educational policy makers and test developers will gain new insights about how their work influences teachers. Moreover, educational researchers will be presented with new insights and new questions for research on the relationship to educational policies and practices.

### Delimitation of the Study

This is a descriptive study of the influences of external examination on chemistry teaching. Because of the nature of the research questions, the study was limited to the development of a case study of the impact of examination policy on the teaching and learning of chemistry at Alanamu Secondary School, Ibadan, and to questionnaires from Chemistry teachers in nearby schools.

It was not the goal of this study to try and generalize the findings of the case study to every geographical location in Nigeria. However since Nigeria operates a centralized system of education, some of the findings might represent events in other schools operating under similar conditions as found in the case study.

### Limitations of the Study

The study was limited by the following:

1. In the interview method of data collection, the interviewees may relay intentions which are not necessarily reflective of actual practice.
2. The limited time spent by the researcher in observing chemistry classes has put a limitation on the quantity of observational data collected at Alanamu Secondary School.
3. The study made use of the survey technique to obtain information from chemistry teachers concerning the impact of WAEC examination policy in schools.

### Definition of Terms

\*Policy Making: The social process in which multiple actors, aided with technical information, interact to formulate policy.

\*Policy Actor: Is an individual who is selected to share the formal powers of authorization to formulate policy. He or she is also an authorizing agent of policy.

\*Implementing Agent: Is an individual who holds a position on the organizational chart under that of the authorizing agent who is acting for or on behalf of the authorizing agent.<sup>29</sup>

\*Educational Goal: The desired ends to be achieved. The goal of education could be the development of cognitive competence, simply personhood, economic influence.



\*Educational Policy: Educational policy is different from other public policies. An educational policy is one of several policies formulated which are necessary for the systematic conduct of education. A large part of educational policy relates first, to curriculum. Second, there is policy concerned with the establishment, structure and governance of individual institutions. Third, is the policy that relates to the recruitment, employment, promotion, supervision and remuneration of all staff. The fourth category is policy related to the provision and allocation of financial resources, and the provision and maintenance of buildings and equipment.<sup>30</sup>

\*Science: A body of knowledge concerned with experimental and empirical study of natural phenomena and the physical universe. School subjects such as physics, chemistry and biology are three main branches of science in schools.

\*Science Curriculum: A curriculum designed for the purpose of transferring scientific information or knowledge such that those who experience the curriculum would acquire some measure of cognitive competence in a specific area of science as a result of teaching and learning in schools.

### Overview

This dissertation was designed to study an aspect of educational policy in Nigeria. Examination policy and its impact on the teaching and learning of chemistry was the major focus of the dissertation.

The sources of evidence include interview data, classroom observation and content analysis of pertinent documents.

The first chapter provides an introduction to the research problem including a background analysis of the Nigerian educational system. The policy and philosophy of education in the country, the purpose and significance of the study are also discussed. Procedures, delimitations, limitations and some important terms are defined.

Chapter two is devoted to identification and review of pertinent literature. Literature review was guided by two paramount issues, namely, formulation and implementation of policy and the factors influencing the way teachers teach. Another topic is teachers' attitudes to examining, exemplified by the work of Scarth (1984) at "Brookview" a comprehensive high school in England. The research is related to environment research in education, therefore some previous works in the area of school and classroom environment research were also reviewed. Chapter two concludes with a conceptual structure which is used throughout the remainder of the dissertation.

In chapter three, the methodology of the study has been described in detail. The instruments used for data collection are described and the procedures for their administration are also presented. The second half of the chapter presents the setting for the field research. This begins with the historical development of secondary science education in Nigeria. The status of secondary education in the city of Ibadan is also included. The chapter ends with a description of Alanamu Secondary School, Ibadan, which was selected for the case study.

Chapter four is divided into two sections. Each section presents the results, data, analysis and interpretation. The first section deals with a number of issues viz., formulation and implementation of examination policies at the national and international levels. The procedures for reviewing WAEC

Guide Syllabi and the problems associated with WAEC's operation in Nigeria.

The second section deals with the relationship between policy and practice both at the school and classroom levels. The perceptions of students on the use of available class time are also presented.

Furthermore, the main research question was answered. This provided the framework for a synthesis of the data collected from the various sources. The section concludes with a discussion of research findings and a critique of the dissertation.

Chapter five is a summary of the findings and conclusions drawn from this study. Recommendations are based on the findings, and implications for further research are based on the above information.

## CHAPTER ONE NOTES

<sup>1</sup>The World Bank, World Development Report, Oxford University, 1984, pp. 218.

<sup>2</sup>N.E.R.C. Perspectives of Quantities and Qualities in Nigerian Education. A Synthetic Report of the Bagauda Seminar, September 1-5, 1980.

<sup>3</sup>The proven reserve of crude oil was estimated as 16,700 billion barrels, 1981 - World Development Report.

<sup>4</sup>McGuire, C. H., Testing in Professional Education. Review of Educational Research: Educational and Psychological Testing, 1968, 38, 49-60.

<sup>5</sup>Karmel, L. J., Measurement and Evaluation in the Schools. Collier-Macmillan Limited, London, 1970, 49200.

<sup>6</sup>Borg, R. W. and Gall, M. D., Educational Research - An Introduction, Longman, New York, London, 1983.

<sup>7</sup>Boyce, R. W. and Paxson, R. C., The predictive validity of eleven tests at one state college. Educational and Psychological Measurement, 1965, 25 (4), 1143-1147.

<sup>8</sup>Hanson, J. W., Enhancing the Contribution of Formal Education in Africa: Primary Schools, Secondary Schools and Teacher Training Institutions. Overseas Liaison Committee on Education, Washington, D.C., April 1971, 31pp.

<sup>9</sup>Medahunsi, S. O., Relationships between Educational Objectives and the Opinions of Professional Educators as Compared with Actual Secondary School Practices in Ogun State, Nigeria. Unpublished Dissertation, Michigan State University, East Lansing, 1978, 189pp.

<sup>10</sup>Nwachukwu, U. I., Looking Beyond WAEC. West Africa Magazine, March 3, 1986, pp. 432-433.

<sup>11</sup>Adeogun, D., Education under Scrutiny. West Africa Magazine. December 16, 1985, p. 2631.

<sup>12</sup>Ibid.

<sup>13</sup>Work, C. E. et al., Nigeria and the Emergence of Engineering Education in Africa. Engineering Education, Vol. 72, No. 4, January 1982, pp. 290-294.

<sup>14</sup>Federal Republic of Nigeria, National Policy on Education. Published by the Federal Ministry of Information, Printing Division, Lagos, 1977.

<sup>15</sup>Thompson, A. R., Education and Development in Africa, Macmillan International College Edition, The Macmillan Press, Ltd., 1981, 358pp.

<sup>16</sup>Hanson, J. W., In Ikejiani, O., Nigerian Education, Bristol England, Longmans of Nigeria, 1965, pp. 1-83.

<sup>17</sup>Ibid.

<sup>18</sup>Weaver, E. K., Science Education in Nigeria, Science Education: 1964, 48 (4), 351-61.

<sup>19</sup>N.E.R.C., Perspectives of Quantities and Qualities in Nigerian Education. A Synthetic Report of Bagauda Seminar, September 1-5, 1980.

<sup>20</sup>Weaver, E. K., 1964, op. cit.

<sup>21</sup>Sasnett, M. and Sepmeyer, I., Educational Systems of Africa. University of California Press, pp. 516-547 (1966).

<sup>22</sup>Omolewa, M., The Question of University Leadership in the Development of Secondary Education in Nigeria. International Review of Education, Vol. XXIV, No. 1, 1978, pp. 35-52.

<sup>23</sup>Ibid.

<sup>24</sup>Ibid.

<sup>25</sup>Fraser, B. J. and Rentoul, A. J., Relationships Between School-Level and Classroom-Level Environment. The Alberta Journal of Educational Research, Vol. XXVIII, No. 3, September, 1982, pp. 212-225.

<sup>26</sup>Alanamu (pseudonym) is a private secondary school located in one of the secluded, modern zones, that surround the inner city core which remains essentially traditional and semi-rural in its cultural setting.

<sup>27</sup>Bajah, S. T., Scope and dimension of science curriculum improvement in developing countries with particular reference to Nigeria. Journal of the Science Teachers' Association of Nigeria 13 (1975), No. 3.

<sup>28</sup>Hovland, C. I., Janis, I. L., and Kelley, H. H., Communication and Persuasion. Psychological Studies of Opinion Change. Department of Psychology, Yale University. New Haven: Yale University Press, 1959.

<sup>29</sup>Kerr, D. H. Educational Policy: Analysis Structure and justifications, David McKay Company, Inc., New York, 1976, 214pp.

<sup>30</sup>Ibid.

## CHAPTER TWO

### REVIEW OF LITERATURE

#### INTRODUCTION

This chapter of the dissertation is devoted to identification and review<sup>1</sup> of pertinent literature. Eight issues determined the structure of the literature review. First is, the general overview of previous research investigations on examinations. Second are some properties of tests, viz., validities, and reliability, and whether they are norm or domain-referenced. Third is, the state of test development in Africa with particular emphasis on West Africa. Fourth is, formulation of examination policy, with an emphasis on the factors which influence policy. Fifth is identification of the various levels of policy implementation in a given system of education. Sixth is, the relationship between policy and practice in centralized and decentralized systems of education. Seventh is teachers' attitude to examining. Eighth is school and classroom level environment research.

The last section of this chapter is devoted to presenting the conceptual framework for the dissertation. First, the analytic framework is presented, which is followed by

a review of the literature about ethnography and the use of observation as a method of inquiry.

### Previous Research on Examinations

Examinations have been the focus of several research investigations. Most of which have been critical, stressing one or more of the following points:

1. that examinations as presently constituted are an unreliable measure of learning achievement.<sup>2</sup>
2. that examinations have a<sub>3</sub> negative effect on the curriculum and teaching.
3. that examination success/failure is strongly correlated with social class and occupational attainment.<sup>4</sup>
4. that examinations play a key role in selective assessment for cultural reproduction.<sup>5,6,7</sup>

On the positive side, a lot of work has been done on examinations. In particular much has been done on the subject of human intelligence, intelligence quotient (IQ) and its measurement.

The concept of intelligence is quite important in education, and perhaps because it is often misunderstood it has been studied a lot, from the time of Plato over 2000 years ago.

Robinson and Robinson<sup>8</sup> provide us with three common themes that form parts of the theories about intelligence. These are first, the capacity to learn. Second, the ability to adapt successfully to new situations and to the environment in general. Third, the total amount of knowledge a



person has acquired. Sattler<sup>9</sup> has reported continuing controversy among psychologists about the nature of intelligence. Some psychologists describe intelligence as a label put on the outcome of intelligence tests. Others disagree on the use of IQ as a true measure of intelligence. They argue that intelligence is the ability to cope with the world. David Wechsler<sup>10</sup> defines intelligence as, "the aggregate or global capacity of the individual to act purposefully, to think rationally and to deal with his environment. Spearman<sup>11</sup> identified one factor which he said was common to all tests of mental abilities. This he dubbed general intelligence (g). He assumed that individuals vary both in general intelligence and specific abilities.

Thurstone<sup>12</sup>, one of Spearman's critics argued for several mental abilities when he listed verbal comprehension, reasoning, spatial relations, numerical abilities, word fluency and perceptual speed as the major mental abilities underlying intellectual tasks.

Guilford<sup>13</sup> through his research activities came up with three faces of intellect, namely, operations, products and contents. Sternberg<sup>14</sup> suggests there are five types of components of intelligence each serving different functions. The functions are:

1. acquisition of new information
2. retention (memory)
3. transfer of information to new problems
4. performance or execution of a strategy

5. meta-cognition or the executive function (making decisions about what strategy to use and monitoring progress).

Despite the existing controversy about its definition, most psychologists agree that intelligence is related to the type of learning that goes on in schools.

Coleman et al<sup>15,16</sup> in their extensive study of the effects of integrated and segregated education took intelligence scores to be the best measure of the effectiveness of previous instruction.

I.Q. scores have been used as predictors for several criterion variables such as creativity viz., the Guilford tests<sup>17</sup> of divergent thinking and the Barron-Welsh Art Scale.<sup>18</sup> I.Q. scores have also been useful in predicting success of students in academic courses. Murphy also reported that British teachers have used students' achievement scores in the GCE 'O' level to predict their performance in the GCE 'A' level.<sup>19</sup>

Bloom and associates<sup>20</sup> do not consider the I.Q. scores as adding any predictive value to specific cognitive entry behaviors. Nonetheless, IQ scores have been used extensively in the field of education with the basic assumption that they possess such powers.

Trotter has quoted Cronbach, a leader in the field of tests and measurements, to have said that "Intelligence research is dead, the psychometric approach - IQ testing

- has run its course and people are waiting for something new."<sup>21</sup>

### Properties of Achievement Tests

Given the above criticisms and the uses of examinations, what then are the desirable properties that a test must have? It is stated in the literature that two essential properties of a test are its reliability and validity.<sup>22,23</sup> For achievement tests, the most important validities are content validity and validity with respect to objectives of educational importance. In addition, examinations should be based on a system of test construction which would measure the true performance of students over the total domain of skills that have been taught the students at those particular levels of education. This is related to what is generally regarded as face validity which is the most common test of validity used by examination boards in the preparation of their papers. Panels of experienced teachers in different subjects form committees which scrutinize the proposed questions and reject any that do not appear to be valid tests of the subject.<sup>24</sup> Content validity is similar to face validity and is defined by some authors as ". . . what is being examined, but is more precise (than face validity) in that it compares this with a previously defined specification, rather than with some vague notion in the mind of an expert."<sup>25,26</sup>

The issue of content validity is discussed further in the following section.

### Test Development in Africa

The next issue which guided the review is the state of test development in Africa, with a special focus on Anglophone or English speaking West Africa. Quansah stated that no explicit technical system is used by test developers in Africa to achieve a good relation between what is taught in the school systems and what is examined.<sup>27</sup> In other words, the tests constructed and administered by testing or examining bodies (in Africa) tend to lack content validity which is the most important characteristic of tests designed to measure competency and mastery of the subject matter. Four problems are believed to be associated with test development in Africa. The first problem concerns the type of people who write the test items. Many of these are drawn from universities and colleges and have little or nothing to do with the implementation of the secondary examination policy. Quansah wants to see secondary school teachers involved in writing the items because they are directly involved with WAEC's policies at the school and the classroom levels.

Second, there is the need to ascertain the adequacy with which the questions assess the objectives or behaviors covered in the syllabus. To guarantee the year to year

comparability of question papers, there is need for examining bodies like WAEC to make use of subject matter experts.

Third, the present system of achievement testing is the norm referenced type in which the fates of students are determined from a normal curve, developed from the raw scores of students' performance in the 'O' level WAEC examinations as an example.

Fourth, urban candidates generally performed better in examinations than rural students, a differential that is linked to learning conditions rather than innate intellectual qualities. Quansah argues for a need to make tests to reflect the syllabus whose items should be classifiable on a level of difficulty scale.

The fourth point is underscored by Quansah in his argument for transforming school leaving certificate examinations in Africa from being norm-referenced to domain referenced tests when he writes:

The major interest of an educational system is obtaining test data that accurately describes the standard that the student has attained with respect to the syllabus at each terminal point of the educational system. This description is done by using the achievement tests. To be of value, achievement tests should be capable of yielding results that are accurate, meaningful and can be interpreted in terms of the degree of success or failure on the specified objectives of the syllabus. This accuracy and meaningfulness is achieved when domain-referenced tests rather than norm-referenced tests are used.<sup>28</sup>

Domain-referenced tests would provide both relative and absolute information about student performance. These

kind of tests are also suited for making both descriptive and selective decisions. For a country like Nigeria which has formally adopted continuous assessment as part of terminal examination, a new system of examination which measures competency or attainment is recommended. Quansah concluded his long essay by calling for a reform in educational testing both in Nigeria and the entire West African Examinations Council.

### Formulation of Examination Policy

Because examination policies are a part of educational policy, in this section, a brief review of the process of formulating educational policies is presented before dealing with examination policy.

### Educational Policy

A policy exists when some agent or agency (A) is obligated to act in accord with some conditional imperative, that is do something in particular (X) when specified condition (C) occurs in order to achieve some purpose (P).<sup>29</sup>

A policy can logically be revised without being violated or broken. Usually the condition under which a policy would be revised is often specified by the agents or agency. This simple analysis enables us to distinguish policy from notions such as plan, program, program goals, principle, way of doing something and promise.

Educational policies are formulated to enhance the quality of our lives. In general, a policy would have more than one type of agents viz., the authorizing agents, and the implementing agents.<sup>30</sup>

Educational policies are in general different from other public policies, they are categories of policies that are logically necessary to the systematic conduct of education, viz., curricular, methodological, resource and distributional policies. Any of these policies may or may not be made within the schools, colleges and universities.

Resource policies and distributional policies tend toward being more political in nature than educational since they are often decided by politicians who may have very little to do with education beyond the legislative domain. These policies rather than being merely intrainstitutional are also interinstitutional rules that define the relative resource priority of the institution or combination of institutions which undertake the conduct of education.<sup>31</sup>

Commentary such as this pose a problem for policy makers in making decisions about testing because much of the data needed to make sound decisions are not readily available.

This dissertation provides some of the relevant data but even more research is needed if wise decisions are to be made.

### Examination Policy

The fourth issue that guided the review is formulation of examination policy. Before examination policies are formulated, the policy makers must be sure about their intention. They have to be sure not only about their goals but also the mechanics of constructing and reporting the tests and test results.

Students' achievement scores in standardized examinations constitute an important component among the factors influencing examination policy in both centralized and decentralized systems of education. This factor is reviewed here in the light of two contexts, namely, the Nigerian educational system, and that of the United States of America.

### Decline in Students' Achievement Scores in Standardized Examinations

The focus of this study was not the decline in students' achievement on the WAEC 'O' level Chemistry examinations. It is somehow related since achievement is often used to measure standards. There is a way the public often blamed low test scores on the teachers' performance and the schools. The more recent focus has been on the new school system christened 6-3-3-4. The appropriate question one should ask at this juncture is: "what factors account for the decline in students' achievement in science?" Various spokesmen for the Nigerian public have expressed concern about



the reported steady decline in average scores of students' achievements in science subjects on the WAEC 'O' level examinations.<sup>32</sup> Should we allow the statistics to cause any alarm? Should we be concerned or should we simply ignore the data? Are there objective ways of viewing and interpreting the data in order to increase our understanding of the reality and the truth? Can we compare the state of affairs in Nigeria with other countries of the world which may have experienced similar occurrences? By reviewing the history of achievement test scores drop in the United States of America during the sixties and the seventies, it may be possible to discuss whether or not decline in test scores is desirable for the current evolutionary stage of the Nigerian educational system, and the Nigerian society as a whole.

#### Achievement Test Score Decline in the USA

There are at least two historical accounts of the rise and fall of achievement test scores in the USA. One of these is the report of the College Entrance Examination Board (CEEB) blue-ribbon panel on SAT score declines published in August 1977. A general overview of this report is presented in a Phi Delta Kappan issue the same year.<sup>33</sup> A second detailed account is published by Harnischfeger and Wiley, 1976.<sup>34</sup> This journal article provides a comprehensive list of different achievement tests and shows how test scores have declined on each test in the sixties and the seventies. The

standardized tests covered include: Scholastic Aptitude Test (SAT); American College Testing Program (ACT); Preliminary Scholastic Aptitude Test (PSAT); Minnesota Scholastic Aptitude Test (MSAT); Iowa Tests of Educational Development (ITED); Iowa Tests of Basic Skills (ITBS); Comprehensive Tests of Basic Skills (CTBS); National Assessment of Educational Progress (NAEP); and the Stanford Binet intelligence test.

The two reports cited indicate that several factors were responsible for the decline as reflected in the achievement test score statistics. The CEEB report capitalized on three factors which it calls "pervasive forces" namely, relaxed standards of schooling, mutation in family living and the impact of televisions (TV) as reasons for drops in the SAT scores. The CEEB's report also alludes to changes in the composition of the test-taking population in the sixties and the seventies.<sup>35</sup>

Harnischfager and Wiley are somewhat skeptical about the public sensationalization of test scores. They attempted several ways to show that test score statistics are explainable to a point where they can no longer mislead or deceive us. Their intensive and extended analysis (test composition, scaling and examinee sampling and evaluation) of test scores brought to light two contextual variables with explanatory powers for causes of achievement decline. To explain their view they write:

. . . the classification of a social or educational factor as one potentially responsible for the decline or as one which is merely another result of those forces producing the score changes. But our lack of knowledge is sometimes not so severe. In some cases, we know that a causal relationship exists between a potentially explanatory factor and test scores, but we do not know if that factor is a cause of the recent decline.<sup>36</sup>

The authors were also aware of other factors. However, they seem to disagree with the CEEB's view on the impact of TV on learning and achievement when they also wrote:

There will, of course, be more proximal and delimitable potential causes or factors such as curricula, course taking and amount of schooling, and also proximal, but less cohesive factors, such as television viewing. Then there are more distal factors, relevant for test score declines, such as social background of teachers and pupils, family size and drug or alcohol consumption.<sup>37</sup>

### Levels of Policy Implementation

Some authors<sup>38,39</sup> have identified the different levels at which the curriculum policy of any educational system is implemented. These are described in detail by Goodlad and others.<sup>40</sup> Four levels of implementation are identified. They include the ideal level, the formal level, the operational level and the experiential level. The first three levels were adopted to design the content analyses undertaken by this investigation. A brief description of each level is presented later in chapter three. The fact that these levels exist provided the investigator the ample opportunity to take some samples of reality at each level of policy

implementation, and to make a reasonable guess at the degree of correspondence which exists among the contents of the physical units (the documents) analyzed. The results of the content analyses are presented in chapter four of this dissertation.

### Educational Policy and Practice

This topic was the sixth issue that guided the review. In his long essay titled "Educational Technology, Policy and Practice", Cohen<sup>41</sup> indicated first, that policies and program depend on practice.

Second, that instructional practice in schools is situated in a larger organization and a longer history of academic instruction than are usually considered. The author went further to identify three factors which in general affect the way teachers teach in American schools. The third factor which is most relevant to this dissertation is the social organization of school systems. Cohen compared the structures of the centralized systems in the United Kingdom, Singapore and some states in Australia, and the decentralized system characteristic of the American education in general. He indicated certain features in the centralized system. These features viz., formal inspection of schools as by Her Majesty Inspectors in England and effective communication networks among teachers and schools, are regarded as advantageous. He argued that decentralization impedes communication about

practice, which according to him, is a problem that plagues public education in America.

Cohen's work is related to school and classroom level environment research endeavors. Some previous works in these fields of educational research are briefly reviewed later in this chapter.

### Teachers' Attitudes to Examining

Since teachers are the main focus of the field research for this dissertation, it is quite in order to present a review of the literature on the teachers' attitudes toward examinations.

Hilsum and Strong<sup>42</sup> reported that public examinations (exams) are an all year round feature of schooling, taking up a large proportion of teacher's day and teachers may spend at least twenty minutes a day on average on the consultation, administration and supervision of these exams. Teachers also participate in other aspects of the examining process which include, subject panels, external examining, and moderating.

Scarth's study of schooling at Brookview<sup>43</sup> was an exploration of teachers' perceptions of and orientation to examinations. Some authors have criticized the central position of examinations for assessment in secondary schools. Others like Broadfoot<sup>44</sup> focused on exams as constraints.

Scarth discussed examining at Brookview - a comprehensive secondary school in England under four subheadings. These are innovation, teachers' practical approach to examining, examining as habit and routine, and the enabling capacity of examinations.

The simplest innovations at Brookview was transferring registration from one examining board to another. The new board offered a different and in some way better syllabus. A more complex mode of innovation was into one which allowed teachers participation<sup>45</sup> in both the construction and assessment of the course. This change, according to the author, gave the teachers sufficient scope to introduce pedagogical practices they preferred, such as pupil-centered rather than teacher-centered learning activities.

At Brookview, teachers viewed examining as a normal part of their work. It does create problems, in particular, it adds considerably to the pressure of teachers' time at certain periods in the year. The job was however made easy at Brookview since teachers did not have to set new exams, they simply used old ones.

One enabling capacity of exams is that they provide additional means of classroom control.<sup>46</sup>

At Brookview teachers recognized that pupils on leaving school needed qualification to obtain employment. Thus in their view, by preparing pupils for exams they were performing an "essential service".<sup>47</sup>

Earlier in this chapter, the researcher presented four levels of implementing curriculum policy. Two of the four levels namely, the operational and the experiential levels coincide with two fields of educational research. These are the school and classroom level environment research. The case study presented in this dissertation was developed from series of data collected at the school and classroom level environments at Alanamu Secondary School, Ibadan. A brief review of environmental education research is presented below.

#### School and Classroom Environment Research

School environment research is often associated with the field of educational administration based on the assumption that schools can be viewed as formal organizations.<sup>48</sup> Several school level environment instruments have been developed.<sup>49,50</sup> However, the data presented in chapter four will be discussed with reference to the works of Fraser and associates<sup>51</sup> who currently have done substantial work in this field. According to these authors, "The strongest tradition in classroom environment research involves use of the classroom perceptions of students (or sometimes teachers) as predictors of student cognitive and affective outcomes." Rentoul and Fraser's study has provided convincing and consistent support for the predictive validity of classroom environment perceptions in accounting for appreciable amounts of variance in student outcomes, beyond that

attributable to student characteristics such as intelligence or pretest performance.

Rentoul and Fraser further indicate that, "when used as dependent variables, perception of classroom environment have differentiated revealingly and appreciably between classrooms following alternative curricula,<sup>52</sup> and between classrooms varying in class size,<sup>53</sup> grade level,<sup>54</sup> and subject matter.<sup>55</sup>

In a more recent work Fraser<sup>56</sup> demonstrated first that students performed better in their preferred environment. Second, that data on actual-preferred discrepancies can be used as a practical basis for planning environmental changes which will align the actual environment more closely with students or teachers' preferred environment.

## CONCEPTUAL DEVELOPMENT

The conceptual framework for this dissertation is "effective communication." Effective communication was chosen because it provided a logical framework for the analysis and interpretation of the data collected in the field.

Communication was a relevant concept at different levels of data acquisition. Effective communication provided the opportunity to draw important and logical inferences from processed data. For example, the content analyses data were analyzed as contents of communication at the various levels of policy and curriculum formulation and implementation.



Communication was also an important idea at the school and classroom level during the ethnographic study of Alanamu Secondary School.

By the application of this concept, the researcher was able to make some sense out of the large volume of data collected in the field. What then is communication? It is defined as ". . . the process of creating a meaning between two or more people."<sup>57</sup> Communication was viewed in this dissertation as a form of interaction between interlocutors. Particular attention was paid small group communication. This is represented by the kind of interaction between a teacher and his or her pupils. The second is organizational communication. Tubbs and Moss<sup>58</sup> indicated that organizational communication applies to several settings which include: hospitals, churches, government agencies, military organizations and academic institutions. The communication network existing between WAEC and implementing agents of examination policy represents organizational communication. The re-searcher wanted to know the role of communication in the process of implementing WAEC examination policy in Nigeria.

From the first classification, Chemistry teachers are the "communicators" of chemical information and their pupils are the "audience." What the pupils do with the information is known as the "response factor."<sup>59</sup>

In the second category, W.A.E.C. is the communicator, the information to be transmitted is contained in the guide syllabuses, published every two or three years by the

examining body. At different levels of implementing W.A.E.C.'s policy, implementing agents viz., subject panels, Chief Examiners, Education Officials (Inspectors), School Principals and Chemistry teachers - who are regarded as the audience or receptors would have a variety of response factors. This is dependent on their dispositions, level of training, their values and beliefs. Another reason is the communicator's credibility. The response factors would therefore reflect audience attitudes. The works of several authors in particular Hovland and Mandell,<sup>60,61</sup> Hovland and Weiss<sup>62</sup> have demonstrated the influence of source credibility on communication.

#### FIELD METHODS AND SCHOOL ETHNOGRAPHY

Research data for this dissertation were collected in the field using a combination of field research techniques viz., interviews, administration of questionnaires and collection of documents for content analysis; and an ethnographic study of the school level and classroom level environment at Alanamu Secondary School, Ibadan.

Field methods is defined by Conklin<sup>63</sup> as data of cultural anthropology obtained by observing the behavior of people in a given society. Thus field researchers often employ several strategies to collect data to set up categories. Ethnography is equated to anthropology. The only difference between cultural anthropologists and school ethnographers

is that the former study the cultures of social groups whereas, the latter study school settings as cultures.

Gallagher<sup>65</sup> provided a list of the similarities between ethnography and cultural anthropology. These include, First, the two research methods use the same approach. Second, they ask the same "big (generic )" questions. Third, they face similar problems with data interpretation and fourth they have interests and use methods that are not very familiar to most people. Furthermore, Gallagher described the work of ethnographers as follows:

A key feature of the work of ethnographers is that they spend a long duration making observations and trying to understand the activities and values of the group being studied. This usually involves "taking up residence" with the group. In studying schooling, it is necessary to participate on a regular basis with the people in the school so that you are viewed to the degree possible, as a member of the group and not as an outsider. This allows formulation of an adequate rapport with group members so that (a) they don't treat you as a "guest" (b) they act normally rather than "staged", and (c) they talk with you candidly. These conditions only emerge with time and, as a consequence, ethnography cannot be rushed.<sup>66</sup>

Bogdan and Biklen<sup>67</sup> indicate that much of ethnographic research involves a phenomenological perspective whereby researchers attempt to understand the meaning of events for people in particular situations. The focus is upon the way in which participants interpret their experience and construct reality.<sup>68</sup> The ultimate aim is to study situations from the participants' point of view. Williams (1981)<sup>69</sup> has shown how these methods that are often termed interpretative

procedures owe much to the theoretical tradition known loosely as 'interactionism' which is represented in the works of some sociologists,<sup>70,71</sup> Blumer<sup>72</sup> and Hughes.<sup>73</sup> Burgess also indicates that interactionism has been the major influence on field research in sociology, and clearly articulated in the papers of symbolic interactionists edited by Rose<sup>74</sup> and Manis and Meltzer.<sup>75</sup> This emphasis upon meanings that individuals construct and modify during the process of interaction is said to hold implications for the research process. The field researcher is viewed by Schatzman and Strauss as follows:

The field researcher is a methodological pragmatist, he sees any method of inquiry as a system of strategies and operations designed - at any time - for getting answers to certain questions about events which interest him.<sup>76</sup>

The field researcher makes use of theoretical samples.<sup>77</sup> Theoretical sampling involves setting forth categories and saturating each one until one can distinguish between core categories from peripheral ones. In theoretical sampling a large sample size is not quite necessary. However, in "hypothesis testing" research statistical sampling is often utilized.

This involves random and stratified sampling. The researcher continues to collect data to achieve his goal of providing a large number of data points or maximum amount necessary to provide an accurate evidence sufficient to prove or falsify a hypothesis. If a field researcher sees a need

to modify his research design as constrained by the existing reality in the milieu, he takes the necessary steps to effect changes. The accruing data help both to set the direction of the research and to refine the emerging hypotheses.

### Content Analysis

Content analysis is defined as a research technique for making replicable and valid inferences from data to their context.<sup>78</sup> According to Berelson<sup>79</sup> content analysis is "a research technique for the objective, systematic and quantitative description of the manifest content of communication."

According to Krippendorff content analysis delineates the object of inquiry and places the researcher into a particular position vis-a-vis his reality.<sup>80</sup> He recommended that the framework for analysis must be simple, general, employing basic concepts such as: the data as communicated to the analyst, the context of the data, how the analyst's knowledge partitions his reality, the target of a content analysis, inferences as the basic intellectual task and validity as ultimate criteria of success.

In this dissertation, at least five out of the six basic concepts listed above are important. The issue of validity should concern anyone who is interested in conducting a meta-analysis of this dissertation.

Berelson has provided a list of seventeen uses of inferences made from content analysis.<sup>81</sup> The most pertinent to this dissertation are the following.

- a. to audit communication content against objectives.
- b. to identify the intentions and other characteristics of the communicators
- c. to reflect attitudes, interests and values of population groups
- d. to reveal the focus of attention and
- e. to describe attitudinal and behavioral responses to communications.

Stone et al.<sup>82</sup> describes application of content analysis in such empirical domains as: psychiatry, psychology, history, anthropology, education, philosophy and literary analysis and linguistics.

### Observation as Inquiry

Observation is an important aspect of the ethnographer's work. It has been regarded as a powerful tool of inquiry. Therefore, this researcher has devoted this section to review some pertinent literature on observation in school or educational ethnography.

What is observation? The answer to this question depends on the purpose of the person asking the question. Observation is an everyday phenomenon which is part of the everyday functioning of individuals in their social interaction, and their conduct of the business of living.

In observational research, the observer often augments the observation process by using a tool or instrument to focus or guide observation. The observation instrument is influenced by the observer's goals, biases, frame of reference and abilities. The instrument also constraints what will be observed, recorded, analyzed and described. Observation is thus regarded as a mediated process.<sup>83</sup> The descriptive records acquired during an observation are statements about reality in a given context.

According to Fassnacht<sup>84</sup> four major issues are associated with observation in educational settings. These include:

1. Observation as a means of representing reality in an educational setting.
2. Observation as a contextualized process.
3. Mechanisms or tools for recording and sorting observations.
4. Factors involved in observation: units of observation/aggregation of data; sampling; and source of error.

Some authors<sup>85</sup> contend that the truth can never be known because the process surrounding the observation also provides a degree of mediation of reality. What the researcher and decision-maker attempt to do is to collect sufficient evidence to ensure an accurate description of a given educational setting.

In this dissertation, the researcher employed several ethnographic techniques and some field methods to acquire sets of data which were used to discuss the impact of WAEC's

i. עכשיו נבחרתם לזכור את כל המילים שאתם רואים בפרק זה.

אם אתם רוצים לזכור את כל המילים שאתם רואים בפרק זה, עליכם לזכור את כל המילים שאתם רואים בפרק זה.



examination policy on teaching chemistry in Nigerian secondary schools.

Because observation is a contextualized process,<sup>86,87</sup> it was necessary for this researcher to address the issues related to the ways of looking at context viz., local context as embedded in larger levels of context; historical context of the setting; historical context of the specific event under study; and context of the research approach. The significance of the attention given to the context of a study have been discussed by some authors.<sup>88</sup>

A whole section of the following chapter is devoted to describe the setting of this dissertation research.

The tools often used in ethnographic and field research include audio and video tapes, coded symbols and field notes depending on the type of units selected for recording.<sup>89</sup> Time units, action and events are common in ethnographic studies. Both of these were used by this researcher to describe events in chemistry classes at Alanamu Secondary School, Ibadan.

Field notes are considered most adequate for recording observations in participant observation.<sup>90,91</sup> Field notes are recorded in everyday language, providing relevant information about the observed phenomena in the milieu.

Once the sampling decisions are made, either a priori or at a specific stage of the study or inquiry, the researcher may opt for event or time sampling.

Time sampling is used in three ways. First to specify the general boundaries of the observation. Second, to designate the specific interval of recording of certain behaviors with an on-line category system.<sup>92</sup> Third, small segments of time can be designated within a general period of observation.

Event sampling is a topic centered approach. In this dissertation, no specific behavior of teachers and pupils was pre-conceived instead, the researcher went into chemistry classes as a passive observer. What was recorded in his field notes represented his psychological perception of phenomena in the classrooms observed. The locus of observation were teachers' behaviors and attitudes toward WAEC's examination policy and the curricular materials provided for teaching chemistry in the school.

## CHAPTER TWO NOTES

<sup>1</sup>Preliminary review of the literature began with ERIC and CIJE computer search. Other sources searched included Dissertation Abstracts International, the education Index and several educational journals and magazines. The search revealed that little work has been done on the topic of this dissertation. However, a number of previous works in the USA and Great Britain are quite relevant to the topic.

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<sup>22</sup> Hoste, R., How Valid are School Examinations? An exploration into content validity. *British Journal of Educational Psychology*, 51, 10-22, 1981.

<sup>23</sup> Cronbach, L. J. and Meehl, P. E., Construct Validity in Psychological Tests. *Psychology Bulletin*, 52, 281-302.

<sup>24</sup> Hoste, R., 1981, op. cit.

<sup>25</sup> Cronbach, L. J. and Meehl, P. E., op. cit.

<sup>26</sup> French, J. W. and Michael, W. B., Standards for Educational and Psychological Tests, Washington D.C.: American Psychological Association, 1966.

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## CHAPTER THREE

### METHODOLOGY AND RESEARCH SETTING

#### PART ONE: PROCEDURES AND INSTRUMENTS USED IN COLLECTING DATA

##### METHODOLOGY

Field research methods and ethnographic techniques<sup>1</sup> were used for data collection. The sources of evidence included data from interviews of selected education officials, content analysis of pertinent documents, field notes and artifacts collected during the school level and the classroom level observation at Alanamu Secondary School, Ibadan, responses to questionnaire by administrators and teachers in other schools in Ibadan, and responses by students to a questionnaire on classroom environment. Field research methods have provided a rich knowledge of the milieu of science instruction and learning in the school including detailed descriptions of the nature of the teacher-pupil interaction at the classroom level, and the role of the school administrators. Furthermore, the content analysis data also presents a clear picture of the nature of communication between policy makers and those who implement policies in classrooms.

## DESCRIPTION OF THE INSTRUMENTS

Three instruments were used to collect pertinent data in the field. These include first, an open-ended interview protocol used to interview the five key education officials. Second, is a survey questionnaire administered to three school administrators, two state education officials and fifteen chemistry teachers. The third is an instrument used to measure students' perceptions about how available time is utilized in their individual classroom. The three instruments are briefly described below.

Instrument No. 1

This interview protocol (Appendix B) is divided into four sections. Each section was used to conduct an in-depth probe of each respondent to acquire some knowledge of the process of formulating and implementing examination policy for Nigerian secondary schools. The open-ended questions in each section gave each respondent the freedom to express his or her opinion, and to provide other relevant information implied but not expressed by the questions. This unique property of the interview technique is described by Borg and Gall (1984)<sup>2</sup>:

The issues dealt with by each section of the instrument are as follows:

1. The role of the West African Examination Council.

2. Procedures used in formulating examination policy.
3. Implementation of examination policy.
4. Procedures used for review of WAEC Guide Syllabuses

#### Instrument No. 2

The second instrument (Appendix B), was a questionnaire administered to selected chemistry teachers at Alanamu Secondary School, and other schools within Ibadan municipality. The sample surveyed also included administrators and some education officials in Oyo State. The instrument is divided into five sections. The first section was used to collect some demographic data about the respondent. The second section focused on probing each respondent to acquire some knowledge about his or her professional background. The remaining three sections are devoted to policy related issues, viz.:

1. The impact of WAEC examination policy on teaching.
2. The impact of chemistry textbook(s) on the choice of content.
3. The impact of the school level environment on chemistry teaching.

#### Instrument No. 3

This instrument (Appendix B) was partly adapted from Goodlad<sup>3</sup> - "A Place Called School". Goodlad holds the view that the amount of time spent on learning enhances students' achievement.

The instrument is divided into three parts. Section one contains the instruction for each respondent to follow. Section two contains four columns and ten rows. Respondents were expected to rank order their classroom activities in order of importance. Each respondent was expected to fill in his or her response in the space provided under each column. Section three was set to collect demographic data from respondents. Since the students have interacted with their classroom environment more than this investigator, their response and evaluation of the usage of available class time is a closer measure of reality than what any external observer can obtain in three weeks. Therefore, the students' response is considered a better gauge of how available time is used by the chemistry teachers. From a field research each respondent may be considered a participant observer.

## PROCEDURES

Triangulation or tripartite design was used to collect data and subsequently clarify some issues dealing with the impacts of W.A.E.C.'s examination policy on the teaching of chemistry in Nigerian secondary schools. The investigator made use of ethnographic techniques viz., open-ended interviews, content analysis of pertinent documents and observation of chemistry classes at the senior secondary (SS-1 to SS-3) level at Alanamu Secondary School, Ibadan.

The three sources of evidence and the procedure for data collection are presented in this chapter.

### Open-ended Interviews

The researcher administered Instrument No. 1 to each of the selected public figures at the University of London and Nigeria during pre-scheduled interview sessions in their offices. Each respondent signed the informed consent document (Appendix C) which indicated that they were willing participants in the investigation. Each interview session took a minimum of two hours to finish. The result of the interviews are presented in chapter four.

### Survey Questionnaire

Instrument No. 2, a survey questionnaire was prepared by the researcher at Michigan State University. The format used for the field research is a final outcome of previous drafts which were modified by the dissertation committee and experts in the field of educational research and measurement at the Michigan State University (Appendix D). This and Instrument No. 1 were field tested among a group of Nigerian graduate students at the Michigan State University to obtain their opinions concerning the relevance of the questions to the Nigerian environment. A political science student and a technical education student said that the questions were relevant. Two graduate students of Education

System Development also affirmed the relevance of the questions to the context of the field research.

A random sample of chemistry teachers from several high schools in Ibadan were asked to complete Instrument No. 2. Graduate student-teachers at the Institute of Education, Ibadan University served as contact persons for reaching the respondents in the city. The researcher also administered the instrument to three teachers at Alanamu Secondary School. Teachers were given five days to complete this questionnaire before the researcher or the field assistants returned to each school to collect the completed copies of the questionnaire.

### Students' Perception of Chemistry Classes

Several copies of the Instrument No. 3, the classroom events inventory, were given to Chemistry teachers at the senior secondary school level at Alanamu Secondary School, Ibadan. They administered the instrument to the pupils in their classrooms in a test-taking setting. They administered the instrument when it was most suitable for each class. The completed collated copies were returned to the researcher within five days.

### Content Analysis

A paradigm or model for analysis of curricular materials (such as the ones analyzed by this researcher) was adopted

from Goodlad et al (1979).<sup>4</sup> The model also simplifies the task of making inferences from the data.

Five physical units<sup>5</sup> (documents) of analysis were selected for this aspect of data collection. Four units were contemplated before the field research was undertaken and the fifth unit of analysis was added to the list during the field research. The units of analysis are as follows:

1. West African Examination Council Guide Syllabus for 'O' Level Chemistry - 1985/86.
2. West African School Certificate 'O' Level Chemistry examination papers 1 and 2, June 1985.
3. Alanamu Secondary School, Ibadan, Mid-Year Examination, Form V Chemistry Paper 2, March 1986.
4. Chapter 13 of Chemistry: A New Certificate Approach: Section on Hydrogen.
5. Teachers' Notes of Lesson on Hydrogen Form IV, Alanamu Secondary School, Ibadan, March 1987.

### Classroom Observation<sup>5</sup>

This researcher sat behind a desk at the back of the room, in chemistry classes at each level of the senior secondary school (SS-1 to SS-3) at Alanamu Secondary School, Ibadan. Data collected at the school after three weeks of observation were used to develop a case study of the impact of examination policy on the teaching of chemistry at the school.

The observation of chemistry classes involved sitting behind a student's desk and taking notes of classroom and



chemistry laboratory activities. The observer was as unobtrusive as possible.

Classroom observation has provided a better understanding of how teachers taught chemistry in the school; the instructional strategies used, the time available for learning and how time was used in each class observed. The ethnographic study of the schools also included informal discussions with chemistry teachers in the preparatory room. During the informal discussions, the teachers expressed their views about their jobs, the role of the school principals and education officials. The contents of the informal discussions are presented in the following chapter.

## PART TWO: PROCEDURES AND TECHNIQUES USED IN ANALYZING DATA

### Instrument No. 1

The notes taken during each interview session were collated and used to develop an analysis of the process of formulating and implementing WAEC's examination policy. Other issues covered in the analysis included test development, security of question papers and scripts. The descriptive accounts are presented in Chapter Four of this dissertation.

### Instrument No. 2

The teachers' response to the questionnaire generated four major issues that include:

1. Teacher's interest in the teaching profession and chemistry.
2. Pre-service Training of Teachers.
3. The nature of the school level environment.
4. Examination and curriculum policy.

Fourteen more issues were developed from the items of the questionnaire. The teachers' opinion on each issue are presented in tabular form in Chapter four of this dissertation.

The researcher then used the teachers' response to develop some apparent potential problems that could hinder effective teaching and implementation of WAEC's policy in Ibadan schools. This is also presented in form of a table in Chapter four.

#### Instrument No. 3

Students' reports on the amounts of time spent on classroom activities were developed from the data collected with Instrument No. 3.

Fifty copies of the completed questionnaire were randomly selected by using the simple random sampling method. Table 1 shows the list of the codes for the 50 selected copies out of the 153 returned to the researcher. The data were analyzed to determine the amount of time spent on classroom activities and the order of importance of the ten activities.

The procedure is described in detail in Section II of Chapter 4.

TABLE 1  
LIST OF THE RANDOMLY SELECTED COPIES OF  
INSTRUMENT NO. 3

A- 91	A-112	A-138	A-178	A- 31
A-139	A-120	A-150	A-168	A- 35
A- 94	A-122	A-180	A-155	A- 39
A- 96	A-124	A-152	A- 3	A- 44
A- 98	A-126	A-189	A- 6	A- 48
A-101	A-128	A-156	A- 10	A- 51
A-104	A-130	A-184	A- 15	A- 77
A-106	A-132	A-166	A- 19	A- 81
A-108	A-134	A-154	A- 23	A- 85
A-110	A-136	A-188	A- 27	A- 89

### Content Analysis

A panel of experts at the Michigan State University reviewed one of the policy documents and identified nine objectives (Table 2) for teaching chemistry in Nigerian secondary schools. These objectives or aims were used to analyze the five physical units. What the researcher wanted to know is the degree to which each unit of analysis reflects the aims; or to put it another way, to what extent can we say that each document complies with the national curriculum policy mandated by the federal government through the agency of the West African Examination Council? This researcher looked at the examination/curriculum policy of WAEC at three levels (Table 3) namely:

TABLE 2

NINE CURRICULUM OBJECTIVES\* FOR TEACHING CHEMISTRY  
AT THE SECONDARY LEVEL OF PEDAGOGY IN NIGERIA

1. To stimulate interest in Chemistry.
2. To show students inter-relationships among the branches of science.
3. To teach students to understand chemical processes.
4. To teach students logical thinking.
5. To enable students to understand principles and concepts of chemistry.
6. To make students learn the applications of chemistry to life.
7. To assist students in developing manipulative skills.
8. To teach students report writing.
9. To help students develop problem solving skills.

\*These objectives were identified by a panel of experts at the Michigan State University that reviewed one of the policy documents from Nigeria.

TABLE 3  
LEVELS OF DOCUMENT REVIEW

<u>Document</u>	<u>Ideal</u>	<u>Formal</u>	<u>Operational</u>
1. WAEC Syllabus	X		
2. WAEC Exam		X	
3. School Exam			X
4. Chapter 13 of IUPAC Textbook		X	
5. Teacher's Notes			X

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1. The ideal level at which the national philosophical direction of education is determined. This level is represented by the WAEC Guide Syllabus 1985/86.

2. The formal level which is the point at which textbooks and tests are developed. This level is represented in this content analysis by the chapter on hydrogen taken from the chemistry textbook widely used in Nigerian schools and the WASC O' level papers in chemistry of June 1985.

3. The operational level at which the teachers teach using the curricular materials with their students. This is represented in this analysis by two units namely, the teachers notes of lesson from a class at Alanamu School and the school's Form V Chemistry Paper two of the Mid-Year examination of March 1986.

This investigator was interested in discovering first, whether there are discrepancies in the stated objectives

and the patterns of implementation as exhibited by the documents. Second, whether some relationships exist among the patterns of implementing the examination/curriculum policy.

Content analysis requires the full attention of the analyst who in the process of analysis must have a clear mind and good vision. Data collection involves reviewing the nine objectives rapidly and yet carefully to match the target statement(s) from the document with the right one. It is a pencil/paper operation that calls for some rapid instantaneous judgment of the analyst. This operation is fastidious; however, the trial is worth the effort.

Perhaps an easier approach is to make a xerox copy of each page to be analyzed. Let the analyst write the numbers of the corresponding objectives against each statement or points counted. That is, match the statements with corresponding objectives. At the end of each matching exercise the responses are counted, and collated and tables are set up (See Appendix E). The result of the content analysis are presented in Chapter Four.

An expert in Chemistry Education also analyzed some of the documents to give the data some degree of reliability. This is discussed in the following chapter.

The two analysts used a combination of tally counts and seriation to collate content analysis data. The format used for two documents by each analyst are presented as work sheets of content analysis in Appendix E.

### Ethnographic Study of a Private School in Ibadan

In this section the researcher has presented a descriptive account of the location and the setting for the case study. The information presented here was developed from some artifacts collected from the site of the investigation. The other sources are the contents of the researcher's field and observational notes. The researcher also took some photographs of some of the infrastructural facilities of Alanamu Secondary School and a state school in the City.

### Statistical Treatment of Data

This was a qualitative research which put no emphasis on statistical testing of the data collected. As it was discussed earlier, there were no preconceived hypotheses, instead, the researcher provided a detailed description of the impact of WAEC's examination policy in Nigeria, in Oyo State and Ibadan municipality.

Where needed, quantitative data are presented as cross tabulation in rows and columns, presenting averages, ranks, and frequencies. In certain cases, data are presented as diagrammatical sketches viz., line graphs and histograms. This form of reporting the research should make the report both readable and easy to apply. The traditional statistical testing was not a part of data analysis and interpretation.

## PART THREE: THE SETTING

The Historical Development of Secondary Science  
Education in Nigeria

General Science was introduced to Nigerian schools during the colonial era. Only a few schools in the country taught the subject before the nation's independence in 1960.<sup>7</sup> However, by the year 1968 about 78.6 percent of the Nigerian schools taught general science.<sup>8</sup> In 1964 less than 600 students were enrolled in the study of science in Nigerian's three institutions of higher learning, and science education was essentially a function of the secondary schools, since science education was practically non-existent in the elementary schools.<sup>9</sup>

The Nigerian Integrated Science Project (N.I.S.P.) was initiated by leaders such as Awokoya (1964)<sup>10</sup>, and Fafunwa (1971)<sup>11</sup> and other authors.<sup>12,13</sup> This curriculum reform project coincided with the worldwide impact of the Soviet Sputnik space exploration and the now famous curriculum projects including the Nuffield Science Project in Britain, and the PSSC, CBA, CHEMS, BSCS, etc. in the USA.<sup>14</sup>

The phases of the NISP curricular project which followed initial development appear to have occurred rather rapidly. Dissemination, diffusion, adoption, implementation and incorporation of the curricular materials were expedited by the bureaucrats of the Nigerian educational system. According to Bajah,<sup>15</sup> "The NISP was introduced into schools without



the trials and re-trials<sup>16</sup> that usually follow the development of curriculum materials to determine their appropriateness." Some authors<sup>17,18</sup> in their studies found NISP textbooks to have low levels of readability, which contributed to the students' difficulty in understanding the subject. The operation of a centralized educational system was probably responsible for the accelerated execution of the last three phases of the process of the NISP curriculum innovation.

#### Trends in Student Achievement in Science Subjects at the Ordinary Level

In this section, an attempt is made to present some data on the trends and pattern of achievement of students in science (chemistry), mathematics and English language. Two basic assumptions were made by the researcher. First, that students are not likely to perform very well in chemistry if they have weak backgrounds in mathematics and/or English language. Students who for example cannot manipulate simple arithmetic functions like ratios, or write a straight forward description of a chemical process in readable and understandable language are not likely to do very well in WAEC chemistry examinations.

Records of students' achievements in the West African School Certificate examinations at the O' level in chemistry, mathematics and English language for five years (1980-1984) are presented in Table 4. The data were generated from some documents,<sup>19</sup> collected in the field and processed using the MINITAB - a computer software package.<sup>20</sup>

Figure 1 gives a highlight of the levels of achievement in chemistry for the five year period. Table 4 and Figure 2 provide comparative data on the proportions of candidates who passed and failed the three subjects between 1980 and 1984.

This data shows that the achievement of students in English, mathematics and Chemistry varies periodically from year to year. These variations should raise questions about the reasons which underlie them. Are these the result of variation in difficulty of the tests or are there more elusive factors which underlie seemingly sporadic shifts from one year to the next?

Data in Table 4 show that the total entry in each academic subject increased by at least 100 percent in less than five years. These data show that WAEC has been dealing with more and more candidates each year. The increased administrative responsibility probably led to the establishment of WAEC offices in each of the 19 states of the federation.

Another significant issue emerging from Table 4 is the rapid increase in the failure rates in each subject. In chemistry the percentage increase was more than 200 percent in 1981 and has remained high ever since. The failure rates in mathematics rose continuously, it reached over 63 percent in 1984. The percentage of students who failed English language reached 75 percent in 1981 and has remained at about 60 percent level.

Table 4 also reveals a fact that draws one's attention to the year 1981.

TABLE 4

NATIONAL RECORDS OF STUDENTS' ACHIEVEMENTS IN WAEC'S O' LEVEL  
EXAMINATIONS IN CHEMISTRY, MATHEMATICS AND ENGLISH LANGUAGE

<u>Chemistry</u>						
<u>Year</u>	<u>Entry</u>	<u>Total SAT</u>	<u>Credit</u>	<u>%</u>	<u>Pass</u>	<u>%</u>
1980	73953	68179	8373	12.57	17809	26.12
1981	59698	50495	2043	4.00	5288	10.50
1982	120240	107826	18848	17.48	21533	19.97
1983	126946	113473	13966	12.30	23408	20.63
1984	125247	112729	28779	25.52	17106	15.17
<u>Fail</u>	<u>%</u>	<u>Absent</u>	<u>%</u>			
23372	34.28	5774	7.81			
43164	85.50	9203	15.42			
67445	62.54	12414	10.32			
76099	67.06	13473	10.61			
66826	59.28	12518	9.99			

<u>Mathematics</u>						
<u>Year</u>	<u>Entry</u>	<u>Total SAT</u>	<u>Credit</u>	<u>%</u>	<u>Pass</u>	<u>%</u>
1980	163047	155597	18025	11.58	44425	28.55
1981	193929	166200	18768	11.30	52677	31.70
1982	304683	286920	38080	13.27	89495	31.19
1983	360591	341758	30399	8.89	95508	27.95
1984	405726	388346	40710	10.48	100374	25.85
<u>Fail</u>	<u>%</u>	<u>Absent</u>	<u>%</u>			
86234	55.42	7450	4.57			
94835	57.00	27729	14.30			
159345	55.53	17763	5.83			
215851	63.15	18833	5.22			
247262	63.37	17380	4.28			

<u>English Language</u>						
<u>Year</u>	<u>Entry</u>	<u>Total SAT</u>	<u>Credit</u>	<u>%</u>	<u>Pass</u>	<u>%</u>
1980	174259	167482	22469	13.41	50263	30.00
1981	336622	302057	16525	5.50	56466	18.70
1982	309610	297921	24275	8.14	59301	19.90
1983	364725	355163	38935	10.96	82694	22.67
1984	407740	398767	57793	14.49	105354	25.84
<u>Fail</u>	<u>%</u>	<u>Absent</u>	<u>%</u>			
90169	53.83	6777	3.89			
229066	73.80	34565	10.27			
214345	71.94	11689	3.78			
233534	65.75	9652	2.62			
235595	59.08	8973	2.20			

90

70

2

80

30

10

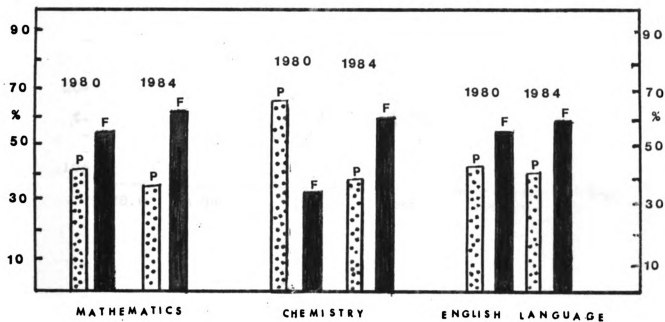


Figure 1 - Comparison of the Proportion of  
Candidates Who Passed and Failed Three  
Subjects Between 1980 and 1984

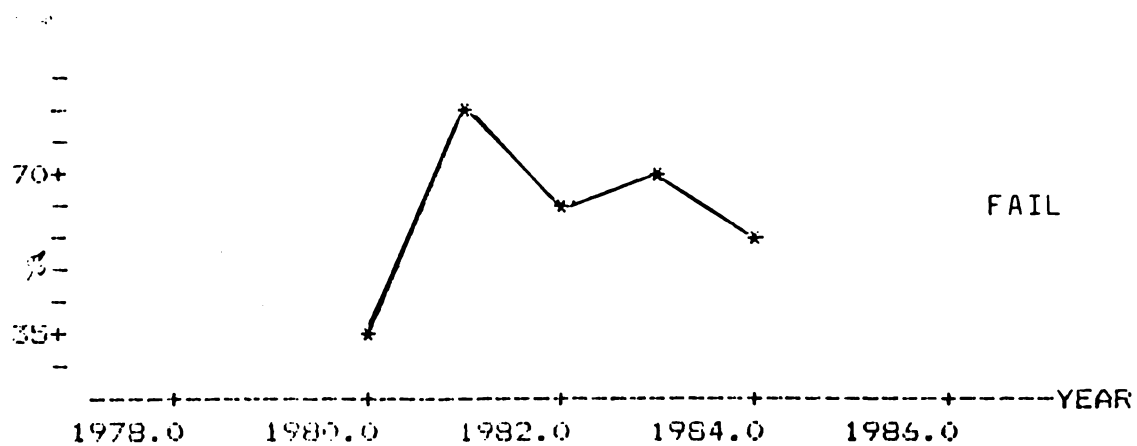
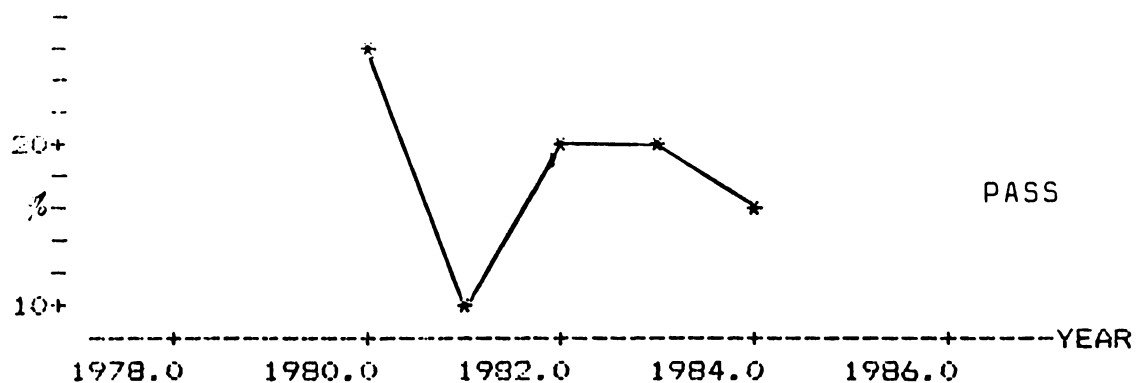
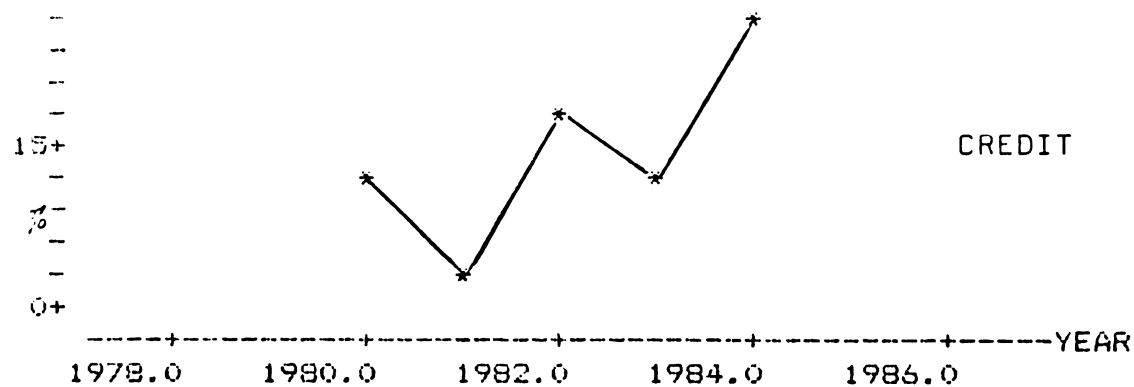


Figure 2 - Percentage of Students Achieving, Credit, Pass and Fail in WAEC 'O' Level Chemistry Examinations (1980-1984)

The failure rate reached an all time high in the three subjects in that year. This researcher could not collect substantial information about what happened that year. However, whatever caused the land slide in under achievement should be investigated and analyzed. The findings of such an investigation should prove useful to the policy makers. Such findings should be effectively applied to facilitate WAECs operations and to avoid the recurrence of similar results in the future.

### Secondary Education in Oyo State

This section presents some descriptive data on the status of secondary education in Nigeria and Oyo State. The data presented here were obtained from three primary sources and one secondary source. The four documents include: First,, a publication of the Federal Ministry of Education entitled: "Statistics of Education in Nigeria 1980-1984".<sup>21</sup> Second, is the "Preliminary Report of the Oyo State Advisory Committee on Science and Mathematics Education in Primary Schools, Secondary Schools and Teachers' Colleges".<sup>22</sup> Third, is a paper presented by officials of WAEC - Test Development and Research Division, at the Commonwealth African Regional Workshop on Gender Stereotyping in Education held at Accra, Ghana.<sup>23</sup> A secondary source and the fourth document is "Secondary Level Teachers Supply and Demand in Nigeria" one of the series of Reports on the Supply of Secondary Level

Teachers in English-Speaking Africa, edited by Dr. John W. Hanson (1973).<sup>24</sup>

The figure in Appendix E presents the trends in the growth of school enrollments at primary and secondary levels in the country between 1960 and 1984. Maps of Nigeria showing state boundaries and inside each state is a bar diagram showing the trends in the growth of enrollment in both primary and secondary education in the country between 1980 and 1984.

Table 5 provides some comparative statistics on secondary school enrollments at the national level and Oyo State for the same period. In 1980 there were 12.37 million Nigerian youths in the age bracket 12-17 years only 2.34 million or 18.94 percent were enrolled in secondary schools. In 1984 there were 13.34 million in age bracket 12-17 years, 3.02 million or 22.55 percent were enrolled in secondary schools. This shows an increase of less than 4 percent of growth in enrollments during this period. Oyo State in 1980 had 1.15 million youths in the same age brackets, 257,192 or 22.30 percent were enrolled in secondary schools. By 1984 the records show that there were 1.24 million youths in the same age brackets and 47.45 percent were enrolled in secondary schools in the state. These data reflect an increase of slightly over 25 percent in enrollment.

The Old Western Region consists of the land area now covered by Ondo, Ogun, Bendel, Oyo and part of Lagos States. The adoption and implementation of an egalitarian policy is perhaps the sole explanation for the rapid growth of education



TABLE 5

SECONDARY SCHOOL ENROLLMENTS AS PERCENTAGE OF AGES 12-17  
YEARS OF POPULATION 1980/81-1983/84

<u>Year</u>	<u>Nigeria</u>				<u>Oyo State</u>	
	<u>Population (Ages 12-17)</u>	<u>Enrollment</u>	<u>% of Ages 12-17 Yrs</u>	<u>Population (Ages 12-17)</u>	<u>Enrollment</u>	<u>% of Ages 12-17 Yrs</u>
1980/81	12,370,813	2,342,701	18.94	1,153,590	257,192	22.30
1981/82	12,686,963	2,857,378	22.52	1,182,790	387,276	32.74
1982/83	13,011,154	3,186,898	24.49	1,212,734	573,504	47.29
1983/84	13,343,685	3,017,635	22.55	1,243,438	590,017	47.45

Source: FME Statistics of Education in Nigeria. 1985 Edition.

in the State. In 1970 there were 3,841 primary schools, 256 secondary modern schools and 221 secondary grammar schools. Table 6 reflects the sharp rise in the number of primary and secondary schools in the state. In 1980 there were 2,529 primary schools and 627 secondary commercial and grammar schools. By 1984 there were more than 2,900 primary schools and over 750 secondary schools in Oyo State. Comparatively this figure is higher than the number of secondary commercial and grammar schools in six other states in the country. For example Bauchi (49), Borno (68), Niger (36), Kaduna (142), Gongola (119), and Sokoto (152) have a total of 566 similar institutions in 1984. This data simply reflects the fact that Oyo State as part of the old west and southern Nigeria was more receptive to European or Western Education than the

TABLE 6  
NUMBER OF PRIMARY AND SECONDARY SCHOOLS IN  
NIGERIA AND OYO STATE 1980-1984

<u>Year</u>	<u>Nigeria</u>		<u>Oyo State</u>	
	<u>Primary</u>	<u>Secondary</u>	<u>Primary</u>	<u>Secondary</u>
1980/81	35,626	4,495	2,529	627
1981/82	37,611	5,067	2,701	722
1982/83	37,888	5,711	2,836	752
1983/84	38,211	5,642	2,907	752+
% Growth 1980-84	7.25	25.52	14.95	19.94

---

north during the precolonial and colonial eras. This fact is reflected in the report of Adesina 1972 when he writes:

The secondary modern school was hastily imported from Britain and was first started by the West. Not surprisingly, 70% of Lagos secondary modern schools are located in areas of the former Western Region . . .<sup>25</sup>

To increase the researcher's knowledge of the setting, more descriptive data were collected on issues related to the Oyo State educational system and the process of education in the state.

### Secondary Education in Ibadan Municipality

According to a list compiled by J. A. Majasan (1968)<sup>26</sup> there were at least 172 public schools and colleges in the city of Ibadan. they were classified as follows:

Teacher Training Colleges -	3
Secondary Schools -	24
Commercial Schools -	3
Secondary Modern Schools -	11
Primary Schools -	128
Koranic Schools -	<u>3</u>
Total	172

The large number of schools in the area obviously indicates that there are many people in the municipality. Interestingly, most of the schools were established by religious organizations, viz. the Methodist, the Baptist, the Roman Catholic Missions and Islamic Groups. Other private organizations include proprietors, and community development groups. Some of the schools were established by the government viz.

Government College Ibadan. More schools have been established since Majasan published his report but the actual statistics were not available to this researcher. For example, Abadina Secondary School established in 1977 by the State Government would be included on the new list of secondary schools in the city.

Almost all the secondary schools in the city are day schools. Students go to the schools in the morning and return home late in the afternoon. Only out of state students live in the schools' student hostels. This might represent between 5 and 10 percent of the student population.

#### Characteristics of the Sample of Teachers Surveyed

Some background information (Table 7) of Chemistry teachers in Ibadan who responded to instrument No. 2 is, presented first, then their views about how the WAEC's examination policy affects their teaching are also discussed. Table 8 presents some information about the characteristics of the teachers, that is, the number of teachers holding a particular class of degree or certificate.

None of the teachers holds a doctoral degree. Two teachers hold the Master's degree, one in the area of Science the other in Education. Three teachers earned a post-graduate diploma in Education. A teacher holds bachelor's degree in Education, while another holds a combined honor in Chemistry and Education. Eleven teachers hold a first degree in either

TABLE 7  
CHARACTERISTICS OF SUBJECTS

RESPONDENT <u>Code</u>	<u>Nigerian</u>	QUALIFICATION(S)	DATE	MAJOR	TEACHING EXPERIENCE (YEARS)
B1	X	B.Sc. PGDE	1974 1986	Chemistry Education	7+
B2	X	B.Sc.	--	--	7+
B3	X	NCE	1984	Education	2-3
B4	No	B.Sc. B.Ed.	1962	Chemistry	7+
B5	X	B.Sc.	1976	Biochemistry	7+
L1	X	B.Sc.	1981	Bio/Chemistry	4-7
L2	X	NCE	1984	Education	1
L3	X	B.Sc.	1981	Chemistry	4-7
L4	X	M.Sc.	1982	Chemistry	4-7
L5	X	B.Sc.	1981	Chemistry	4-7
L6	X	B.Sc.	1981	Chemistry	4-7
L7	X	NCE	1978	Chem/Biology	4-7
L8	X	B.Sc.	1977	Education/ Chemistry	7+
L9	X	B.Sc.	1983	Chemistry	2-3

TABLE 8  
CHARACTERISTICS OF CHEMISTRY TEACHERS' QUALIFICATIONS

<u>Degrees</u>	<u>Number of Teachers</u>
Doctorate	0
MSc/M.Ed	2
PGDE	3
B.Ed	1
B.Sc (Chem/Ed)	1
B.Sc (Chem/Biochem)	11
B.Sc (Chem/Maths)	1
NCE	3

\*Some teachers have more than one degree/certificate.

Chemistry or Biochemistry. One teacher earned a combined honor in Chemistry and mathematics. Three teachers hold a National Certificate of Education each.

Tables 9 and 10 provide a close up analysis of the professionally qualified and unqualified teachers in the sample surveyed. The left column in Table 9 contains a list of name codes of each teacher. The middle column contains the degree(s) and or certificate(s) held by the teacher. The right column presents the number of years of experience of each teacher. The length of their post qualification experience range from one to over seven years. Table 10 is similar to the one just described, the only difference is that it provides descriptive data on teachers who though are qualified in the content area, are not professional teachers. One of the teachers in this group holds a master of Science degree.

TABLE 9  
QUALIFIED TEACHERS

<u>Qualified Teachers</u> (Name Codes)	<u>Degrees(s) and/Certificate</u>	<u>Years of Experience</u>
B1	B.Sc, PGDE	7+
B4	B.Ed	7+
B3	NCE	2-3
L2	NCE	1
L7	NCE	4-7
L8	B.Sc (Chem/Ed)	7+
*S1	B.Sc, Diploma	7+
*S2	B.Sc, MEd, PGDE	7+

\*From Alanamu Secondary School, Ibadan.

TABLE 10  
UNQUALIFIED TEACHERS

<u>Unqualified Teachers</u> (Name Codes)	<u>Degrees(s) and/Certificate</u>	<u>Years of Experience</u>
B2	---	7+
B5	B.Sc.	7+
L1	B.Sc.	4-7
L3	B.Sc.	4-7
L4	M.Sc.	4-7
L5	B.Sc.	4-7
L6	B.Sc.	4-7
L9	B.Sc.	2-3
*S3	B.Sc.	7+

\*From Alanamu Secondary School, Ibadan.

All the others hold a bachelor of Science degree. Many of them have a bachelor's degree in Chemistry.

### Description of the Research Site

The Alanamu Secondary School, Ibadan, was selected for the case study. It is a private secondary school located in the suburban zone of the city.

It was established in the 1960s. It provides secondary and Higher School Certificate courses in arts and science. Total enrollment at the onset was about 200. In 1987 the student population had risen to about 1000.

The school was selected for a case study for a number of reasons.

First, it offers WAEC's O' Level examinations to its graduating students. For example, 160 WAEC candidates sat for the O' level Chemistry examination in 1984/85 session. It is regarded as one of the best schools in the city.

Second, by selecting one of the best schools in the area one should easily find the facts to describe the process of schooling in the area.

Third, Alanamu Secondary School has a good reputation for outstanding achievement by its students in all the external examinations offered by the school, this researcher wanted to gain an insight to the secret of the success.

Fourth, the researcher wanted to know the pedagogical factors that contributed to the outstanding achievement in



the midst of the decline in student achievement in science<sup>27</sup> in the WASC O' level examinations.

Ethnographic methods are useful in probing into factors which underlie uniqueness. Thus, ethnographic techniques were used to study the school for a period of three weeks.

### The School Level Environment

The infrastructure of the school includes a main complex, which houses the administrative offices, some classrooms and laboratories; and a few buildings laid out parallel to the main complex in front and behind it. The architecture and the finish of the school as a whole provides an aura of high status and elitism.

Compared with the facilities in a state school under the Oyo State Ministry of Education, Alanamu's infrastructures out-class those by a wide margin.

### Administration and Curriculum

Alanamu School has 44 academic staff (Table 11) which include the school principal and the vice principal. It has 10 administrative staff.

Admission of new students to the private school is not automatic instead, it is competitive and highly selective. The 1986 entrance examination was conducted in several centers in Nigeria, with more than 3,500 candidates in attendance. This was followed by the second stage of the screening process

TABLE 11

ALANAMU SECONDARY SCHOOL, IBADAN  
TEACHING STAFF 1985/86 SESSION

<u>Subject</u>	<u>Number* of Teachers</u>
English Language	5
History	4*
Geography	3
Economics	2
Government	2*
Mathematics	7*
Physics	3*
Chemistry	4*
Biology	3
Fine Arts	2
Technical Drawing	1
Bible Knowledge	1
French	2
Music	1
Home Science	1
Physical Education	1
Yoruba	2
School Counsellor	1*
Integrated Science	2*
School Librarian	1

\*Some teachers who hold combined honors degrees like physics/maths were counted twice.

which involved taking an aptitude test, a vocabulary and composition test and a face to face oral interview. Only 150 places were available to about 400 candidates who qualified.<sup>28</sup> The 150 students were distributed into the four arms of the lowest grade level at the school. Each grade level has four arms.

The subjects taught in the school include: History, English Language, English Literature, Geography, Economics, Government, Mathematics, Additional Mathematics, Physics, Chemistry, Biology, Art, Technical Drawing, Bible Knowledge and French. Others are Cookery and Music.

The students' test scores for 1984/85 and 1985/86 in WAEC O' Level (Table 12) are very impressive. These were described as a "mark of excellence" in one report.<sup>29</sup>

#### A School Day at Alanamu Secondary School

Classes begin at 8:30 AM and end at 1:45 PM. But before the classes, there is an early morning assembly. Since the school does not have an assembly hall, the staff and students congregate at the quadrangle located in the boys main dormitory. The assembly is a daily routine that lasts for 20-30 minutes before the staff and students disperse to their various classrooms. The main gate to the school is closed during the period of the morning assembly and late comers have to wait behind the gate.

TABLE 12

EXTERNAL EXAMINATION RESULTS  
ALANAMU SECONDARY SCHOOL, IBADAN

WAEC ORDINARY LEVEL EXAMINATIONS

1985

<u>Subject</u>	<u>Percentage of Students who Passed</u>
English language	96.3
English Literature	95.4
History	97.1
Geography	67.6
Economics	62.6
Government	92.9
Maths.	91.3
Add Maths.	74.1
Physics	92.1
Chemistry	96.2
Biology	92.1
Art	100.0
T.D.	100.0
Bible Knowledge	88.9
French	95.0

1986

<u>Subject</u>	<u>Percentage of Students who Passed</u>
English language	98.9
English Literature	85.8
History	85.0
Geography	96.2
Economics	67.5
Government	85.7
Maths.	91.2
Add Maths.	82.3
Physics	91.0
Chemistry	98.1
Biology	93.5
Art	85.0
T.D.	97.0
Bible Knowledge	75.6
French	100.0

SOURCE: Alanamu Secondary School, Ibadan Annual Report  
1985-86

Less than 300 students live in the dormitories, parents and guardians bring the students to the school in the morning and pick them up in the afternoon. Lunch is served at 2:00 PM.

For those who live in the hostels the day continues as follows:

Between 2:30 PM and 6:00 PM, students do a variety of things. Some sleep while others read. Some students play basketball or football (soccer). Seven o'clock finds the junior students in the classrooms where they are expected to study, complete assignments and prepare for the next day.

Some beverage (cocoa) is served at 8:15 PM, after which the students get ready for bed. The day ends at 9:30 PM.

## CHAPTER THREE NOTES

<sup>1</sup>Gallagher, J. J., Looking in the Classroom: Qualitative methods for the study of schooling, in Treagust, D. and Fraser, B. (eds) Western Australian Institute of Technology. The Monograph in the Faculty of Education, Research Seminar and Workshop Series, 9pp, 1985.

<sup>2</sup>Borg, R. W. and Gall, M. D., Educational Research - an Introduction. Longman, New York, London, 1983.

<sup>3</sup>Goodlad, J. I., A Place Called School: Prospects for the Future. Chapter 7. New York: McGraw Hill Book Company, 1984.

<sup>4</sup>Goodlad, J. I., et. al., The domains of curriculum and their study. In J. I. Goodlad & Associates (Eds.), Curriculum Inquiry, The Study of Curriculum Practice, New York: McGraw-Hill, 1979.

<sup>5</sup>Krippendorff, K., Content Analysis: An introduction to its methodology, Beverly Hills: Sage Publications, 1980.

<sup>6</sup>Alao, D.A., An Ethnographic Study of the Process and Problems of Teaching Earth Science in a Middle School. Institute for Research on Teaching Secondary School Science Project (IRT-SSSP) College of Education, Michigan State University, East Lansing, January 1982. 21 pp. Unpublished.

<sup>7</sup>Stone, R. H., A Survey of Science Teaching in Nigerian Grammar Schools. Occasional Publication, No. 1, Institute of Education, University College, Ibadan. 1960.

<sup>8</sup>Yoloye, E. A., Some Science Resources in Nigerian Grammar Schools. Occasional Publication No. 7, Institute of Education, University of Ibadan. 1968.

<sup>9</sup>Weaver, E. K., Science Education in Nigeria. Science Education: 1964, 48(4) 351-61.

<sup>10</sup>Awokoya, S. O., Curriculum Development in Nigeria. West African Journal of Education, Vol. VII, No. 1, October, 1964, pp. 145-147.

<sup>11</sup>Fafunwa, A. B. and Adaralegbe, A. (eds.), Education in Nigeria - Towards Better Administration and Supervision of Instruction, proceedings of first seminar on School Administration and Supervision (Institute of Education, University of Ife, 1971).

<sup>12</sup>Stone, R. H., op. cit.

<sup>13</sup>Bajah, S. T., Preparation of Secondary School Teacher of the Physical Sciences for the African Environment. WAJE, Vol. XIX, No. 1, 1975, pp. 85-96.

<sup>14</sup>Jegede, O. J., An Evaluation of the Nigerian Integrated Science Project (NISP) after a decade of use in the classroom. International Review of Education, Vol. XXVIII (1982), pp. 321-336.

<sup>15</sup>Bajah, S. T., 1975, op. cit.

<sup>16</sup>"NISP seems to expect too much of teachers who learned science in separate specializations and by means of methods alien to the basic concept implied by Integrated Science, in asking them to adapt to the demands of teaching Integrated Science with very little practical guidance" (Jegede, 1982.).

<sup>17</sup>Yoloye, E. A., Readability indices in the evaluation of curriculum materials, Journal of Curriculum Studies 7 (1975), No. 1.

<sup>18</sup>Soyibo, K., The Role of the Nigerian Integrated Science Project in the Teaching and Learning of Science with Particular Reference to Biology. Unpublished M.A. Thesis, University of Leeds, 1979.

<sup>19</sup>Two sources have most relevant data. These include the FME (1985) publication and the paper presented at Accra Ghana by Adeyegbe et. al., 1987.

<sup>20</sup>Data analysis was carried out with the aid of the Minitab Data Analysis Software package published and marketed by Minitab, Inc., 1986.

<sup>21</sup>Federal Ministry of Education, Statistics of Education in Nigeria, 1980-1984 (1985 Edition), 129pp.

<sup>22</sup>Preliminary Report of the Oyo State Advisory Committee on Science and Mathematics Education in Primary Schools, Secondary Schools and Teachers' Colleges. Ministry of Education, Oyo State, Ibadan, 1985.

<sup>23</sup>Adeyegbe, S. O. and Olamusi, O. A., Pattern of Enrollment in WAEC Examinations in Science, Mathematics and Technology Subjects for the Period 1980-85. A paper presented at the Commonwealth African Regional Workshop on Gender Stereotyping in Education held at Accra Ghana 12th-16th January 1987.

<sup>24</sup>Hanson, J. W. (ed.), Report on the Supply of Secondary Level Teachers in English Speaking Africa, 16 Volumes, 1968-1973. Vol. 15, p. 16.

<sup>25</sup>Ibid.

<sup>26</sup>Majasan, J. A., Guide Map of Ibadan. Occasional Publication, No. 8. Institute of Education, University of Ibadan, 1968.

<sup>27</sup>Agbebi, E. A. and Ajayi, G. O., Under Achievement in the Physical Sciences - Lessons for the Future. A Paper presented at the 27th Annual Conference of STAN, Federal University of Technology, Owerri, August 25-30, 1986.

<sup>28</sup>Principal, Annual Report of 1985/86 Session. Alanamu Secondary School, Ibadan, Nigeria.

<sup>29</sup>Ibid.



CHAPTER FOUR  
PRESENTATION AND INTERPRETATION OF RESULTS

PART ONE: FORMULATION AND  
IMPLEMENTATION OF POLICY

OVERVIEW

In this chapter, the following subsidiary questions are answered:

1. What are the factors controlling the formulation and implementation of examination policy in Nigeria?
2. What is the procedure for reviewing the WAEC 'O' level syllabus in chemistry?
3. What is the correspondence among the national curriculum objectives, the contents of the WAEC Guide Syllabus in chemistry, the contents of instructional material, IUPAC textbook in chemistry, the contents of WASC 'O' level chemistry papers 1 & 2 of June 1985, and the actual content of instruction in the classes observed?

Two sources of evidence provided the data to answer the above questions. The sources are, first, the information collected during interviews with individuals in Nigeria and Great Britain who are or have been engaged in establishment and implementation of examination policies. Second, the

results of the content analysis of pertinent documents named above in question no. 3.

## PRESENTATION OF RESULTS

In this section, the researcher has presented the results and analysis of the interviews conducted at the University of London, England and Nigeria. The information presented provide some answers to the question about how examination policies are formulated. Following are a series of analytical data from the content analyses of five pertinent documents. The results of the content analyses constitute the various measures of the implementation of policy. This chapter concludes with analysis and interpretation of results.

### Organizational Structure of WAEC and Interactions Among National and Regional Groups

The West African Examination Council consists of a chairman, four representatives of each member nation, and the London representative from the United Kingdom.<sup>1</sup> The WAEC head office is located in Accra, Ghana. Each member country has its own national committee and states committees. For example, in Nigeria there is a national committee and nineteen state committees. The state committees advise the national committee. The national committees elect members into the WAEC council. The WAEC examinations committee which is drawn from the council bears the responsibility of formulating

examination policy.<sup>2</sup> The national committee makes recommendations to the council on matters of examination policy.

In addition there are international subject panels who advise the examination committee. There are several international subject panels. The members of these panels are experts in different fields, some of them are drawn from the council and others drawn from appropriate university departments. The international subject panel also share the responsibility of reviewing the WAEC guide syllabuses.

In each country, there are subject panels which advise the chief examiners on the matter of examination policy. The chief examiners are appointed by WAEC. They oversee the conduct of the tests, carry out pretest and post-test item analysis, and write an annual report each year. The chief examiner in chemistry, for example, will bring matters of policy to the notice of the national committee for onward transmission to the international subject panel.

Since the policies affect five West African nations, endorsement of the proposed policy changes at this level is necessary. The endorsed proposal or new policies are then forwarded to the examinations committee. The examinations committee has been delegated by the council to carry out detailed consideration of policy in regard to WAEC examinations.<sup>3</sup> The committee also reviews all criticisms and suggestions about WAEC's operation.

### How Examination Policy is Formulated

Two out of the five interviewees said that the formulation of WAEC's examination policy, in the past, was initiated by the joint efforts of the Joint Consultative Committee on Education (J.C.C.) and the National Council on Education (N.C.E.).<sup>4</sup> One respondent expressed the view that two other agencies of the federal government namely, the Comparative Education Study and Adaptation Center (CESAC), attached to the University of Lagos, and the Nigeria Educational Research Council assist WAEC in formulating the curriculum and examination policy. CESAC was established with a grant from the Ford Foundation at the University of Lagos in January 1968. Its focus has been curriculum development and educational innovation. It continues to influence the Nigerian educational system and WAEC's operation in the country. This is highlighted in "CESAC: It's Work" as follows:

CESAC has adopted the guided-discovery approach to teaching. Under the approach, students are encouraged to learn by inquiry and discover concepts and generalizations based on experience. For the full realization of this objective, CESAC has developed textbooks and teachers' guides in the three principal science subjects - Biology, Chemistry and physics. Efforts to produce integrated science textbooks and teachers' guide are yielding good results. The West African Examinations Council set special examinations, in CESAC science syllabuses.<sup>5</sup>

Because of its multi-national status, WAEC both influences and is influenced by intra-national groups. The interviewee at the University of Lagos indicated that a lot of

the policy development process takes place within the hierarchy of WAEC's staff at the national and international levels. He discussed the role of WAEC in the systematic conduct of education in the country.<sup>6</sup> Because WAEC is an international organization, it is bound to have several categories of authorizing agents. According to this official, the agents are there to protect the interest of various groups including federal and state governments, universities, teachers, and subject matter specialists.

The respondent also said that the National Council on Education engages in some communication with CESAC on educational issues, and WAEC is also in frequent contact with the same agency. WAEC has been working with Nigeria Educational Research Council (a division of the Federal Ministry of Education) concerning policies and curricular matters.

It appears that the works of CESAC and the N.E.R.C. are essentially the same. To avoid duplication of efforts, the two agencies working so closely with WAEC should specialize or work toward a merger. If the former option is agreeable, one of them should specialize in elementary science education and the other in secondary science education. The focus of CESAC's research efforts seem to be most relevant to secondary education.

The London respondent indicated that an arm of WAEC named TEDRO (meaning Test Development and Research Organization) should be doing post-examination analysis of marking schemes, and written questions. This would help to clarify

what might be wrong with a marking scheme. He suggested that the responsibility could be assigned to a research team. He proposed an array of research teams that could facilitate WAEC's operation in Nigeria. A development team should be sending development information to schools and other users of WAEC results. Another research team is needed to provide the Advisory Panel with information about new, improved materials for subject assessment. Another team should be answering government requests on assessment.

Test specification was emphasized by the London interviewee, which he discussed at length. His view is summarized as follows:

Test specification means what grid or what skill you are testing or hoping to test. If you plan to use multiple choice items, seek for people who have the skill to write and judge the sort of answers that ought to be there. Pretest the items to determine individually how difficult it is and do bi-serial correlation to determine the differences in candidates. Analyze the results with the computer. Pretest over say 500 candidates. There is need to pretest other types of questions also. These are things TEDRO used to do. This should be done three years ahead, and make sure you get<sup>7</sup> back all the questions and papers pre-tested.

There are a variety of groups which collaborate with and influence WAEC in its work (Figure 3). These groups include state and national groups in five West African nations and in England. Premises which WAEC employs in establishing syllabi and examination are complex and slow moving because they must allow for all constituencies to be heard. WAEC's

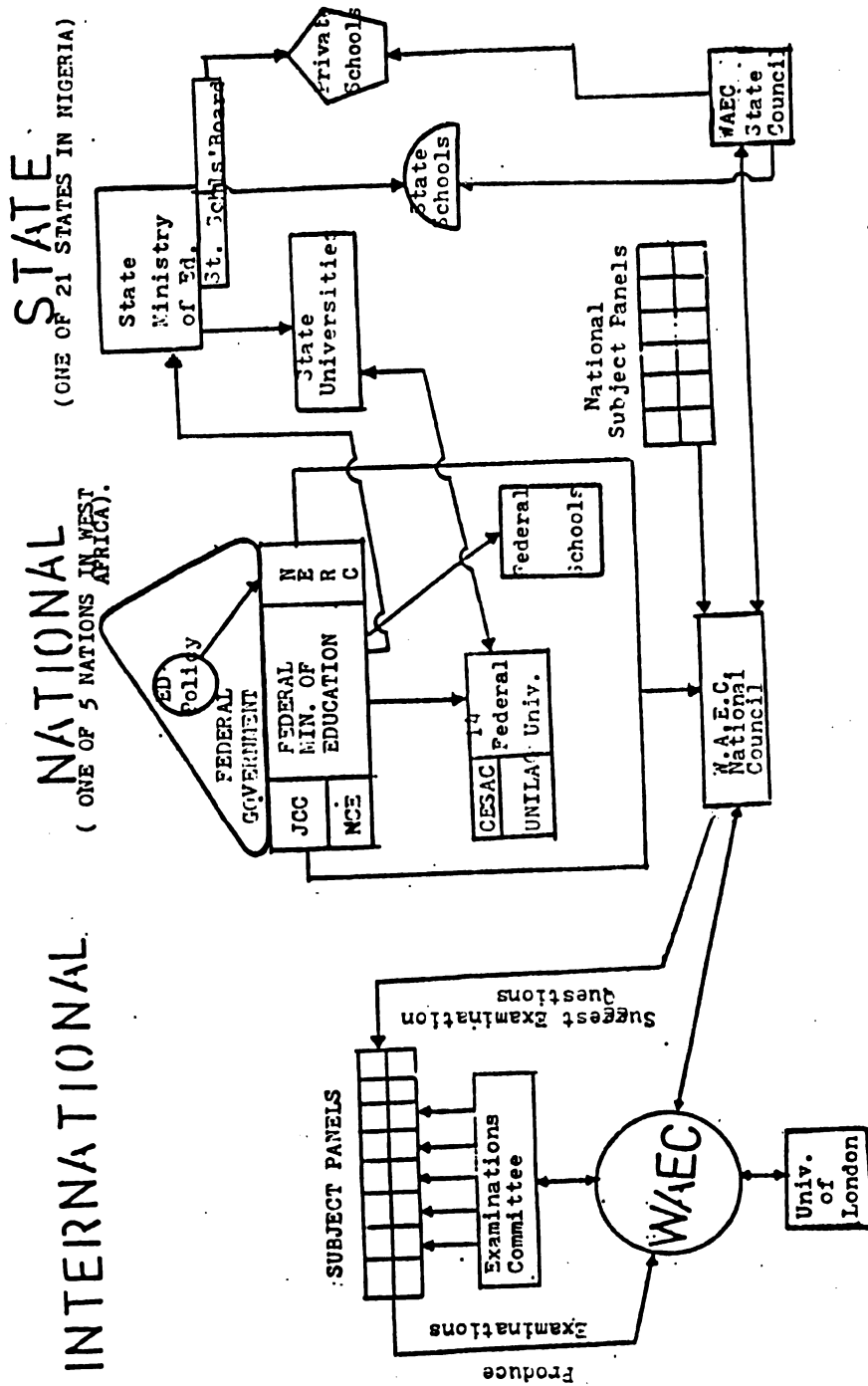


FIG.3: SCHEMATIC DIAGRAM OF SCHOOL ORGANIZATION IN NIGERIA

slow cumbersome procedures are a source of frequent criticism from teachers, administrators and others concerned with the practice of education. However, from the viewpoint of those within WAEC, the work of the organization needs even more safeguards than are now in place in order to carry out its work effectively. Clearly there is tension between policy makers and those who must implement the policy. However, that tension may be a necessary factor in building and maintaining an effective educational system.

#### Correspondence Between the WAEC Syllabus in Chemistry and Implementation Documents

Since WAEC's policies are implemented at different levels of the nation's educational system, it is important to know the degree of correspondence among various documents and individuals that support implementation. To provide some data for this issue, the third subsidiary question was stated as follows:

What is the correspondence among the national curriculum objectives, the contents of the WAEC Guide Syllabus in Chemistry, the contents of instructional materials (IUPAC textbook), the contents of WASC 'O' level Chemistry Papers 1 and 2 of June 1985, and the actual contents of instruction in the classes observed?

This question was answered by presenting and interpreting the results of the content analysis of five documents. The five documents analyzed were:



include 2 1 and no end parts no initials

1. The School Certificate/GCE WAEC Guide Syllabus for O Level Chemistry 1985/86.
2. The West African School Certificate (WASC) examination papers 1 and 2 in chemistry of June 1985.
3. The relevant sections of curricular materials (viz. textbook(s)) being used in teaching O Level chemistry in the schools.
4. Teacher made tests from Alanamu Secondary School, Ibadan.
5. Teacher's notes of lesson on hydrogen Class IV, Alanamu Secondary School, Ibadan, March, 1987.

The content analysis data presented in Table 13 shows the frequency of occurrence for each category of objectives for secondary chemistry teaching. The first column contains a listing of the nine objectives as found in the WAEC Guide Syllabus. There are ten columns on the right side of the first column. Each pair of columns represent the analysis of one document. For example the second column represents the frequency with which each category of objective was found in the WAEC Guide Syllabus and the third column expresses the second column in percentages. The next eight columns are the results of the analysis carried out by this researcher.

A second analyst was engaged to determine the reliability of my content analysis. This person was a specialist in chemistry education at Michigan State University and he assisted me with the analysis of documents 2, 3, and 4. Worksheets used in this phase of the data analysis are shown

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$f = \text{frequency}$

Documents:		WAECSyllabus		WAECExams		LocalTest		IUPACTextbook		Teacher'sNotes	
		f <sub>1</sub>	%	f <sub>2</sub>	%	f <sub>3</sub>	%	f <sub>4</sub>	%	f <sub>5</sub>	%
Objectives for Chemistry Education											
1.	Stimulate interest in chemistry	2	0.87	0	0	0	0	1	3.85	0	0
2.	Teach inter-relationships in science	3	1.31	0	0	0	0	3	11.54	0	0
3.	Teach students chemical processes	59	25.76	15	19.74	41	19.81	4	15.38	2	16.67
4.	Teach logical thinking	38	16.59	7	9.21	3	2.83	0	0	0	0
5.	Teach principles and concepts of chemistry	64	27.94	33	43.42	55	51.89	10	38.46	8	66.67
6.	Application of chemistry to life	36	15.72	2	2.63	4	3.77	4	15.54	0	0
7.	Develop manipulative skills	21	9.17	6	7.90	2	1.89	3	11.54	0	0
8.	Teach report writing	1	0.44	0	0	0	0	0	0	0	0
9.	Develop problem solving skills	5	2.20	13	17.10	21	19.81	1	3.85	0	0
TOTAL		229	100.0	76	100.0	106	100.0	26	100.0	12	100.0

in Appendix E. The results of this analysis showed interrater reliability coefficients of 85.5 percent, 95.5 percent and 96.0 percent for documents 2, 3, and 4 respectively.

The analytical data show some variability within each column and among the columns. The within column variation reflects the fact that the content analysis showed high frequency of occurrence in the five documents pertaining to some instructional objectives and very low frequency for others.

Objectives pertaining to chemical concepts were most frequently mentioned in the five documents. Objectives pertaining to chemical processes, applications of chemistry to daily life, development of logical thinking, and development of manipulative skills were also found with somewhat lesser frequency. Objectives concerning stimulation of interest in chemistry, interrelationships among the sciences, report writing, and developing problem solving skills were much less frequent in occurrence in the five documents reviewed.

Table 13 provides further insights to policy implementation when the frequencies of specific objectives are compared among the five documents. For example, teachers' notes and local tests are considerably different from the three published documents regarding the inclusion of the range of objectives. Only three objectives appear in the teachers' notes and 67 percent of the statements in the teachers' notes pertain to concepts and principles of chemistry. In the

local tests, 52 percent of the items pertained to concepts and principles of chemistry and about 40 percent of the items were divided equally between chemical processes and chemical problem solving.

These data suggest that there is a substantial difference between what is recommended in the WAEC Syllabus Guide and what is actually taught by the teachers in the school studied. The difference lies in the breadth of subject matter emphasis. That is, the Syllabus calls for nine different objectives and it gives emphasis to five of them by detailing them with a reasonable degree of frequency. The teachers' notes, by contrast, only emphasize three objectives; one of these receives two thirds of the "space" in these notes. The local test shows a similar disjuncture with the WAEC Syllabus.

How can this dissonance between the Syllabus and the teachers' implementation be understood? Why is the Chemistry course offered by teachers at variance with the syllabus? Part of the answer to these questions lies in the WAEC Examinations. The columns in Table 13 headed "WAEC Exams" and "Local Test" are nearly identical in terms of the percentages in each category. Thus, it is reasonable to infer that teachers give much more attention to the WAEC Examinations as they plan their assessment of students' learning than to the Syllabus or the Textbook. Certainly, this is understandable, since students' achievement, as well as the teachers' effectiveness, will be judged on the basis of test scores on the WAEC Examination and not on the contents of the Syllabus or the Textbook.

Two other results appear in Table 13 that are of importance. First, comparing the WAEC Examinations and the local test, it should be noted that a key difference in the percentages lies in emphasis on development of logical thinking. The Examination has about 9 percent of the items focusing on logical thinking, whereas the local test only has 3 percent. Conversely, the local test has 52 percent of the items on concepts and principles of chemistry, whereas the WAEC Examination has 43 percent of these items. It would appear that the teachers tend to minimize teaching of logical thinking and give greater emphasis to concepts and principles. These results are consonant with what is known about teachers' teaching in U.S. schools.<sup>8</sup>

Second, the teachers' notes represent a narrower interpretation of the objectives for chemistry education than is found in any of the four other sources. Again this is consonant with findings in other studies of teaching practices and teacher planning.<sup>9</sup>

Table 14 presents some more descriptive statistics of the content analysis. More meaning may be derived from the data if we rank order the results from the analysis of the WAEC Guide Syllabus separately and then compare the sequence to what we obtained when the data for the other four documents were combined and rank-ordered. These are presented in Table 14. This table reveals some interesting patterns. First the WAEC document and the others shows some similarity in the emphasis given to certain objectives of Chemical Education

TABLE 14

COMPARISON OF CONTENT ANALYSIS DATA FOR WAEC GUIDE  
SYLLABUS AND FOUR OTHER DOCUMENTS

<u>Objectives</u>	<u>WAEC Syllabus (#1)</u>		<u>Other Documents (2-5)</u>	
	<u>Total Counts</u>	<u>Rank</u>	<u>Total Counts</u>	<u>Rank</u>
1. Stimulate in- terest in Chem- istry	2	8	1	8
2. Interrelation- ship in Science	3	7	3	7
3. Teach chemical processes	59	2	42	2
4. Logical think- ing	38	3	10	6
5. Principles and concepts	64	1	106	1
6. Application to Life	36	4	12	4
7. Manipulative Skills	21	5	11	5
8. Report Writing	1	9	0	9
9. Problem Solving	5	6	35	3

at the secondary level. All the five documents yielded maximum frequencies for the fifth objective namely, "Teach principles and concepts of chemistry." This is given the first priority all other things considered. The five documents also placed the third objective: "Teach students chemical process" as the second most important objective.

The ranking of objectives 1, 2, 4 and 8 by the WAEC Syllabus and the other documents is also important. The frequency for objective nos. 1, 2 and 8 are quite low in all the documents. This could mean that it is not feasible to formulate policies for inherent properties such as students' interest in chemistry. One can also assume that at this level, the students have acquired a knowledge of inter-relationship in science. Similarly, students are expected to have acquired report writing skills in their English Language classes. As stated earlier, logical thinking was de-emphasized by those who implement policy, in its place, concepts and principles are taught.

#### Problems of WAEC's Operation in Nigeria

Several problems militate against the smooth operation of WAEC organization in Nigeria. Each problem is complicated with the rapid growth of the organization and the increasing number of students who sit for WAEC's examinations annually.



(a) Maintenance of Examination Standards

Since WAEC's examinations are recognized world-wide, the testing body has to maintain high standards in the development and administration of examinations on the one hand, and the reporting of test results on the other.

Still on standards the interviewees asserted that the crucial thing about testing is the nature of the test. The structure and contents of the examination is important. It must be clear to the test developer what the structure will be. That is whether all the questions will be multiple choice type, or essays. Another issue is test specification. Test developers must know what grid, what skills they are testing or hope to test. For example if they intend to test practical skills and/or observation skills, they should provide good specimens or slides in biology. For chemistry examinations, students should be provided chemicals that will give clear color change or easily observed thermal change be in exothermic or endothermic.

(b) Security of Question Papers and Scripts

Also related to maintenance of standards is the issue of security. Security is so crucial to test development, test administration and reporting the test scores.

Three respondents expressed some concern about examination leakages experienced by WAEC several years back. There have been leakages in schools, examination centers and even

in the banks. One respondent said, "There is no 100% security in Nigeria because we cannot rely on the integrity of people. The Nigerian government encouraged security by making people serve long jail terms if they are caught in fraudulent practices.

### Reviewing WAEC Guide Syllabi

The WAEC Guide Syllabi are policy documents, published every three years by the WAEC Council as "Regulations and Syllabuses for the Joint Examinations for the School Certificate and General Certificate of Education - (Ordinary Level) and for the General Certificate of Education (Advanced Level)." This policy document is the medium of communicating the intentions of policymakers to implementing agents that include school administrators and science teachers. Because of the complex structure of WAEC organization, the process of reviewing the guide syllabus often is painstaking and cumbersome. Some questions were asked during the interviews which have shed some light on the process of reviewing the guide syllabus. The questions concerned procedures for scheduling a review of WAEC Guide Syllabus in a science subject like Chemistry. Who initiates the review process, how is a review panel constituted and what is the general format for reviewing the syllabus? From the interviews, the researcher was told that "WAEC will schedule a review if there is need for a new syllabus or if the current one needs

amendment. It takes five years to plan and prepare it. It requires at least five years before any examination can be affected by the new syllabus."<sup>10</sup> It requires five years to place the reviewed syllabi in schools because WAEC is serving five nations and several panels of experts have to meet to discuss and exchange ideas before they arrive at a final format.

At other times, members of the Advisory Panel decide that the current syllabus is out of date and therefore recommend a new one. Subject experts also may decide that the syllabus needs revision. The advisory panel then sets up a working party to draft a new syllabus and question paper(s) commensurate with the contents of the syllabus. Each Advisory Panel will review and return it to each country's panel. Given the size of the constituency, with five nations involved it takes about 2-3 years to prepare a new syllabus for WAEC.<sup>11</sup>

According to the former chief executive of WAEC, "In England, the drafts are sent to different institutions taking the GCE 'O' level examinations. Bodies such as the Science Teachers Association would hold conferences and workshops to discuss the draft. They might then agree on the new syllabus. Conferences are also held in West Africa to discuss proposed changes in the WAEC Guide Syllabuses."<sup>12</sup>

The next question to be answered has to do with the procedure for communicating changes in the syllabuses to the stakeholders of examination policy. The stakeholders of policy include universities, teachers' union, teachers,

school administrators and future employers of school graduates. According to one respondent, "When a syllabus is agreed upon, it must be published and must be in the schools at least two years before it can influence any of the WAEC's examinations. This is why it takes five years before a new syllabus becomes public property. Once in circulation, the syllabuses are sold in most bookstores all over the country.

#### ANALYSIS AND INTERPRETATION

The five public figures expressed concern about the need to change the orientation of students and the Nigerian public from regarding the West African School Certificate as a stepping stone to higher education to recognizing it, as an expression of the skills and knowledge which have been developed by students as a result of secondary science education.

The change in orientation will not occur quickly because attitudes toward examination appear to be deeply ingrained.<sup>13</sup>

One important step to bring about this change is already in place. That is, the WAEC Guide Syllabus has a broad scope of objectives for chemistry education (see Table 2). However, examinations could coincide more closely to these objectives, increasing the emphasis on applications of science, logical reasoning, analytical thinking, and other skills that are pertinent to this changed orientation. Further, the data also point to a need for helping teachers broaden their

orientation from heavy emphasis on concepts and principles of chemistry to applications and higher order reasoning skills

Another meaning arising from the interviews is the need for research in WAEC. This was highlighted by the London and the Lagos respondents. The Lagos respondent would like to see more application of computer hardware and software in WAEC's operation in Nigeria. By so doing, parallel forms of the same test could be developed using a bank of test items. This would have at least two benefits: (1) The security of examination would be enhanced, because students could be randomly assigned to one of several examination forms available at a setting, (2) Students who fail and wish to retake the examination could do so at an earlier time than is presently possible. Also, computer usage could speed the scoring of examinations and reporting of results to students and other agencies.

The researcher will now focus on the results of the content analyses of the five documents described earlier in this chapter (see subsidiary question no. 3). The aim is to decipher the nature of the communication in the Nigerian educational system. How effective is WAEC in communicating its objectives for chemistry education to teachers? This is reflected in the content analysis. Table 14 also indicates that the frequency is high for some of the objectives, and low for the others. Correspondence among the percentage frequencies for each objective could be used to measure communication effectiveness.<sup>14</sup> The four documents which

represent policy implementation put together ranked the teaching of "principles and concepts" and "the teaching of chemical process" very highly. Taken individually, documents nos. 2, 3, 4 and 5 respectively devoted 43 percent, 52 percent, 38 percent and 66 percent of their contents to the teaching of the principles and concepts of chemistry. WASC examinations contained 43 percent and the local test underscored this point by having as much as 52 percent of the total test items on this objective. On the teaching of chemical processes, documents nos. 2, 3, 4, and 5 contained 20 percent, 20 percent, 15 percent and 17 percent respectively.

The data in Table 14 show that the emphasis in WAEC Guide Syllabus varies considerably among the objectives. The frequency of appearance of objectives pertaining to concepts and principles of chemistry, chemical processes, logical thinking and application to life were high whereas objectives such as interest in chemistry, interrelations in science, and problem solving are mentioned infrequently. It is interesting to note that there is a high degree of correspondence between the frequency with which objectives are mentioned in the WAEC Guide Syllabus and the other four documents that were subjected to content analysis.

These data suggested that the WAEC Guide Syllabus is very effective in communicating to implementing agents including text writers and teachers. One area of discrepancy is logical thinking. In the WAEC Guide Syllabus logical thinking objectives rank third in frequency. In the other

four documents this ranked sixth. In teacher's classnotes, they were virtually absent. It would appear that WAEC officials may need to place greater emphasis on objectives 1, 2, 8, and 9 (see Table 14) if these are to receive more attention in the curriculum and in testing.

On the other hand, looking more closely at data in Table 13, it is evident that teacher's notes and tests correspond less well to the guide syllabus than is shown in Table 14 when data are grouped. This suggests that individual teachers need some careful supervision. As will be seen in Section II of this chapter, many teachers feel at liberty to choose instructional contents with little regard for the syllabus.

The process of changing the WAEC Guide Syllabus usually is initiated internally. However, when the need is perceived by affected groups, it is possible to request a syllabus review. The process is both complex and slow because of its international character. To bring about a change in the syllabus affects people in five nations. Therefore, provision must be made to allow all who are affected to be heard before WAEC will alter educational policy. Then, after a policy change is agreed upon by WAEC, the policy must be disseminated to the participating nations and eventually to all schools, teachers, administrators, and users of the certificate. This process takes five years.

While many people criticize this process as being unnecessarily cumbersome and slow, it does provide a measure of stability for educational policy. It helps to assure

that policy changes do not occur in response to fads. With the broad scale of input, it should help to prevent excessive changes in educational policy. With broad scale input, in a democratic setting, it should also help the educational system, to serve the needs of society as a whole as well as the needs of individuals who comprise it.<sup>15</sup>

However, the measure of effective policy lies in its implementation by teachers and administrators in schools for the benefit of students. This is the subject of the next section.



## PART TWO: THE RELATIONSHIP BETWEEN POLICY AND PRACTICE

### OVERVIEW

In this section two subsidiary questions are answered. The first is on the degree of influence that examination policies have on chemistry teaching in secondary schools. The second is about how WAEC's examination policies are implemented at the school and classroom levels.

Subsidiary to the second question are the following:

- a. What is the quality of the teaching and learning environment at Alanamu Secondary School, Ibadan?
- b. What instructional strategies are employed by teachers at Alanamu Secondary School?
- c. How is the available class time utilized in the chemistry classes?

This section of chapter four presents the research results and a detailed analysis and interpretation of the research data. These are followed by highlights of the major research findings of this aspect of the study.

### PRESENTATION AND INTERPRETATION OF RESULTS

Four categories of results and their interpretation are presented in the following pages. These include first, the information collected from a chemistry teacher who consented to an interview. Second is the set of data collected with the administration of the questionnaire (instrument

no. 2) to chemistry teachers located in different schools within the city of Ibadan, Nigeria. Third are the observational notes written during the study of the school and classroom environments at Alanamu Secondary School, Ibadan.

Fourth, is the response of 153 students at Alanamu Secondary School to instrument no. 3. The descriptive data represent the perceptions of students at the three levels of instruction (classes 3, 4, and 5) in the high school. The students' perceptions have increased the researcher's understanding of how the three teachers observed, utilized available time in their classrooms. The students have spent considerable length of time with the teachers (a minimum of six months), thus their combined judgement of the classroom climate is an accurate reflection of actual events.

#### An Interview with a School Teacher

To understand how WAEC's policy is implemented at the school level, a chemistry teacher who also served as chairman of a school examinations committee in the Ibadan area consented to an interview. The account of the interview is presented below. This account presents only part of the picture that will be portrayed about science teaching in Ibadan. More information follows which pertains to the specific points raised by this teacher.

INTERVIEWER: What is the student population of your school and what is a fair estimate of the West African School Certificate (WASC) Examinations' Candidates in Science for 1987.

TEACHER: The student population of my school is 2,700. We have 700 WASC candidates this year, 200 of these will sit for science examinations.

INTERVIEWER: How will you describe the state of teaching science/chemistry in your school?

TEACHER: Concerning the state of our facilities, the laboratories are old and the space available is too small to hold our students at a setting.

INTERVIEWER: What factors influence the implementation of WAEC's policy in your school?

TEACHER: As I mentioned earlier, the laboratories are too small for the students. Therefore, we usually divide them into two groups for the practical examinations in chemistry and biology.

The respondent went further to release the following information:

There are at least five other factors which affect the implementation of WAEC's policy in our school.

First, a crucial issue is that students are ill-prepared for secondary education. They are often too young. It is common to have fourteen year olds sitting for the WAEC examination and subsequently applying for University admission.

Second, the boarding system is essentially scrapped. Out of our 2,700 students only about 200 of them are left in the boarding hostels. These are students from far away places who are out of state. Supervision of students in the hostels has become very poor.

Third, during the school hours you may find many students outside their classrooms, playing for several hours in the fields.

Fourth, is the newly introduced continuous assessment. Teachers somehow fail to set standard questions. Many lazy teachers tend to set shallow questions. This they do in order to make the job of grading less tasking for them.

Fifth, is the newly adopted system of education commonly called the 6-3-3-4 system. The new system has created some problems for the school in the area concerning the implementation of WAEC's policy.

The chemistry teacher whom I will now call Dupe (pseudonym) listed several factors in her school which influenced the implementation of WAEC's policy.

First, the fact that students were too young and ill prepared for secondary education show that the cognitive entry behaviors of the students often are not adequate for the learning situation at the secondary level.<sup>16</sup> The excessive freedom given to students during the school hours, points to the absence of good leadership on the part of the school principal or the school administrator in this particular school. Furthermore, concerning the newly introduced continuous assessment, Dupe hinted that many poorly motivated teachers tend to set shallow questions in order to make the job of grading easier. This indicates that the teachers involved probably loath the new assignment for certain unknown reasons.

Their attitude to the new policy may be analyzed in another study. Their behavior toward continuous assessment could be a form of resistance.<sup>17</sup>

### The Teachers' Response to a Questionnaire

The second category of data were collected with the questionnaire. The data were collected from 17 teachers, fourteen of them were from different schools in Ibadan and three were from Alanamu Secondary School. A description of the same was presented in Chapter 3. A summary of the data is presented in Table 15. The data presented helped to clarify four broad issues namely:

1. The nature of the school level environment in Ibadan schools.
2. Effect of examination and curriculum policy.
3. Teacher's interest in the teaching profession and in chemistry.
4. Pre-service training of teachers.

These issues are discussed in the following paragraphs.

What is the nature of the school environment within Ibadan municipality? The answer to this question is answered by looking at the data collected with the questionnaire.

According to the teachers surveyed, the school administrators in Ibadan support their teachers. Eighty-eight percent of them also said that the educational resources in their schools were adequate. These points reflect two dimensions of Fraser and Rentoul's classification. It follows therefore, that professional interest and achievement orientation exist in Ibadan schools. The achievement orientation is reinforced by the teachers who often coach their students (Table 15) to pass WAEC examinations. The other dimension

TABLE 15

THE TEACHERS' RESPONSE TO QUESTIONNAIRE  
CONCERNING WAEC'S EXAMINATION POLICY  
N=17

<u>Issues</u>	<u>Response (%)</u>	
	Yes	No
1. EFFECT OF THE SCHOOL LEVEL ENVIRONMENT ON TEACHING		
a. School Administration is supportive	58.8	41.2
b. Available educational resources are adequate	88	12
c. Laboratories are well equipped and well maintained	41.2	58.8
d. Teacher freely decides what to teach	70.6	29.4
2. EFFECT OF EXAM POLICY AND CURRICULAR MATERIALS		
a. WAEC Syllabus is a good teaching guide	82.4	17.6
b. Teacher avoids difficult section of the Syllabus	12	88
c. Teacher coaches students to pass WASC exams	70.6	29.4
d. Textbooks match demands of WAEC Syllabus	82.4	17.6
3. TEACHER'S INTEREST IN TEACHING, AND IN CHEMISTRY		
a. Teaching job was easy to find	12	88
b. Loves to teach Chemistry	94	6
c. Easily covered the Syllabus	70.6	29.4
4. PRE-SERVICE TRAINING OF TEACHER		
a. Teacher has a professional teaching certificate	47	53
b. Teacher uses information from other sources apart from the textbook(s) to teach Chemistry	94	6
c. Teacher wants the WAEC Syllabus restructured	23	77

described by the data is teachers' innovativeness. From these data 94 percent of the sample loves to teach chemistry and at least 70 percent of them covered the WAEC syllabus with ease. They must be innovative to accomplish this much in the face of the several problems confronting the teachers. For example 58 percent of the sample said that their chemistry laboratories are ill-equipped. This is one of the potential problems that could hinder effective chemistry teaching.

On the other end of the scale is the freedom assumed by the teachers. Seventy percent of the sample freely decided what to teach. Given that 53 percent of them (Table 15) were not qualified, one should wonder about the instructional content and teaching approaches selected by unqualified teachers who have little supervision. This is where the inspectorate division of the federal and state ministries of education can help policy implementation.

#### An Ethnographical Study of Alanamu Secondary School, Ibadan

The third category of data are the observational notes written during the ethnographic study of the school and classroom level environments at Alanamu Secondary School, Ibadan. This set of descriptive data were used to answer the question about how WAEC's examination policy is implemented at the school and the classroom levels at Alanamu Secondary School.

Background for this question is provided in Chapter 3 which includes descriptive accounts of the infrastructure, and other educational resources available at the school that were noted during the three week ethnographic study of the school between March 23 and May 8, 1987. One week was spent at the beginning of the field research, another week was spent in April, while the researcher spend another one week toward the end of the field research. When the researcher was not at Alanamu School he was either engaged elsewhere in the city attending to other research matters or was in the city of Lagos engaged in activities like collecting artifacts and talking with policy makers.

The following pages contain two tables 16 and 17 of observational notes written during classroom observation at Alanamu Secondary School.

### The Context of the Classes Observed

In the first class recorded in Table 16, Mr. Agbado (pseudonym) wrote the instruction for the practical on the chalkboard. He then asked the students to divide themselves into groups of 2-3 to work on the project. The instruction for the practical is as shown below.

### Experiment

A is a solution containing 1.325g of impure sodium trioxocarbonate (IV) salt in 250cm<sup>3</sup> of solution. B is a solution containing 1.575g<sub>3</sub> of trioxonitrate (V) acid in 250cm<sup>3</sup> of solution. Pipette 25cm<sup>3</sup> of solution A into conical flask till the burrette with solution B and titrate this against solution A in the conical flask. Using methyl orange as



TABLE 16 - FIELD NOTESSUBJECT: ChemistryOBSERVER: DAACLASS: SSS-2TEACHER: MR. Agbado (Psuedonym)

<u>Time</u>	<u>Teacher</u>	<u>Students</u>
	Teacher wrote the instruction for the practical on the chalkboard. Students were divided into groups of 2-3 to work on the project.	The students started their project. Some were writing, some were setting up the apparatus.
8:52	"One person at a time should do the titration."	
8:54	The teacher reprimands a student in Yoruba.	Another student compliments teacher in Yoruba.
8:57	He walks around and reprimands one or two students.	At this point some of the students have gone far with the first titration some were still getting started.
8:59	Advised students to stop when they see the color change.	Some students have seen the color change.  Some students have their burrette tilted some have their burrette at a higher elevation.
9:04		Some have problems.  Students are expected to carry out 4 titrations. Some have done 3 already. Some 2, some 1. Some students are going for just 2 titres only. Students have the freedom to choose the number of titrations to conduct.

TABLE 16 (Cont.)

9:06	He went out of the lab.	
9:12	"Before you start your calculations at all make sure your apparatus is returned."	A group of students (2) have passed the end point and did not know until the observer intervened and stopped them.
9:18	Teacher helps students return the glassware.	Students begin the calculations and group members return apparatus after they have cleaned them.
9:22		3 groups are still titrating.
9:26	"No consultation with anybody. Do your calculations on your own. Not even with textbooks."	
9:30	"There should be no copying of other people's work. Stop where you are stuck, I will explain later."	

Below are the outcomes of the volumetric titration conducted by group no. 1.

## TITRE VALUES

Burette Readings	1	2	3	4
Final	20.1	33.3	41.2	45.0
Initial	0.0	13.0	21.0	25.0
Net Volume	20.1	20.3	20.2	20.0

Average  $20.15\text{cm}^3$

AVE =  $\text{mol}_b = 0.06209$

TABLE 16 (Cont.)

Below are the outcomes of the volumetric titrations conducted by group no. 2.

Burette Readings	1	2	3
Final	21.30	42.60	21.50
Initial	0.0	21.30	0.00
Net Volume	21.30	20.70	21.50

Probing the Teacher by the Observer

Teacher

Observer: What textbook do you use?

Teacher: I do not use a textbook.

Observer: Are you a graduate of University Ibadan.

Teacher: Yes, I graduated in 1973.

Teacher grades some papers.

Comments on students work

1. Not consistent
2. Too high

Students

One of the students shares his book with others in group 2.

TABLE 16 (Cont.)

Below are the outcomes of the volumetric titration conducted by group no. 3.

Burette Readings	1	2	3
Final	19.6	19.5	19.4
Initial	0.0	0.0	0.0
Net Volume	19.6	19.5	19.4
Too low	19.6cm <sup>3</sup>	19.5cm <sup>3</sup>	19.4cm <sup>3</sup>

TABLE 17  
FIELD NOTES

SUBJECT: Chemistry

OBSERVER: DAA

CLASS: JSS-3

TEACHER: Ms. Agbabiaka (Pseudonym)

REVIEW OF EXAM (MID-YEAR)

<u>Time</u>	<u>Teacher</u>	<u>Student</u>
9:00	<p>Q. "How does the ionic bond form?"</p> <p>Q. "How does the co-valent bond form?"</p> <p>The teacher sat on a desk on one side in front of the class.</p>	<p>Several students attempted the questions, by reading their answers in the exam scripts</p>
9:10	<p>Section B #2 group. She asked a female student to attempt it.</p> <p>Another student was asked to read his answers to Q. 2a-f. The papers have been graded by the teacher. The teacher directed, "The multiple choice you'll do the corrections yourselves in your assignment notebook and pass them to me."</p>	<p>The student went to the front of the class to draw the chart and to fill it in.</p> <p>Most of the students were attentive and remain quiet.</p>
9:20	<p>"Now let's go on to the classwork." "Bade to classwork all test papers away," said the teacher to the class and another female student.</p> <p>She wrote a problem example on the chalkboard. (see below)</p>	

TABLE 17 (Cont.)

9:20	"One student will dictate what to do and I will write it on the board and others will affirm or reject."	Student gave definition as shown in step 2 below.
	She ordered the students to write it in their notes.	
9:25	"Example No. 2. Now Adamu its your turn," she said.	Adamu stood up to give the steps for the computation.

PROBLEM EXAMPLESExample 1

Calculate the number of atoms in 2 moles of Carbon.

1. 2C
2. 1 mole C contains  $6.02 \times 10^{23}$  carbon atom
3. 2 moles C will contain  $(6.02 \times 10^{23} \times 2)$  Carbon atom  
 $= 12.04 \times 10^{23}$   
 $= \text{standard form } \underline{1.204 \times 10^{24}} \underline{\text{ C atoms}}$

Example 2

Calculate the number of atoms contained in 0.1 mole Sulphur.

$$\begin{aligned}
 &1 \text{ mole of sulphur contains } 6.02 \times 10^{23} \text{ sulphur atoms} \\
 0.1 &= 0.1 \times 6.02 \times 10^{23} \\
 &\quad .602 \times 10^{23} \\
 &= 6.02 \times 10^{22}
 \end{aligned}$$

TABLE 17 (Cont.)

Example 3

Calculate the number of molecules contained in 2.5 moles of Chlorine gas.

Working

1 mole Cl gas contains  $6.02 \times 10^{23}$  Cl molecules

: 2.5 moles will contain  $2.5 \times 6.02 \times 10^{23}$

=  $15.05 \times 10^{23}$  Cl<sub>2</sub> molecules

=  $1.505 \times 10^{24}$  Cl<sub>2</sub> molecules

Example 4

Calculate the number of atoms contained in 4g of carbon.

Working

Formula mass of C = 12gm.

12gm of C = 1 mole

: 4g =  $1/12 \times 4$  =  $1/3$  mole

1 mole contains  $6.02 \times 10^{23}$

:  $1/3$  mole contains  $1/3 \times 6.02 \times 10^{23}$

=  $2.007 \times 10^{23}$  carbon atoms

Teacher

The teacher assumed the students understood the solutions to these problems. She went on to the 4th example

Who can tell us what to do first?

She called Adamu again. After the calculation she goes on to example 5. (see below)

Students

The students were busy writing down what the teacher has written on the chalkboard.

A student stood up and said, change the gm to moles.

TABLE 17 (Cont.)

The teacher wrote 2 [H] on the chalk board. The symbols [H] was not explained to represent the concentration of the substance hydrogen.

She gave them an assignment.

#### Example 5

Calculate the number of molecules contained in 4g of  $H_2$  gas.

Formula of Hydrogen gas is  $= H_2$

Formula mass is  $2[H] = 2 \times 1 = 2$

2gm of hydrogen molecule - 1 mole

: 4gm of hydrogen molecule -  $1/2 \times 4 = 2$  moles

1 mole of hydrogen gas contains  $6.02 \times 10^{23}$

2 moles contains  $2 \times 6.02 \times 10^{23}$

$$= 12.04 \times 6.02 \times 10^{23}$$

$$= 1.204 \times 10^{24}$$

#### Practice Question

Calculate the number of (a) atoms in 16gm of oxygen gas  
(b) molecules in 71gm of  $Cl_2$  gas.



indicator, find the average volume of Solution B required to neutralize completely 25cm<sup>3</sup> of Solution A.

Using your result:

1. Calculate the molar concentration of the sodium trioxocarbonate (IV) mol/dm<sup>3</sup>.
2. Calculate the concentration of sodium trioxocarbonate in g/dm<sup>3</sup>.
3. Find the percent of purity of the sodium trioxocarbonate (IV).

The context of Ms. Agbabiaka's (pseudonym) class was like any traditional classroom in which the teacher stands in front of the class to teach.

Presented below is a summary of Mr. Agbado's practical lesson from the observer's point of view.

The assignment given to students was straight forward. Students however had problems with the various steps involved. The job was made easier because the teacher had prepared the solution ahead of time for them. All they had to do was to set up the burette and then pipette the 25cm<sup>3</sup> of the Na<sub>2</sub>CO<sub>3</sub>. Students are weak in Maths.

### Problems

1. Some students set up the burette in a slanting position to take some of the readings. Other readings were taken with the burette in a vertical position.
2. Several students were unable to detect the color change early enough until the methyl orange was changed into deep pink color.
3. A few students read the burette at a higher elevation than their eye levels.
4. More than 1/3 of the class did not know how to calculate the percentage impurity.

5. The teacher did not demonstrate the exercise to the students.
6. The teacher expressed a low opinion of the students' ability.
7. The teacher scolded the students severely. Some of them said supportive statements in Yoruba to encourage the teacher.

### The Behavior of Teachers

The students in this class worked in groups of twos and threes. For several obvious reasons instruction in chemistry lessons in this school and elsewhere in Ibadan was not personalized. The situation thus put a limit on student's participation.

Mr. Agbado tried to encourage independence when after the hands-on group work, he ordered the students to do the computation individually (See Table 16).

When the teacher was probed by the researcher concerning the use of textbooks, he said that he did not use the recommended textbook or any textbook for that matter. Observational data showed that he used a book with his classes. The volumetric titration experiment was adapted from a textbook<sup>18</sup> of practical chemistry for General Certificate of Education (GCE) 'O' level. Mr. Agbado tried to present himself as an expert, professional teacher with a wealth of experience. Thus, to admit dependence on a textbook may be perceived by the teacher as a sign of weakness, to be avoided.

Like the teachers at Brookview, England,<sup>19</sup> this teacher considered the preparation of his students for the WAEC's exams a serious matter and an essential service. This is probably why he scolded some students who appeared not to be serious with their assignment during the practical lesson.

The behavior of teachers could be summed up in terms of what activities they engage in inside their classrooms and laboratories -- the way they taught chemistry and the nature of their interaction with the students.

The researcher observed that the teachers used four instructional strategies in teaching chemistry. The strategies include: chalk and talk method, problem solving algorithms, group work, and examinations. These strategies were used interchangeably both in the classrooms and during the practical lessons in the laboratories.

The chalk and talk method, whole class, teacher directed instruction, was predominant at the three levels (classes 3, 4, and 5) of instruction observed at the school.

#### Students Perceptions of the Use of Available Class Time in Chemistry Lessons

The information provided here was collected from the students' response to Instrument No. 3. Ten important classroom activities adapted from Goodlad, 1984<sup>20</sup> were used to construct the instrument. The activities considered were:

- A. Written Work
- B. Being Disciplined
- C. Reading

- D. Use of Audio Visual Aid Equipment (AV)
- E. Preparation for Assignment
- F. Discussion
- G. Test Taking
- H. Watching Demonstrations
- I. Listening to Explanation/Lecture
- J. Free Time

This instrument was developed by the researcher after discussion with Dr. Barry Fraser of Western Australian Institute of Technology at the Michigan State University in 1985. He has done extensive research on classroom environments. He has also developed some instruments for measuring both the school level and the classroom level environments. He however, doubted their applicability in the Nigerian milieu. Fraser left the impression that students are better judges of their classroom climate than any external observer. This idea is also presented in Goodlad's famous book - "A Place Called School . . ."

In view of Fraser's comments, a new instrument was devised in which ten classroom activities were listed. One hundred fifty three students in classes three, four, and five at Alanamu Secondary School were administered the questionnaire. The students were required to rank the ten activities in order of their perceived importance and to estimate the amount of time spent on these activities in a typical class period.

The instrument were administered to 153 students by the class teachers in four classrooms. Table 18 provides some useful information about the time spent on activities

TABLE 18

THE ORDER OF IMPORTANCE OF CLASSROOM ACTIVITIES IN CHEMISTRY  
LESSONS AT ALANAMU SECONDARY SCHOOL, IBADAN

Column #1	Column #2 Classroom Activities	Column #3 Mean of Time Used (Mins)	Column #4 Order of Importance (Mean)	Column #5 Rank of Importance
A	Written Work	23.96	3.74	2
B	Being Disciplined	32.30	6.62	7.5
C	Reading	17.30	5.96	6
D	A.V.	20.78	6.62	7.5
E	Preparation for Assignment	12.84	6.92	9
F	Discussion	18.34	4.26	4
G	Test Taking	24.74	5.62	5
H	Watching Demonstration	21.36	4.06	3
I	Listening to Lecture	23.52	2.96	1
J	Free Time	9.06	8.22	10

and the rank of importance as perceived by the students in classes 3, 4 and 5 at Alanamu Secondary School. Fifty copies of the completed questionnaire were randomly selected<sup>21</sup> by the researcher for this analysis.

The data presented show that the teachers have tried to do several things during their chemistry lessons. The classroom activities listed in Table 18 is a proof that teachers at one time or the other have used a number of them during a lesson.

The record of students' achievements in the WAEC examinations is one of the best in Ibadan. It is most likely that this model of classroom climate is the reason for their success. The teachers gave top most priority to lecturing, which is communicating chemical information to the students. Second, they engaged the students in written work, perhaps some problem in chemistry which could be computational or descriptive. Third, they spent time to demonstrate experiments to their classes. This is an important strategy in situations where equipment and chemical substances are in short supply. The other two important, highly ranked activities are discussion and test taking. The remaining five activities were ranked at the lower wrung of the priority scale. However, one of these attracts some further consideration. This activity is being disciplined. Although it was ranked as 7.5 on the scale it took the highest amount of time (32.30 mins.) whenever it occurred. Almost half of the available time (70 mins.) for teaching chemistry may

be spent on discipline. These data suggest that some students perceived that they are continuously disciplined during the class period. This resulted in (a) a high score for "being disciplined" (Category B) and (b) a total duration of activities which exceeded the length of the class period.

One form of discipline was recorded in Table 16 where the teacher scolded some idle students. Teachers could find other forms of discipline that will not detract the attention of the whole class. The data show that part of the time meant for instruction is given over to classroom control.

#### The Impact of Examination Policy on Teaching

The evidence from the five sources viz., the interviews with educational leaders, the content analysis of documents, the questionnaire for teachers and students, and the field-notes written during the ethnographic study of Alanamu School were combined to present a scenario of the impact of WAECs examination policies on teaching chemistry in Nigerian Secondary Schools. By so doing, the researcher was able to address the main research question of this dissertation which is the following.

How does examination policy influence teaching of chemistry in Nigerian schools? The analysis of the data collected from different sources demonstrated the impact of WAEC's policy on chemistry teaching. At the formal level where textbooks and tests are developed, the response of the

implementing agents appears to be satisfactory. The content analysis data justify this position.

However, a combination of the results of content analysis and classroom observation showed that policy and practice exist as two rather separate entities which do not affect each other significantly. For example, at Alanamu Secondary School, one of the teachers decided not to use the recommended textbook because it has so many pages. This teacher had a phobia for voluminous books. Another teacher did not use any book to prepare his lessons. His own claim was that he earned a bachelor's degree in chemistry, and with so many years of experience in teaching there should be no need to use a textbook to teach ordinary level chemistry. However, in his practical lesson, many of his students could not set up the apparatus in a way to obtain accurate values. The inability of schools and teachers to effectively implement WAEC's policy led many of them to engage in inventing short-cuts which would make their students pass the 'O' level chemistry examinations.

Policy and practice exist as separate entities because of lack of connection between the work of the policy makers and the implementing agents such as school administrators and chemistry teachers. For example, the teachers' lesson plans did not reflect the breadth of objectives found in the WAEC guide syllabi although they claimed it was a good teaching guide. Unlike in England where Her Majesty Inspectors (HMI)<sup>22</sup> observe and evaluate teachers to ensure adequate



implementation of policy, in Nigeria, the role of the inspectors of education appeared to be minimal. More than 70 percent of the teachers surveyed said that they freely decided what to teach without regard for the WAEC guide syllabi.

In the United States of America the federal and state governments have limited control of schools and schooling, control is at the local level. However, the parent-teacher organization (PTO) is a strong force. Parents are actively involved in their children's education. Because the populace of Nigeria does not have the educational level found in advanced nations, Nigeria has decided to utilize a centrally controlled educational system instead of a locally controlled one. Further, Nigeria has to invoke a method to ensure adequate implementation of both the curriculum and examinations policies by the school and the science teachers. This is an issue that the federal and the state ministries of education have to resolve with immediate dispatch in order to guarantee effective implementation of policy.

### Interpretation

The processes which WAEC has in place for formulating and reviewing policy appear to be effective. They permit broad based input from many agencies and groups in the five participating nations as well as from the University of London. Also, within Nigeria and within the 21 states which

comprise the nation, there are parallel organizational structures which foster this input from the many constituents who are affected by the policies which WAEC formulates. It appears that parallel structures also exist in the other four nations comprising WAEC.

This system has resulted in stable educational policy. However, it is often criticized for being too slow to change. A five year time lapse between initiation and implementation of policy changes may be both necessary and desirable given the nature and importance of the educational system to a nation's future.

The WAEC Guide Syllabus in Chemistry serves as a guide for development of the WASC Examinations and is used by groups who prepare educational materials including textbooks. The Syllabi are widely disseminated throughout the nation and are used by some educational officials and teachers as guides for planning programs. Thus these documents have a great influence on teaching practice.

One concern which this researcher raises pertains to the emphasis placed on the various objectives that are presented. Concepts and principles of chemistry and chemical processes received the largest share of emphasis among nine objectives listed. Students' interest and interrelationships among the sciences are given far less emphasis in the syllabus. Results from studies in Nigerian schools showed that teaching practices corresponded to the differential emphasis in the syllabus on several items. If the objectives listed

in the Guide Syllabus are important, why do some receive greater emphasis than others? Also, is the relative frequency of occurrence of mention of particular objectives in the Guide Syllabus a measure of the policy makers intended emphasis in the curriculum? If so, is there a better way to communicate this information to policy users?

However, it is in the area of implementation of policy that most concerns were raised in the mind of this researcher. Observations in classrooms in one of the best schools in the region were somewhat disappointing. Teachers seemed to be limited by lack of materials and supplies. This was supported by 41.2 percent of the teachers from other schools who indicated that equipment and supplies were not adequate for effective teaching. Moreover, in spite of the guidance provided by the Syllabus, 70.6 percent of the teachers surveyed said that they were free to choose instructional content. In addition, there seems to be a belief among well qualified teachers that adherence to the text and syllabus is a sign of weakness. As a result, some of the best qualified teachers appear to be diverting from expected content in this teaching. Also, there seem to be some difficulties with classroom control which interfere with effective teaching.

Many of these problems with implementation appear to arise from inadequate supervision and leadership. The traditional system of inspection appears not to be functioning as it should. Principals appear not to be exerting sufficient

leadership with their staff. Budget for supplies and materials either is not available or it is not being spent appropriately. As a result, the thoughtfully made plans of the WAEC system are not attaining the effects that are intended. This is a serious matter that needs attention from national and state ministries of education as well as other groups throughout Nigeria.

If the results found in this study are generalizable throughout the nation, educational leaders and public officials who are charged with protecting the national welfare should give careful thought to changes needed in implementation of educational policies. The findings of this study will come as no surprise to many in Nigeria who are associated with schools. Thus, these findings should give pause to educational leaders and public officials because so much is at stake that affects the future of our developing nation.

#### A CRITIQUE OF THE DISSERTATION

In this section, the researcher presents a general critique of the entire dissertation. The discussion covers the following issues, rationale for the research, design consideration, liaison and coordination, general approach and uniqueness.

### Rationale

In Nigeria, test scores are used for three main purposes. First, to qualify for promotion from one grade level to another in schools. Second, to satisfy the requirements laid down by the West African Examination Council in order to qualify for employment in the public service. Third, many secondary school students in the country aspire to reach the apex of the national education pyramid. A satisfactory performance in the West African School Certificate examinations strongly determines admission to any post-secondary institution in the country.

This dissertation research was designed to assess how examinations and examination policies currently are affecting the teaching and learning of science in Nigerian secondary schools. This researcher used qualitative research methods which include classroom observation, interviews and review of pertinent literature, and content analysis of documents.

### Design Consideration

The data collection strategies compliment one another thus providing a rich data base used to prepare Chapter Four. The field and classroom observation notes also served as a ready reference for writing up a detailed account of the setting of education at the national level, in Oyo State and within Ibadan municipality.

Without a good design, the field research efforts would have yielded little useful data.

### Liaison and Coordination

This was the most painstaking aspect of this evaluation. The time lag between the initial contacts with the clients in Nigeria, and the time when the field research was undertaken is approximately twenty-four calendar months. The three consultants (see copy of a letter in Appendix J) for this research played significant roles in the process. The researcher maintained communication with interested parties in Nigeria and the United Kingdom. A key public figure in Nigeria eventually coordinated and supervised the field research activities.

### General Approach

Since this dissertation utilized both fixed and emergent designs, it is specified in Chapters One and Three what to expect from the research as a whole. It leaves a large degree of flexibility at each point for changes needed or desired. An important quality of this research design is the multiple strategy used for data collection during the field study. This approach paid off eventually because the "pooled" data presented in this Chapter guaranteed the completion of this dissertation.

### Uniqueness

This study is unique in its general approach. One unique characteristic of the study is its methodology. Ethnography is very different from positivistic techniques in which the researcher formulates his hypotheses before conducting the study. He later goes to the field to collect data to support or falsify the hypotheses. One basic problem with that kind of research is the final arrival at some statistical significance to support the preconceived hypotheses, but might fail to catch important concepts which can be learned by researchers from the participants in a given context.

Willard Wirtz, while discussing education in America, rightly asserted that, "There are many important things that can't be proved, things that statistics won't tell. And there's simply got to be broader attention given to whether we in education and in this society - are putting the right emphasis on the right things."<sup>23</sup>

The richness of the descriptive data presented in this dissertation would have been impossible if this were an hypothesis testing research. For example, the accounts of the process of formulating and implementing examination policy would have been impossible if this researcher used the traditional statistical techniques.

Furthermore, if the researcher had set up dependent and independent variables, viz., the number of chemistry lessons per week versus students' achievement, it would have

been impossible to write a complete story about how WAEC's examination policy affects instructional practice at Alanamu Secondary School.

Although the school has good records of high achievement test scores in WAEC examinations, these data alone would not present the nature of reality as we have learned from this ethnographic study.

Much research has been done in the field of science education in Nigeria, but most of these were conducted within the premise of the positivistic research approach.

Few researchers like Stone,<sup>24</sup> Yolooye,<sup>25</sup> and Weaver<sup>26</sup> used the ethnographic approach.

This study is unique also in its ability to clearly present the milieu of the learning environment, and how policy affects practice. The richness of the descriptive data is simply beyond the reach of positivistic or the statistical methods.



## CHAPTER FOUR NOTES

<sup>1</sup>WAEC, The West African Examinations Council Regulations and Syllabuses for the Joint Examinations for the SC and GCE 'O' Level and for the GCE Advanced Level. Academy Press Ltd., Lagos, Nigeria, 1985.

<sup>2</sup>Ibid.

<sup>3</sup>Ibid.

<sup>4</sup>The Federal Ministry of Education administers two vital advisory bodies - "The National Council on Education (N.C.E.) and the Joint Consultative Committee on Education (J.C.C.). The N.C.E. is a council of the Minister and the State Commissioners of Education, which meet in rotation at the Federal and State capitals to consider current issues on education and make recommendations in the light of the national objectives of education. The J.C.C. is a committee of the professional officers of the Federal and the State Ministries of Education, representatives of the University Faculties or Departments of Education, the Nigeria Union of Teachers and the National Manpower Board. The Committee deliberates on the professional aspects of education such as quality in education, mobility of teachers and pupils, and the education, remuneration and discipline of teachers. It covers education below the university and professional level for which there are other provisions. Like the N.C.E., it meets in rotation at the Federal and State capitals." (Taiwo, C. O., the Nigerian Education System, Past, Present and Future. Thomas Nelson (Nigeria) Ltd., 1980, Chapter 10).

<sup>5</sup>CESAC., CESAC: Its Work. De-Sunshine International Publishing Co., Mushin, Lagos, 1986.

<sup>6</sup>Interview with an official of CESAC, University of Lagos, Nigeria.

<sup>7</sup>Interview with an official, University of London, School Examinations Board (ULSEB).

<sup>8</sup>NSTA, Distinctions Between the Ideal and Actual States of Science Education in American Schools from the Project Synthesis Reports (NSTA, 1983b, p. 1).

<sup>9</sup>Gallagher, J. J. (1984a), A study of policy program formulation and implementation in a secondary school science department. AETS Yearbook, 1984. pp. 153-184.

<sup>10</sup>Interview with an official of ULSEB, London, England, March, 1987.

<sup>11</sup>Ibid.

<sup>12</sup>Ibid.

<sup>13</sup>Adeogun, D., Education under scrutiny. West African Magazine. December 16, 1985, p. 2631.

<sup>14</sup>Hovland, C. I. and Mandell, W., An experimental comparison of conclusion drawing by the communicator and by the audience. Journal Abnormal Soc. Psychology, 1952, 47, 581-588.

<sup>15</sup>Eisner, E. W., The Kind of Schools We Need. Educational Leadership, October 1983, pp. 48-55.

<sup>16</sup>Bloom, B. S., Human Characteristics and School Learning, McGraw Hill Book Company, New York, 1982.

<sup>17</sup>Watchtel, P. L. (ed), Resistance: Psychodynamic and Behavioral Approaches. Plenum Press, New York, London, 1982.

<sup>18</sup>Oriaifo, S. O., Practical Chemistry for G.C.E. Ordinary Level. Evans Brothers (Nigeria Publishers) Limited, 1981.

<sup>19</sup>Scarth, J., Teachers' Attitudes to Examining: A Case Study. In Selection, Certification and Control. Social Issues in Educational Assessment edited by Patricia Broadfoot. The Palmer Press, London & New York, pp. 83-102, 1984.

<sup>20</sup>Goodlad, J. I., A Place Called School: Prospect's for the Future. New York: McGraw Hill Book Company, 1984, Chapter 4.

<sup>21</sup>Rees, D. G., Essential Statistics. Chapman and Hall, London, New York, 1985.

<sup>22</sup>Interview with an official of ULSEB.

<sup>23</sup>Shane, H. G., The Academic Score Decline, Are Facts the Enemy of Truth? An interview with W. Willard Wirtz, Phi Delta Kappan, Vol. 59, No. 2 (1977) pp. 83-86 and 145-146.

<sup>24</sup>Stone, R. H., A Survey of Science Teaching in Nigerian Grammar Schools. Occasional Publication, No. 1, Institute of Education, University College, Ibadan. 1960.

<sup>25</sup>Yoloye, E. A., Some Science Resources in Nigerian Grammar Schools. Occasional Publication No. 7, Institute of Education, University of Ibadan. 1968.

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## CHAPTER FIVE

### SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

#### SUMMARY

This dissertation was designed to study how W.A.E.C.'s examinations and examination policy affect secondary science education in Nigeria. The researcher employed three main sources of evidence for data collection. These include, open-ended interviews, content analysis of pertinent documents and an ethnographic survey of one secondary school in Ibadan, Nigeria.

Relevant information about examination policy and its influence on practice was obtained (1) by interviewing five selected knowledgeable public figures in Nigeria and at the University of London, England; (2) from conversation and interviews with, and questionnaire completed by civil servants, administrators and chemistry teachers within Ibadan municipality; and (3) from questionnaire completed by students enrolled in chemistry classes at one high school. The researcher also conducted an ethnographic survey of the learning environments at this same high school. Field and classroom observation notes together with data collected with three instruments formed the data base for the dissertation.

## Purpose

The main research question of this dissertation is the following: How does examination policy influence teaching of chemistry in Nigerian schools?

Subsidiary questions which were answered include:

1. What are the factors controlling the formulation and implementation of examination policy in Nigeria?
2. What degree of influence does examination policy have on teaching chemistry in secondary schools?
3. What is the procedure for reviewing the WAEC 'O' level syllabus in chemistry?
4. What degree of correspondence exists between the elements which give substance to the curriculum including
  - 4a. curriculum objectives in chemistry.
  - 4b. the contents of textbooks and other instructional materials which are used by chemistry teachers.
  - 4c. IUPAC chemistry textbook.
  - 4d. the WASC 'O' level chemistry examination papers 1 & 2 and
  - 4e. observed contents of instruction in selected classes?
5. How is the WAEC examination policy implemented at the school and classroom levels?
  - 5a. How is the available class time utilized in the chemistry classes at Alanamu Secondary School, Ibadan?
  - 5b. What instructional strategies are employed by chemistry teachers in the school?
  - 5c. What is the quality of the teaching and learning environment in the school?

### Procedure

A tripartite design was used to collect data and subsequently clarify some issues dealing with the impacts of W.A.E.C.'s examination policy on teaching Chemistry in Nigerian secondary schools.

The researcher conducted structured interviews each of which was guided by open-ended questions contained in the interview protocols (Appendix B). Selected public figures in Nigeria and at the University of London were interviewed.

Five documents (WAEC Guide Syllabus for O' level Chemistry 1985/86, the West African School Certificate examination papers 1 and 2 in Chemistry of June 1985, relevant sections of curricular material used for teaching O' level Chemistry, teacher-made tests at Alanamu Secondary School, and a teacher's notes for lessons on hydrogen) were analyzed for their contents referenced to the nine national objectives for teaching chemistry in Nigerian secondary schools. The analysis was based on a conceptual framework adapted from Goodlad et al. (1979).

A survey questionnaire (Instrument No. 2) was field tested at Michigan State University and administered to Chemistry teachers located in four different schools within the city of Ibadan, Nigeria. Seventeen teachers returned these questionnaires.

The researcher also conducted an ethnographic study at Alanamu Secondary School, Ibadan for a period of three

weeks between March and May, 1987. As part of this study, the researcher examined the school level and the classroom level environments. A questionnaire (Instrument 3) was designed and administered to 153 students at Alanamu High School to provide additional evidence about the learning environment at that school.

Qualitative methods were chosen because the main objective was to provide a detailed descriptive account of the context and the research findings. Data analysis included preparation of quantitative data in the form of tables, charts and graphs. Frequencies, averages and percentages along with descriptive data from interviews, observations, conversations, and document review, comprise the data presented in Chapter 3 and 4.

### The Context of Nigerian Secondary Education

As a way of ensuring credibility and stability in the educational system, Nigeria and four neighboring West African nations established and maintained the West African Examination Council (WAEC) in conjunction with the University of London. The organization formulates and disseminates curricular policy and examinations in all of the academic subjects in secondary schools. WAEC operates through a complex network of organization in each of the member nations. In Nigeria, the network has two levels of organization - a Federal organization and a state level organization in each of Nigeria's

twenty one states. This organizational level allows for a two way flow of information and influence. Schools, universities, governmental agencies, labor unions, potential employers of graduates and other groups are able to provide input into WAEC's work in formulating and disseminating policies, syllabi, and examinations. Similarly, the policies, syllabi, and examinations prepared by WAEC influence the educational system at Federal, state, and individual school levels.

WAEC syllabi and examinations provide school officials, teachers, students, universities, and potential employers a clear, uniform statement about expectations. Syllabi and examinations are designed to be congruent. That is, the examinations tests students on the subject matter content defined in the syllabus. Further, it is expected that teachers and students will focus their work in this content. Thus, the intention of WAEC is to give uniform substance to the school curriculum across the five member nations by providing syllabi and examinations which will guide school officials, teachers, and students in their work. Syllabi and examinations do change as new needs arise. However, changes generally require five years from initiation to implementation, providing the educational system with an important element of stability. This allows for broad input from many constituencies prior to decisions on change and broad dissemination to "users" afterward.



The Nigerian government requires a standardized school certificate for those graduating from secondary schools nation-wide. To earn this certificate, students must pass WAEC examinations in required and elected subjects. Scores on WAEC examinations further determine admission to tertiary institutions and selection for available positions in public service departments. Thus, WAEC has significant impact at many levels throughout Nigeria.

### Research Findings

Content analysis of the five pertinent documents gave some important insights regarding communication between those who established policy and teachers who implement it.

First, nine objectives of chemistry education were portrayed in the WAEC Guide Syllabus. These represented a broad scope of intention for chemistry education. Not all objectives were given equal emphasis. For example, chemical processes and concepts and principles of chemistry were strongly emphasized whereas students' interest in chemistry received very little attention in the syllabus. The emphasis of objectives of chemistry education portrayed in the WAEC chemistry examination differed somewhat from those in the syllabus, but the general intention appeared to be carried out. However, there were some differences in degree of emphasis of some objectives.

The objectives of the IUPAC chemistry textbook which is widely used by chemistry teachers in Nigeria also differed somewhat from those in the WAEC Guide Syllabus but the variation with the WAEC chemistry examination was somewhat more pronounced.

Second, tests prepared by classroom teachers were clearly aligned with objectives portrayed in WAEC examinations but did not reflect syllabus or textbook objectives with as much accuracy. Again, the differences were in the degree to which each of the objectives were emphasized. Thus it appeared that examinations are a better device for communicating objectives of instruction to teachers than are either syllabi or textbooks.

Third, data from observation of chemistry classrooms and teachers' classroom notes which were used to guide instruction represented a very narrow portrayal of the objectives of instruction. Since the teachers' practices in classes and their notes represented a selection of material from the adopted text and supplemental text, data from this analysis show that teachers' choices of content tended to focus on concepts and principles of chemistry and to ignore the broader range of objectives of chemistry education.

The data suggest that examinations play a very important role in communicating the intentions and objectives of chemistry education in a manner that are difficult for teachers to ignore in the long run; whereas, teachers can ignore significant parts of the information contained in syllabi and

textbooks since there is no direct accountability pertaining to these guides as there is with examinations.

Additional research findings are listed below. The findings are arranged in the order of appearance of the research questions (to which they correspond) presented earlier in this chapter.

### Summary of Research Findings

1. In Nigeria, formulation of examination policy is a national assignment carried out by policy actors which include: the Joint Consultative Committee on Education, the National Council on Education, agencies of the state and federal governments, for example, Nigeria Educational Research Council and Comparative Education Studies and Adaptation Center, representatives of the state ministries of education, universities, colleges, state chambers of commerce and the teachers' union.

2. Information about WAEC's policies or changes in policies normally is prepared in the printed form and disseminated nation-wide to implementing agents, for example, school administrators and science teachers.

3. A new syllabus takes 2-3 years to prepare and about five years before it can affect WAEC examinations, due to the complex structure of WAEC organization operating in five countries in West Africa, the desirability of broad based input prior to decisions about changes and the need for

adequate dissemination and adjustment among teachers and other school officials.

4. WAEC's examination policy in Nigeria is influenced by two competing agencies of the government for example, Nigeria Educational Research Council and the Comparative Education Studies and Adaptation Center. These agencies work very closely with WAEC.

5. WAEC officials stated that there is need to increase research activities in the WAEC. Each activity should be designated to a specific research team. For example, one team can handle development issues, while another research team can deal with public relation matters.

6. According to those most closely associated with WAEC, the operation of WAEC has become rather complex thus increasing the need for computer hardware and softwares, which would facilitate WAEC's operation in Nigeria. This is in order because the entry figures and the total number of students who sat for WAEC's examinations have more than doubled in the last decade. Computer application should aid the operation of several divisions of the organization.

7. According to WAEC officials the chief examiners of WAEC should have a number of qualities which include the capacity to undertake quantitative analysis of WAEC's examinations, marking schemes and scripts, including pretest and post-test item analysis to establish difficult indexes, for the items and improvement of the quality of the methods of reporting WAEC's examination results.

8. According to many people interviewed, WAEC's academic standards are internationally recognized, but maintenance of standards is threatened by a lack of a fool-proof system of providing security for examinations in Nigeria. There has been leakages of examinations at school, in transit, in examination centers and in banks.

9. The goals of chemistry education as defined by the syllabus are broad and appear to have a dual orientation. First they appear to be directed toward development of scientific literacy. The greatest emphasis is placed on development of understanding of concepts and principles of chemistry, but other goals direct attention toward understanding of chemical processes, the applications of chemistry to life and logical thinking which also contributes to a broad understanding of chemistry as well as the development of higher order thinking. In addition, chemical processes are included in the syllabus as a way of helping students relate chemistry to potential employment opportunities.

10. Content analysis data showed that the teachers paid more attention to WAEC examinations as they planned their assessments of students' learning than to the syllabus or the IUPAC textbook.

11. The schools in Ibadan area have a strong orientation toward high academic achievement for their students. Good performance is probably guaranteed by having specialists in chemistry to teach the subject at the high school level. Some chemistry teachers have higher degrees or post-graduate

diplomas in education. This characteristic of Ibadan schools enhances their professional outlook.

12. Many teachers assumed unlimited freedom to decide what they teach. About 71 percent of the sample said that they have this freedom in their schools. This finding raises questions about lack of supervision of teachers by school administration and supervising staff.

13. Most of the chemistry teachers in Ibadan area used the WAEC Guide Syllabus to plan their chemistry lessons. About 82 percent of the sample endorsed the WAEC syllabus as a good teaching guide.

14. About half of the chemistry teachers surveyed are underqualified. Given the lack of supervision and perceived freedom in selecting instructional content, educational officials can expect problems unless concerted action is taken.

15. Lack of adequate educational resources such as laboratory equipment and crowding in school laboratories has resulted in infrequent use of laboratory work as part of instruction in chemistry.

16. Observational data in classrooms and data from students' questionnaires show that teachers use a narrow repertoire of teaching strategies. Students have limited opportunity for practical work or for reflective discussion. Most instruction is didactic.

17. Observational and interview data in schools and classrooms showed that the WAEC examination along with the

limitations on supplies and laboratory space had a strong influence in teaching practices.

## CONCLUSIONS

Data from the study suggest that examinations constitute a more effective device for communicating instructional intentions than either syllabi or textbooks. However, data also show that teachers acting without adequate resources and supervision frequently select instructional content and methodology that are inappropriate for the attainment of the intended objectives of secondary school chemistry. The conceptual content of chemistry receives most attention from teachers while laboratory work, higher order reasoning, and positive attitudes toward chemistry are virtually ignored by teachers even in the best schools. Behaviors represented in the syllabus are also under-represented in the classroom. The teacher dominates his or her classroom thus functioning as an active participant whereas, the students who are being trained continued to be passive observers in the classrooms. Students who are supposed to acquire manipulative skills are deprived the opportunity because of the strict and limited classroom environment.

In the last decade, the WAEC organization has grown larger and its services also have grown larger and more complex. To handle increased demands, WAEC officials see the

need to use computers to improve test development and administration, and subsequently, WAEC's service to the students and other users of test results.

This study adds evidence about the importance of the WAEC system in Nigerian education. WAEC is an important force for quality and stability. While a gap exists between policy and practice, the WAEC examination program, stimulates inclusion of broader objectives of chemistry education than would occur if teachers were permitted to make their own decisions on instructional content. Moreover, WAEC sets standards of quality and breadth of coverage of chemistry content.

## RECOMMENDATIONS

1. The research showed that the teaching of chemistry in the schools studied requires some form of intervention. More supervision of teachers is needed to ensure adequate attention to laboratory work, difficult content, and high level objectives.

2. There is a need to make the teaching and learning of chemistry both meaningful and interesting in schools. This is substantiated by the content analysis data presented in section I of Chapter four. Content analysis indicated the need for the policy makers to provide the opportunity for chemistry teachers to broaden their orientation from



heavy emphasis on principles and concepts of chemistry to application and higher order thinking.

3. The situation calls for certain pragmatic actions on the part of policy makers to improve chemistry education in secondary schools. At least two avenues of improvement may be explored. First, the Federal Ministry of Education should find ways to improve the teaching and learning of English language and mathematics in secondary schools. The ministry should also provide adequate resources for chemical education in secondary schools nation-wide so that students can engage in laboratory work in chemistry and be taught by qualified teachers.

4. The study showed that both WAEC's organization and operation have grown larger and complex. For these reasons, there is need to introduce computer hardware and software into WAEC's operation to facilitate its research activities and improve the quality of its service to the Nigerian populace.

5. Computer applications in the WAEC would enhance security when students sit for examination. For example, students could be randomly assigned to one of the several parallel tests available at a sitting. Students who fail and wish to retake such examinations could do so at an earlier time. Computer usage could speed the scoring of examinations and reporting of results to students and other agencies.

6. To avoid duplication of efforts, the two competing agencies of the government working rather closely with WAEC

should specialize. That is the Nigeria Educational Research Council and the Comparative Education Studies and Adaptation Center should focus their research activities in different areas. For example, one can specialize in elementary science education, and the other in secondary science education.

7. The Ministry of Education, supervisory staff, professional organizations, and other groups should give attention to assuring congruence between the WAEC guide syllabus and examinations on one hand and instructional materials and classroom practices on the other. Textbooks should coincide with syllabi and examinations. Teaching practices in classrooms and laboratories should be directed toward attainment of the objectives of instruction. Supervision should be strengthened to support teachers in implementing policies effectively.

8. WAEC should give attention to the emphasis on different objectives in its syllabus and examinations. Nine objectives receive quite different emphasis in WAEC's documents. Is this difference accidental or intended? How should intention of differential emphasis on different objectives be conveyed to teachers, supervisors, and students? These questions need attention by WAEC staff and those who advise them.

9. WAEC is an effective organization because of its responsiveness to input from its constituents. This author encourages continuance of this responsive quality.

## APPENDICES

APPENDIX A

NIGERIA: LOCATION MAP  
AND BACKGROUND INFORMATION

PLEASE NOTE:

Copyrighted materials in this document have not been filmed at the request of the author. They are available for consultation, however, in the author's university library.

These consist of pages:

165-169

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University  
Microfilms  
International

300 N. ZEEB RD., ANN ARBOR, MI 48106 (313) 761-4700

# APPENDIX A

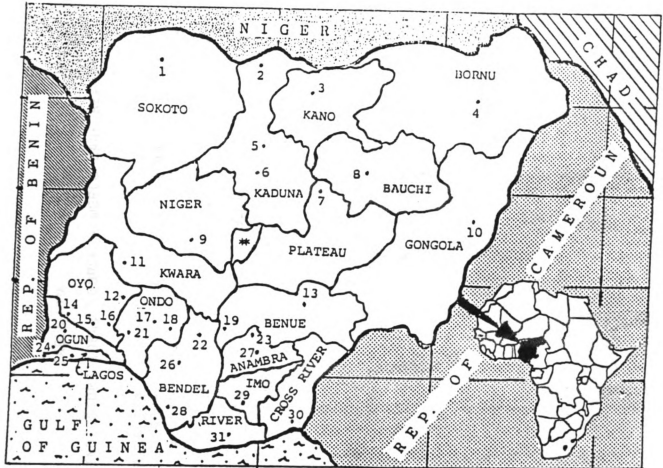


FIGURE 4 - Map of Nigeria with States and Post Secondary Institutions for Engineering and Technology.

\*\*Federal Capital Territory

Source: Work et al (1982).

TABLE 19

## NIGERIA, BASIC INDICATORS 1984; SOURCE - WORLD BANK REPORT

	GNP PER CAPITA	Population (Mill)	AREA
	1960-82	Mid '82	Km <sup>2</sup> x 1000
	\$		
(H) Netherlands	10,930	14.3	41
(M) Nigeria	860	90.6	924
(L) Tanzania	280	19.8	638

## GROWTH OF PRODUCTION

	GDP	AGRIC.	INDUSTRY
	1960-70	1960-70	1960-70
	1970-82	1970-82	1970-82
Netherlands	5.2	2.8	6.8
Nigeria	3.1	-0.4	14.7
Tanzania	6.0	--	--

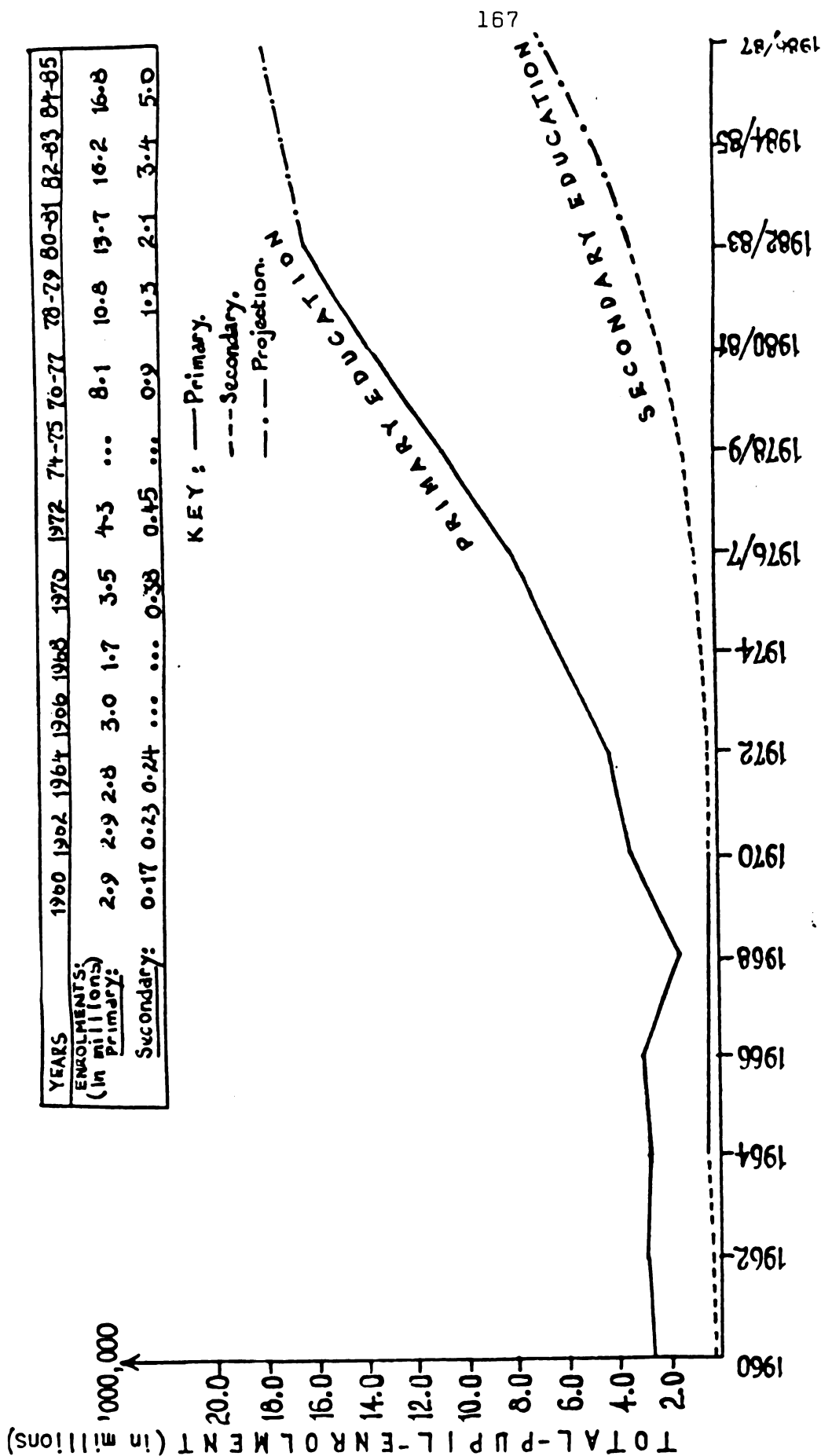


Figure 5 - Trends in the Growth of School Enrollments at Primary and Secondary Levels of Education, 1960 to 1984

SOURCE: FME - 1985.



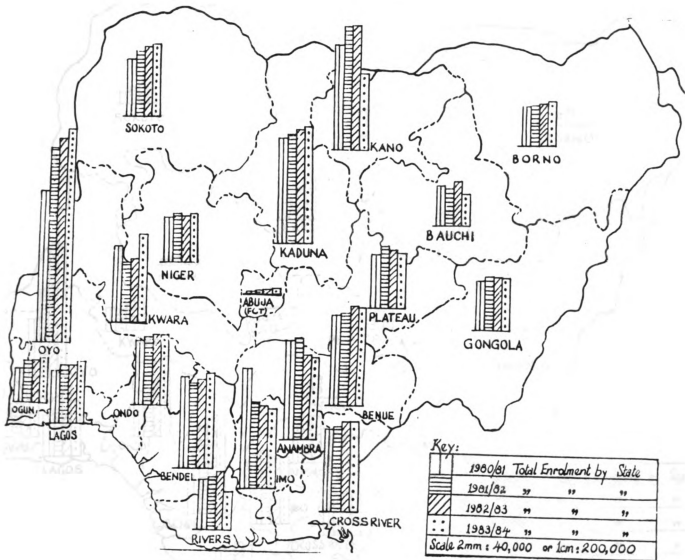


Figure 6 - Trends in the Growth of School Enrollments  
at Primary Level of Education,  
1980-1984

SOURCE: FME - 1985.

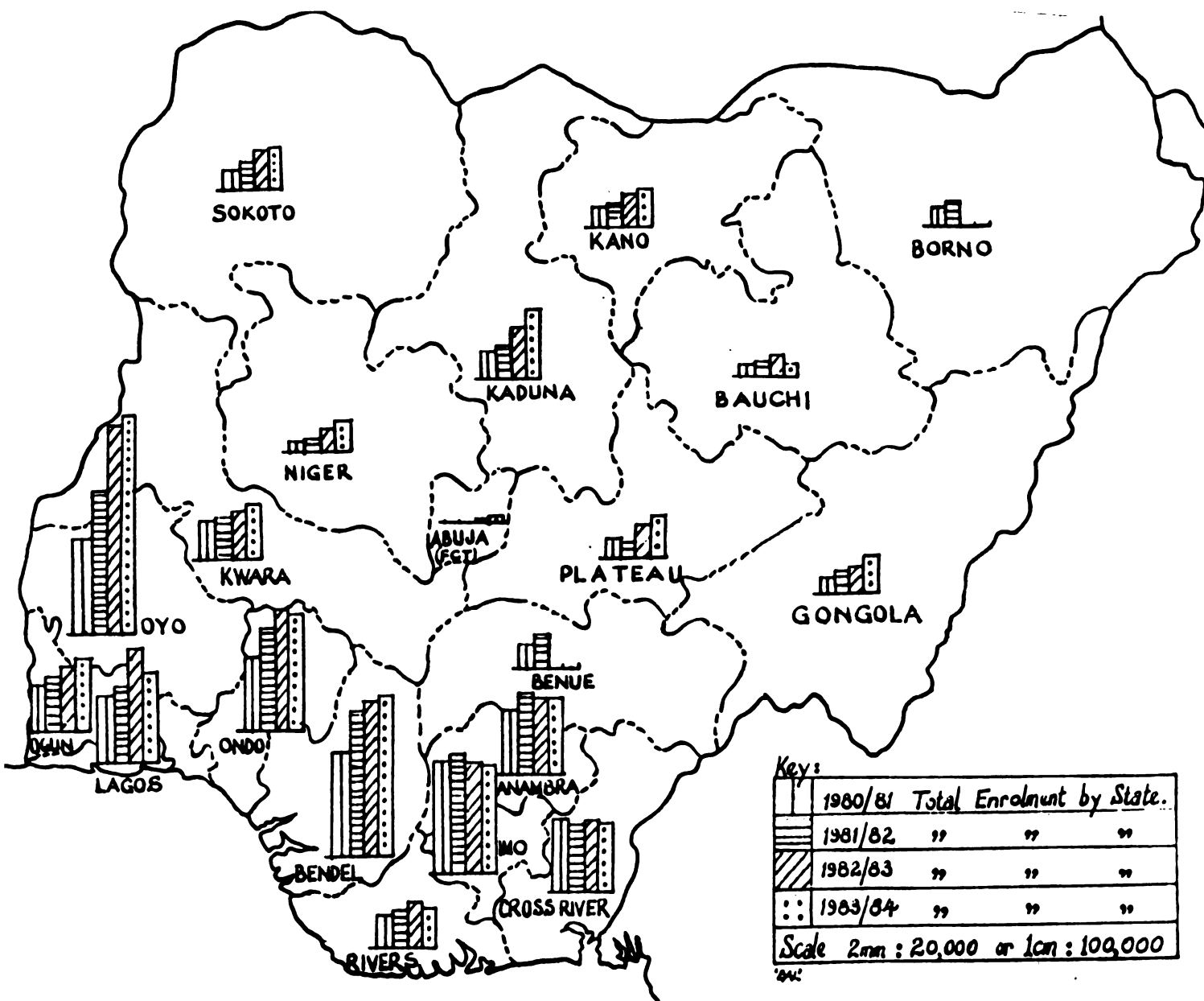


Figure 7 - Trends in the Growth of School Enrollments  
at Secondary Level of Education,  
1980-1984

SOURCE: FME - 1985.

APPENDIX B

INSTRUMENTS

NO. 1 2, and 3

APPENDIX B

INSTRUMENT - NO. 1

INTERVIEW PROTOCOL - I

PERCEPTIONS OF SELECTED PUBLIC FIGURES AND  
INSPECTORS OF EDUCATION ON THE ROLE OF THE WEST AFRICAN  
EXAMINATIONS COUNCIL, THE FORMULATION AND IMPLEMENTATION  
OF EXAMINATION POLICY, AND REVIEW OF W.A.E.C.

GUIDE SYLLABUSES IN NIGERIA

THE ROLE OF THE W.A.E.C.

1. What in your opinion is the function of WAEC vis-a-vis the educational objectives of Nigeria?

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2. How well do you think WAEC has performed this role? Explain.

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3. A school of thought has expressed the opinion that WAEC has outlived its usefulness. Do you agree with this view? Explain.

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4. What do you consider the most important factors controlling the operation of WAEC in Nigeria?

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5. Why do you consider the above as the most important factors?

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FORMULATION OF EXAMINATION POLICY

6. Who are the authorizing agents of examination policy?

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7. What criteria are used in selecting the authorizing agents?

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8. What is the process of formulating WAEC examination policy?

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9. What factors are considered in setting examination standards

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10. How reasonable are the WAEC examination standards? Would you say that they are adequate or inadequate for the systematic conduct of education in Nigeria? Explain.

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IMPLEMENTATION OF EXAMINATION POLICY

11. What is the pattern of communication between WAEC and stakeholders of examination policy; viz governments, private agencies and schools?

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12. Who are the implementing agents of policy, and what is the nature of their job?

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13. How will you describe implementation of examination policy at the school level?

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14. What are the impacts of examination policy on teaching, and students' achievements in the WAEC 'O' level standardized examinations in Chemistry as an example?

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15. How will a change in examination policy affect schooling in Nigeria? For example, how will it affect instructional practice and learning in general?

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#### REVIEW OF WAEC GUIDE SYLLABUSES

16. What are the conditions for scheduling a review of WAEC Guide Syllabus in a science subject like Chemistry?

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17. Are the conditions the same for all academic subjects, or are there certain exceptions to the rule?

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18. Who initiates the review process?

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19. How is a review panel constituted; and what is the length of their tenure of office?

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20. What are the criteria used to select panel members?

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21. What is the general format for reviewing the syllabus in chemistry?

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22. What is the procedure for communicating changes in the syllabus to the stakeholders of examination policy?

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INSTRUMENT - NO. 2

PERCEPTIONS OF CHEMISTRY TEACHERS AND INSPECTORS  
OF EDUCATION ON THE IMPACTS OF THE WAEC EXAMINATION  
POLICY, CURRICULAR MATERIALS AND SCHOOL LEVEL  
ENVIRONMENT ON TEACHING CHEMISTRY IN NIGERIAN SCHOOLS

Part - I - DEMOGRAPHIC DATA

Instructions: Place a check mark ( ) next to the answer that best describes your response to each statement.

1. My position and year of experience in this position are:

Position	New (1st Year)	2-3 Years	4-7 Years	More than 7 years
Science Teacher	___	___	___	___
School Principal	___	___	___	___
Inspector of Education	___	___	___	___
Other	___	___	___	___

2. Nationality

\_\_\_ Nigerian

\_\_\_ Non-Nigerian

3. Qualification

Degree	Major	Date
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Intermediate College Diploma

Bachelor's

Master's

Doctorate

Other (specify)

Part - II - THE IMPACT OF WAEC GUIDE SYLLABUS

Instructions: Please rate on a scale of 1-5 your response to each of the following questions. Where 1 - strongly disagree, 2 - disagree, 3 - no opinion, 4 - agree, and 5 - strongly agree. Place a check mark ( ) in the column that best describes your response.

	$\frac{SD}{1}$	$\frac{D}{2}$	$\frac{N}{3}$	$\frac{A}{4}$	$\frac{SA}{5}$
1. I am a teacher because it was the easiest job to find.	_____	_____	_____	_____	_____
2. I am a chemistry teacher because I love to teach chemistry.	_____	_____	_____	_____	_____
3. On a scale of 1-5 (highest) I would rate my interest in teaching as	_____	_____	_____	_____	_____
4. WAEC Guide Syllabus has no influence on my style of teaching.	_____	_____	_____	_____	_____

Part - III - IMPLEMENTATION OF POLICY

Instructions: Please rate on a scale of 1-5 your response to each of the following questions. Where 1 - strongly disagree, 2 - disagree, 3 - no opinion, 4 - agree, and 5 - strongly agree. Place a check mark ( ) in the column that best describes your response.

	$\frac{SD}{1}$	$\frac{D}{2}$	$\frac{N}{3}$	$\frac{A}{4}$	$\frac{SA}{5}$
1. WAEC Guide Syllabus is inadequate for anyone to teach chemistry effectively.	_____	_____	_____	_____	_____
2. I often find it easy to cover the syllabus on each topic in teaching 'O' level chemistry.	_____	_____	_____	_____	_____
3. I sometimes leave out some sections of the syllabus while teaching a particular topic.	_____	_____	_____	_____	_____
4. I leave out those sections that are difficult for me to teach.	_____	_____	_____	_____	_____
5. The avoidance of certain sections of the syllabus affects the performance of my students on the WASC.	_____	_____	_____	_____	_____
6. I always coach my students to pass the WASC examination in chemistry	_____	_____	_____	_____	_____
7. I was properly trained to teach all the contents of the WAEC Guide syllabus in Chemistry.	_____	_____	_____	_____	_____

- |  |       |       |       |       |       |
|--|-------|-------|-------|-------|-------|
| 8. I support the view that the WAEC chemistry syllabus be restructured to make the load of the teachers lighter. | _____ | _____ | _____ | _____ | _____ |
| 9. The textbooks are very useful for planning chemistry instructions.  | _____ | _____ | _____ | _____ | _____ |
| 10. The contents of the book(s) meet the requirements of WAEC Guide Syllabus.                                    | _____ | _____ | _____ | _____ | _____ |
| 11. I use other materials apart from the textbook(s) and teachers guide to plan my lessons.                      | _____ | _____ | _____ | _____ | _____ |
| 12. I simply follow the WAEC Guide Syllabus when teaching.   | _____ | _____ | _____ | _____ | _____ |

INSTRUMENT NO. 3

PERCEPTIONS OF STUDENTS ON THE PRIORITIZATION  
OF CLASSROOM ACTIVITIES AND THE USE OF  
AVAILABLE CLASS TIME IN CHEMISTRY AT  
THE INTERNATIONAL SCHOOL, IBADAN.

RANK ORDER OF ACTIVITIESINSTRUCTION:INSTRUMENT - NO. 3\*

Arrange the following classroom activities in their order of importance in your chemistry lessons and or practicals. In the space provided indicate the amount of available class time spent on each activity.

- |                                      |                                       |
|--------------------------------------|---------------------------------------|
| A. Written Work                      | F. Discussion                         |
| B. Being Disciplined                 | G. Taking Test                        |
| C. Reading                           | H. Watching Demonstrations            |
| D. Use of Audio Visual Aid Equipment | I. Listening to Explanations/Lectures |
| E. Preparation for Assignment        | J. Free Time                          |

COLUMN:

<u>1</u> <u>CLASSROOM ACTIVITY</u>		<u>2</u> <u>TIME SPENT ON ACTIVITY</u>	
1. _____	6. _____	1. _____	6. _____
2. _____	7. _____	2. _____	7. _____
3. _____	8. _____	3. _____	8. _____
4. _____	9. _____	4. _____	9. _____
5. _____	10. _____	5. _____	10. _____

PERSONAL DATATODAY'S DATE:YOUR NAME:YOUR AGE:PLEASE CIRCLE ONE:      MALE OR FEMALEYOUR CLASS:NAME OF YOUR SCHOOL:



## APPENDIX C

INFORMED CONSENT DOCUMENT,  
LETTER TO THE PRINCIPAL AND  
LETTER TO CHEMISTRY TEACHERS

## Letter to the Principals

March 1987

Dear Sir/Madam:

As part of my doctoral dissertation research at Michigan State University, I am conducting a study of the impact of WAEC's examination policy on the teaching of chemistry in some Nigerian secondary schools. Your school has been suggested as a good one for this study.

We would like to collect a set of data which include the following: First, your school records of students' performance in the West African School Certificate (WASC), 'O' Level Chemistry between 1976 and 1985, inclusive; and the Mock WASC examination papers in Chemistry for 1985 or 1986. Second, observe your chemistry laboratory or laboratories to see what resources are available for teaching chemistry. Third, observe one chemistry class at each level of your senior secondary school (ie., SS-1 to SS-3) for a period of 1-3 weeks.

Any information collected from this study will be treated as privileged information. The names of your school, staff and students will not appear in any report of this study.

I am hereby seeking your permission to work in your school. Please complete the authorization form below. I will collect it along with the authorization from your teachers after five working days. Thank you.

Yours Sincerely,

*David Alao*

David Alao  
c/o Institute of Education  
University of Ibadan  
Ibadan, Nigeria

-----  
Detach here

Detach here

### Authorization Form

I, \_\_\_\_\_, the principal of:

Name of School: \_\_\_\_\_

Address: \_\_\_\_\_

approve that Mr. David Alao (the principal investigator of the above named research) and his field assistants can work in my school under the conditions stated above. I recognize that I may withdraw from this study at any time without penalty.

Date \_\_\_\_\_ 1987

\_\_\_\_\_  
(signed) School Principal or  
Representative

# Informed Consent Document

March 1987

Dear Respondent:

As part of my doctoral disseration research at Michigan state University, I am conducting a study of the impact of the West African Examinations Council's (W.A.E.C.) examination policy on the teaching and learning of chemistry in some of the Nigerian Secondary Schools.

You are one of the public figures selected to serve as informants for this policy evaluation research. There are no right and wrong answers to the open-ended questions in this interview. Your opinion is all that is needed.

Any information collected from this study will be treated as strictly confidential. Your name and the organization you represent will not appear in the report of this study.

Please complete the Informed Consent Document below before we proceed with the open-ended interview. Thank you.

Yours Sincerely,

*David Alao*

David A. Alao  
c/o Institute of Education  
University of Ibadan  
Ibadan, Nigeria

-----  
Detach here

Detach here

## Informed Consent Document

I, \_\_\_\_\_

Title \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

hereby declare that I understand the nature of Mr. David Alao's investigation. That I willingly opted to serve as a respondent for this study. I recognize that I may withdraw from this study at any time without penalty.

\_\_\_\_\_ Date \_\_\_\_\_ 1987  
(signed) Respondent

## Letter to Chemistry Teachers

March 1987

Dear Teacher:

As part of my doctoral dissertation research at Michigan State University, I am conducting a study on the impact of WAEC's examination policy on teaching chemistry in Nigerian schools.

One of the activities of this study is the observation of chemistry classes and practicals.

I am hereby seeking your permission to observe your classroom and laboratory lessons for a period of 1-3 weeks.

Our aim is to understand how the WAEC's examination policy affects teaching. The observer (the researcher or one of his field assistants) will sit at the back of your classroom. He or she will not interfere with your lessons. During one of our visits, the observer may schedule to meet with you to hear your own views about how WAEC's policy affects your teaching of chemistry.

The purpose of this letter is to obtain your permission to observe your classes (lessons and practicals) and to carry out the research as stated above.

Thank you for your cooperation.

Yours Sincerely,

*David Alao*

David Alao  
c/o Institute of Education  
University of Ibadan  
Ibadan, Nigeria

-----  
Detach here

Detach here

### Authorization to Observe Chemistry Classes

I, \_\_\_\_\_ approve that Mr. David Alao (the principal investigator) or any of his field assistants may carry out their study as explained above. I recognize that I may withdraw from this study at any time without penalty.

Address: \_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
Signature

Date \_\_\_\_\_ 1987

Please detach this form and return it to the principal's office within five working days. Thank you.

## APPENDIX D

### PANEL OF EXPERTS

APPENDIX D

PANEL OF EXPERTS

Members were drawn from the College of Education, Michigan State University, East Lansing.

1. Professor James J. Gallagher
2. Dr. Robert Liske
3. Mr. David Cline
4. Mr. Armando Contreras
5. Mr. Ribhi Abri Isneineb
- \*6. Mr. David Eichinger

\*He was the second analyst for the contents of pertinent documents.

APPENDIX E

CONTENT ANALYSIS WORK-SHEETS  
FOR THREE DOCUMENTS

TABLE 20

TEXTBOOK, CHEMISTRY: A NEW CERTIFICATE  
APPROACH - CHAPTER 13

TOPIC: HYDROGEN

<u>SECTION</u>	<u>OBJECTIVE #</u> *
A. Experiment 13.3	1, 3
Experiment 13.4	3, 5
Student Experiment 13.5	3
Demonstration Expt. 13.6	3, 5
Properties of Hydrogen	2, 2, 2, 5, 5, 5, 5, 5, 5,
B. Oxygen & Hydrogen as Reagents	6, 6
Commercial Preparation and Uses of H <sub>2</sub> and O <sub>2</sub>	6, 6 5 9
C. Questions: End of Chapter 13.	
1	5
2	7
3	7
4	7

\*Presented in Chapter 3.



TABLE 20 (Cont.)

SUMMARY

<u>Objectives*</u>	<u>Counts</u>
1	1
2	3
3	4
4	0
5	10
6	4
7	3
8	0
9	1
	<hr/>
TOTAL	26

\*Presented in Chapter 3.

DOC #4SECOND ANALYST

TABLE 21

TEXTBOOK: CHEMISTRY : A NEW CERTIFICATE APPROACH  
pp. 118-122

## I. HYDROGEN (p. 118)

Experiment 13.3 - 3,\* 5, 7

Experiment 13.4 - 3, 5, 7

Student Experiment 13.5 - 3, 5, 7

Demonstration Experiment 13.6 - 3, 5

Properties of Hydrogen - 5

## II. OXYGEN AND HYDROGEN AS REAGENTS

Commercial preparation of oxygen - 3

Uses of oxygen - 6

Commercial preparation of hydrogen - 3

Uses of hydrogen - 6

## III. QUESTIONS

#1 3, 5

2 3

3 3, 5, 9

4 3, 5, 9

\*The numerals indicate objectives which are in Table  
7 of Chapter 2.

TABLE 21 (Cont.)

SUMMARY

<u>Objective #</u> *	<u># of Responses</u>	<u>%</u>
1	0	0
2	0	0
3	10	40
4	0	0
5	8	32
6	2	8
7	3	12
8	0	0
9	2	8

\*Presented in Chapter 2 (Table 7).

FIRST ANALYST

TABLE 22

TEACHER'S NOTE OF LESSON ON HYDROGEN CLASS 4,  
A.S.S., IBADAN

<u>SECTION</u>	<u>OBJECTIVE #</u> *
HYDROGEN	
1. Occurrence	5
2. Method of Preparation	3, 5
3. Properties of Hydrogen	5
4. Uses of Hydrogen	3, 5, 6
5. Acids and Hydrogen	5, 6
6. Bases and Hydrogen	5
7. Salts and Hydrogen	5
8. Indicators	5

\*Presented in Chapter 3.

FIRST ANALYST

TABLE 22 (cont.)

SUMMARY

<u>Objective #</u>	<u>Counts</u>	<u>%</u>
1	0	0
2	0	0
3	2	16.67
4	0	0
5	8	66.67
6	2	16.67
7	0	0
8	0	0
9	0	0
	<hr/>	<hr/>
TOTAL	12	100

## APPENDIX F

### ACKNOWLEDGEMENTS

## APPENDIX F

### ACKNOWLEDGEMENTS

The completion of a dissertation leaves the researcher with a heavy feeling of gratitude and indebtedness to a large number of people and institutions who have assisted one way or the other during the course of the study.

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I wish to recognize three people who made significant contributions toward my early childhood education. Chief

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