

PIAGETIAN TESTING OF AN INTERNATIONAL
STUDENT POPULATION IN ZARIA, NIGERIA

by

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For my
grandchildren
Mathew and Camille

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Chapter 1

INTRODUCTION

Nature of the Study

This study was carried out in Nigeria, the most populous country in Africa, south of the Sahara Desert, located on the west coast in the eastern corner above the Gulf of Guinea (Appendix A).

Nigeria, like many Third World countries is in a state of transition in developing and becoming Westernized. This in turn has its effects upon school children. Westernization has a tendency to develop

a permanent urban dweller who has no desire to return to his rural village of origin, even periodically or after retirement. He is careful to chose a profession that will not require him to be transferred to work in rural areas. He makes sure by all available means at his disposal to be transferred to another urban area if he must be transferred at all. He has lost touch with his kinship in the rural areas (Oshuhor, 1976).

The study reported in this thesis was concerned with the administration of the Piagetian conservation tasks in Zaria Children's School, a small private institution of elementary education in northern Nigeria. The school was originally established to meet the educational needs of the expatriate community (mainly British) stationed in Zaria. Upon retirement of the original owner (Mrs. Iris Dexter) the school was acquired by an Educational Trust in 1967 on behalf of the

parents of the students. The Constitution stated the purpose of the school was:

. . . to provide a nonprofit making basis for the education up to secondary school entrance of children of either sex without restriction to race, tribe, religion, language, place of birth and without restriction as to the political or other beliefs of the parents.

By demolishing the old inadequate structure and constructing modern classrooms, the Trust was able to provide for the education of a larger number of students. Earlier, Independence from Great Britain (1960) had resulted in an increase of the nationalities of expatriate children attending the school. As the government policy of indignization gathered momentum, the number of Nigerian students increased, a growing number of whom were below the standard maintained at the school, were coming into contact with British system of education first time, or who were English-deficient. There still remained a diversity of fluctuating nationalities.

In brief, the school was being asked to educate an increasingly diverse population of students while retaining a curriculum comprised of western concepts taught mainly by expatriate teachers with English as the language of instruction. This situation posed a number of problems such as the placement of certain groups of students, language differences and instructional techniques. A reevaluation of the existing remedial instruction became necessary in order to provide programs for students who required greater preparation and more intensive groundwork in order to achieve minimal standards of

their respective classes.

The school thus became a common but ever changing meeting place for children of many but varied ethnic groups and nationalities. They moved between two distinct cultures with different physical and intellectual environments, with varying language constructs and tonal inferences. The lines of demarcation were clearly established by the ringing of the school bell.

Diversity in the Zaria Population

1. Expatriate students. Expatriate children attending the school came from many different countries. The types of nationalities varied and mostly depended upon the foreign aid contracts established by the Nigerian government, commercial companies and other institutions.

Within their homes the expatriate families maintained their national way of life, speaking their primary language and wearing the costume of their country. They preferred their own type of cuisine and adapted the recipes to include the local products. These could be bought in the open markets where the price was determined by haggling or in the supermarkets which, while small in comparison with those in Western countries, were opening throughout the country. These were mainly run by the Lebanese community. Items sold in the supermarkets were packaged, imported and were more expensive. Traders selling Nigerian artifacts visited the homes and again prices were determined by lengthy discussion.

The expatriate child became used to observing many daily occurrences which would be unusual in their own country. This included the distinctive tribal costumes worn by the Nigerians, the nomadic Fulani herdsmen driving their herds of Zebu cattle in search of food and water in the different seasons of the year, open-air markets and sheep, goats and donkeys roaming free across the roads. The climate with its dry and rainy seasons of the year, the Harmattan carrying fine dust from the Sahara and penetrating the homes were accepted as normal.

The expatriate child traveled by air far in excess of the average Western child. They were proficient in discussing the relative merits and advantages of different air line companies and routes. The older ones were experienced in such matters as customs, immigration and health regulations for countries en route and could discuss with accuracy arrivals, connections, transfers and departures.

The curriculum of the school was in most cases similar to that of their own country. British empiricism had established education in many countries around the world. Western elementary education is basically the same in most countries.

2. Indigenous students.

(a) Children of mixed (indigenous-expatriate) marriages. The mother in these marriages was a "Bature" or foreigner, generally European, mainly British. She had great influence monitoring the child's progress in school, teaching the child

to subscribe to Western standards of living, code of social behavior, values, interests and attitudes. The homes were built on European lines with European furniture and comforts. Indoor and outdoor servants maintained its upkeep.

The children of these marriages visited Europe frequently with their parents to stay with their European grandparents or relatives and lived under typical European conditions. They bought toys, books and sports equipment comparable with that of the Europeans which they brought back to Nigeria. Both in Europe and at home in Nigeria they wore European clothing. Some attended schools in Europe.

Spending most of the year in Nigeria had its influences, particularly if the responsibilities of the father's extended family had been attached to what was basically a nuclear family unit. This could include the educational support of a relative's children or having a relative living with them for a period of time.

Marriages were monogamous but pressure could be applied by the husband's family if there was no male child. The role of the father would depend on his upbringing and if he had been educated abroad. His position in society would be another significant factor. In almost all the cases, it was prominent, influential and affluent.

(b) Children of university faculty. University trained personnel who spent more than one year abroad for graduate training were usually accompanied by their wife and children. There

was a growing tendency for these men to have only one wife who was frequently university educated. While her husband studied, it was not unusual for her to take advanced training in her own field. The children in the meantime attended area schools and soon assumed the behavior, interests and attitudes of the new country. Upon returning to Nigeria, they maintained interest in overseas events and their range of conversation was greater than those who had not traveled outside the country. However, as their Nigerian upbringing remained the basic factor, they soon fitted back into their accustomed routine.

(c) Children of overseas businessmen and residents. A few parents of children attending Zaria Children's School were in commerce and spent time abroad. The children were sometimes left at home with members of the extended family or with junior wives. If taken along, they were placed in charge of a "nanny", usually a member of the extended family. In some cases, advertisements were placed in such magazines as "The Lady" in England, so that the child could live in a foster home of good quality. Here they soon ascribed to Western standards, clothing, acquired "acceptable" British accents and attended private schools. Upon return, they were frequently "more British than the British". Some were born in England and had dual nationality.

If the children stayed with their parents they mainly lived in Nigerian or African urban communities and maintained their way of life. When they returned, the parents imported

(duty free) many items of Western comfort to furnish their homes. However, they basically retained their culture and values of Nigerian society, spoke tribal language or dialects among themselves and maintained communications with fellow Nigerians.

(d) Children of permanent residents. These students had not traveled overseas and their main contact with Western civilization was the school. However, they were affected by the changes that were taking place in Nigeria.

The children in this group came from the families of well-to-do business and professional men, traders, civil servants, university faculty, military personnel and administrators who ascribed to Western standards of living (television, air conditioning, latest models of cars, etc.). In some cases the parents did not speak English and wives were illiterate. Contact was made through the Hausa-speaking Nigerian school secretary or through English-speaking relatives or friends of the parents.

In their homes the children spoke tribal language or dialects. They were brought up by members of the extended family mainly in the Muslim faith. The influence of Christianity however, had gradually intruded from the south where it had been established early in the nineteenth century by white missionaries.

The children could be raised by one to four wives. Where the family shared a compound, the child lived in his

mother's quarters and had few books or toys although these were becoming available. Several of the children in the school were heard to express with pride "We are duka" i.e. "We have the same mother and father." Many families had abandoned the adobe style compound for modern concrete brick structures.

Parents of children attending the school appeared to have a realistic appreciation of the future of the country and wish to prepare their children. Urban existence had changed much of the tribal patterns of village life.

(e) Comparison with village existence. There were no village children attending Zaria Children's School. Apart from the fact that this was a private (fee paying) institution of elementary education, there was little that would be applicable to the village child's way of life. Similar to Mead's studies in the South Pacific (Muss, 1968) village children were given continuous and progressive cultural and tribal education in accepting family responsibility from the earliest age. Older children took care of the younger. Girls carried their younger siblings in a "moagn" or sash worn around the waist and tied in front. Baskets and calabashes were carried on the head to leave the hands free to work.

A West African rural mother can leave her 10 year old son to take care of the home and the younger children while departing for a day at the markets. In the village there would be no danger and in the case of emergency, members of the extended family or kinship group would help out. Boys soon learn to identify with their older brothers or father in learning how to use bows and arrows, work on the farm with their parents,

carry food to the workers, help in the hand-hoeing, harvesting and taking care of the animals, sheep, goats and cattle (Halligan, 1976).

It was difficult to obtain accurate information from the villages regarding times of birth, marriages, etc. The approach most used was that of the "important event" (Otaala, 1973; Kamara and Easley, 1977) i.e. "The child was born at the time of Sallah, Harmattan, building of the bridge, harvesting, etc."

Marriages in the villages were contracted as early as the age of three and consummated at puberty. Until then, the bride-to-be remained with her parents and during that time the Hausa custom of present-giving to the bride, her parents and relatives was maintained. This custom persisted among the urban Hausa.

The village bride was expected to be subservient to her husband. Her rights however, were protected by her family and if a husband was unnecessarily cruel to his wife, she could return to her family's compound without stigma. She could remarry and if she had produced sons by the previous marriage, the bride price would be satisfactory (Boer, 1969; Lemu, 1971, Egnonwu, 1975). Women in the Zaria area generally remarry four times (Gibbs, 1965).

What education there was, was supplied by the Mallam through the teaching of the Koran. Emphasis was placed upon rote learning, explicit dictation of values and passive reception by the child. The effect of the nationwide federal scheme of education (Universal Primary Education, U.P.E.) to

provide free elementary education to all children in Nigeria remains to be seen. Much will depend on their proximity to educational centers. The Mallams appear to be generally in opposition as they fear it will extend the influence of Western civilization, undermine their authority and position as well as the teachings of the Koran.

The indigenous child attending Zaria Children's School had a diminishing relationship with their village counterparts. A main factor was the influence of Western education which oriented their interests and mental abilities towards Western concepts. This influence was noticeable even before the Federal government of Nigeria issued its directive in 1976 for standardized school uniforms in the national colors of green and white (Appendix B). Nigerian children attending the school wore European clothing of the latest styles in preference to tribal costume. Possibly they conformed to peer pressure of the then predominately European student population. They were also driven to school by car, usually Mercedes or were accompanied by servants. A growing number of older male students preferred to ride bikes.

Although the families played a major role in contracting or dissolving marriages, there appeared to be less significance placed upon early arrangements. The Nigerian student remained in school at a time when their village counterpart had married and applied to the village elders for a plot of land, all of which belonged to the Emir.

The goal of the indigenous students at the end of the

elementary period of education was to pass the Common Entrance Examinations for entry into secondary schools and possibly onto the universities. About the same number of females as males attended the school demonstrating another change in outlook. The cleavage from village life was obvious.

Language diversity. Although the standard of English spoken throughout the school was generally high, allowances had to be made for the diversity and variations of English (both students and teachers). Children from the United States and United Kingdom were monolingual while the remaining expatriates were bilingual. The Nigerian child, however, was in contact with one or more indigenous languages or dialects before he learned to speak English. He may have spoken the following:

1. Intertribal. Hausa is widely used throughout West Africa as a trading language between tribes or ethnic groups. Many tribes who do not understand each other's primary language use it as a means of communication. It includes many words of Arabic, Zaria being in that part of the country known as the "Muslim North". Hausa consists of many dialects and is classified as part of the Chadic language group.

2. Tribal. There are over 240 ethnic groups in Nigeria, the main tribes being Ibo, Hausa, Yoruba, Kanuri and Tiv, most of whom were represented at the school. Interspersed were the Town or Settled Fulani who had settled with the Hausa, intermarried, adopted their customs, costume and language. They

were excellent administrators. They maintained cordial relations with the Cow, Cattle or Bororo nomadic Fulani, herdsmen who still carry on the original traditions, rites and language and do not intermarry.

3. Regional or village dialect. This can vary within a tribal group. There are reported to be over 400 regional dialects in Nigeria (Onibonje, 1972). There can be distinct differences between neighboring villages who may communicate through the main tribal language or Hausa.

Statement of the Problem

This study was undertaken because of the decrease in the number of expatriate children and the corresponding increase in the number of below-standard students, English-deficient students and students being exposed to the British system of elementary education for the first time (Appendix C). This created an obvious divergence between the two, particularly in designing instructional programs.

Goals and Objectives of the Study

The goal of this study was to reduce this divergence by establishing a common set of criteria for instructional programs for an international student population at Zaria Children's School, Nigeria. This would provide for a more effective convergence of abilities of Nigerian students with the British system of elementary education employed at the

school. More specifically, the researcher sought to:

1. Identify and verify the existence of an underlying cognitive structure within a diverse student population.
2. Identify the age levels at which conservation occurred.
3. Identify a sequence or sequential variation in acquisition of the conservation tasks.

In order to achieve these objectives the researcher applied the Piagetian conservation tasks to an international student population and reported the data in the following categories:

1. Age and nationalities of students at Zaria Children's School.
2. A similar study carried out in Norman, Oklahoma, U.S.A. (Renner et al., 1973).
3. Zaria international population.
4. Norman, Oklahoma and Zaria, Nigeria.
5. Sequence of conserving tasks by Zaria population.
6. Conservation of all six tasks by Zaria population.
7. Highest achievers among Zaria population.
8. Zaria indigenous students with Zaria expatriate students and Norman population.
9. Zaria male population with Zaria female population and Norman population.
10. All Zaria student groups with Norman student sample.

Delimitations

This study involved 167 students in Reception through to grade six in Zaria Children's School, Nigeria. Student ages ranged from five to twelve years. The Piagetian conservation tasks included number, solid amount, liquid amount, length, area and weight.

In applying Piaget's tasks, the researcher adopted the procedure used in a study of 252 students carried out in Norman, Oklahoma, U.S.A. (Renner et al., 1973). While the Norman model served as a basic guideline, certain modifications were made since the Zaria study posed certain problems in terms of the student's cultural backgrounds, ethnic affiliations, language constructs and diversity of experiences and concepts. The basic attributes of the Norman model however, were retained and applied since this researcher was unable to locate previous studies conducted with an international student population in Nigeria or elsewhere.

Significance of the Study

The findings of this study will prove beneficial for revising and expanding existing instructional programs and for initiating new programs for indigenous students in rapidly developing countries in elementary schools with English as the major language of instruction.

This study is unique in that it brought together children from many countries including indigenous students in

a common experience, at the same time, in the same location and permitted immediate comparative analyses. It also investigated Piaget's pronouncement (1947) (Evans, 1973) that there is an underlying cognitive structure which is universal. At the same time, it made possible the consideration of numerous cultural characteristics. Finally, it took into consideration work of other researchers who had carried out cross-cultural studies and attempted to establish the relative merits of the "Universalist" and "Relativist" positions.

Definition of Terms

For the purpose of this study the following definitions were used:

Bature. Foreigner. This term is applicable to all non-indigenous people irrespective of origin or race.

Clinical method. The means by which the child actively searches for the solution to the problem. The examiner stimulates and challenges the child to reflect on his answers and uses this discourse as a means to clarify his own thought. Through this method, the examiner skillfully questions the child and provides for learning, pushing him to the limits of his operational structure without giving him ready-made answers (Muss, 1968).

Cognitive development. The sequential development of mental growth in that there is an invariant sequence of stages through which the individual passes, i.e. sensorimotor, preoperational, concrete operational and formal operational.

Conservation. Invariance of equality in the face of transformation or deformation which Piaget considers a necessary condition for all rational activities (Furby, 1971).

Conservation tasks. Number, solid amount (quantity, mass, substance), liquid amount (volume), length, area (surface) and weight.

Decalage. Variations in the stages, chronological age levels or in the sequence of conserving the tasks.

Emir. Originally one of the Fulani flag-bearers of Usman dan Fodio in the Jihads (Holy Wars) of the nineteenth century in which the corrupt and immoral Hausa leaders were deposed.

Expatriate. A person living in a country other than his place of birth and who is not a nationalized citizen of the country in which he is residing.

Extended family. Includes all relatives and can also include members of the village i.e. "village brother".

Fulani. Probably arrived from the east. There are two distinct groups:

(a) Town or settled Fulani. They live in the towns mainly with the Hausa tribe with whom they have intermarried, adopted their customs, dress and languages. They are excellent administrators.

(b) Cow, cattle or Bororo Fulani. They retain their original tribal language, customs and rites. They do not intermarry. For centuries they have had the right of way for their Zebu

cattle which they drive across large tracts of Nigeria following the rivers in seasonal search for grass and water.

Hausa. Originally came from North Africa and were mainly Jewish people fleeing from the Arab invasions of the eighth century. They married into Iron Age communities. Their language is a mixture of tribal dialects classified as Chadic. They are mainly of the Islamic religion which infiltrated via the Trans-Saharan trade routes. Hausa are the main traders of West Africa.

Harmattan. Wind bearing fine dust from the Sahara Desert and which penetrates closed windows and doors. Generally blows from December to March.

Indigenous. Native to the country.

Invariance of tasks. The sequential conservation of quantity, weight and volume.

Kinship groups. As the younger members of the compound (nuclear) family grow up and have their own wives and children, they may go out and build their own houses and compounds in close proximity. In this way a whole village may be made up of compounds of nuclear families.

Qualitative aspects. The stages of cognitive development i.e. sensorimotor, preoperational, concrete operational and formal operations¹.

Quantitative aspects. Rates of development (ages) through the stages.

Relativists. Cross-cultural researchers of the Piagetian theory of universal cognitive development who stress

the role of culturally transmitted technologies and the internalization of information processing.

Sabon Gari. Place of strangers. Open markets used by tribes other than Hausa or Fulani. Mostly consists of galvanized iron stalls run by licensed women traders.

Sallah. Celebration held after the fasting period of Ramadan.

Samaru. Place of (male) students. The village and markets are opposite Ahmadu Bello University.

Sequencing or state theory. Predicts that cognitive abilities appear at increasingly higher age levels, passing through the stages of sensorimotor, preoperational, concrete operational and formal operational.

Tudan Wada. New town. Apart from the old city of Zaria.

Universalists. Researchers who support Piaget's theory that there is a biologically determined sequence of cognitive structures which is invariant and universal or constant in all cultures.

Zaria. One of the main cities of the Hausa tribe. Established in the fifteenth century as a commercial center. Best known as the home of Queen Amina, the warrior queen who remained undefeated for thirty-four years and conquered vast territories.

Summary

This chapter described the diverse characteristics of

the population in the immediate locale of Zaria, Nigeria, which was tested with the Piagetian conservation tasks. The background of the Zaria Children's School was presented and the purpose of the study was established. Finally, the central terminology was defined.

Remainder of the Study

This thesis is divided into five chapters and an Appendix. The remaining five cover the following: Chapter II -- Review of the Literature; Chapter III -- Methodology; Chapter IV -- Results; Chapter V -- Conclusions, Implications and Recommendations.

Chapter II

REVIEW OF THE LITERATURE

Piaget hypothesized that the structure and approximate ages for the appearance of the stages of intelligence are universal. This theory has been challenged by many researchers when it is applied across cultures. These researchers express the belief that development of cognitive abilities is relative to each culture. This divergence has given rise to two major schools of thought in developmental psychology. Like Piaget, there are those who favor the theory of the "unfolding of universal maturational states" (Furby, 1971) and who have thus become known as the "Universalists". On the other hand, there are those who support the belief that development of cognitive abilities is determined by what is important in each culture and have become known as the "Cultural Relativists" or "Relativists".

Considerable cross-cultural literature accumulated since Piaget first tested his theories on a "limited and homogenous population" (Dasen, 1977) seeks to explore the validity of his hypothesis. Articles by critics and supporters have appeared in practically every journal of psychology, irrespective of its speciality. Many symposia have been devoted to this controversy which is of major concern to the evolution of psychology. The annual "Inventory of Cross-cultural Piagetian Research" edited by Seagram and Dasen is

among those publications attempting to keep up to date with the enormous number of Piagetian related publications (Dasen, 1977).

Piaget's conservation tasks have been and still are among the most frequently used in cross-cultural research, although in recent years, researchers have applied a wider range of Piagetian and Piagetian related tasks. This is because researchers have considered the conservation tasks to be out of context in particular situations and find that other tests are more applicable in non-Western environments. It has been said that, "Piaget has led cross-cultural research astray in that research has followed his procedures rather than his theories" (Dasen, 1977).

Piaget's Theory of Universal Cognitive Development

Piaget hypothesized that a large component of cognitive development was biologically or genetically determined and followed the same succession of stages (Furby, 1971):

1. Sensorimotor (approximate ages 0-2 years);
2. Preoperational (approximate ages 2-7 years);
3. Concrete operational (approximate ages 7-11 years);
4. Formal operational (approximate ages 11-15 years).

The "stage" or "sequence" theory predicts that cognitive abilities appear dramatically and at increasingly higher levels. In reflecting the hierarchical structure, it is accepted that if a subject responds correctly to a task on one level, it can be assumed that he has the ability to pass

all earlier tasks. Appearance of the stages is dependent on the ontogenic potential of the individual.

Piaget maintained that all individuals pass through each stage and eventually reach the stage of formal operations, if not between the ages of 11-15, then at least between 15-20 years. "They view this stage in different areas according to their aptitudes and their professional specializations" (Dasen, 1977).

Operational thought is reversible and associative and demonstrates the individual's ability to reason logically (Muss, 1968). Piaget considered conservation as a "necessary condition for rational activity" (Furby, 1971).

Piaget's claim for universality may be taken as applying either to the stages of cognitive development or to their hierarchical order. He considered that both the qualitative aspects (basic cognitive processes, structural properties of the stages and their hierarchical ordering) as well as the quantitative aspects (ages at which children develop through the various levels of the sequence) to be universal (Dasen, 1977). At the same time each organism is constantly interacting with its environment and has the biological ability to adapt by assimilation and accommodation thereby attaining a state of equilibrium (Muss, 1968). This is also seen as an universal process.

Piaget distinguished four factors responsible for cognitive development:

1. Biological factors (nervous system maturation).
2. Equilibrium or autoregulation (corresponding to the sequential forms in general coordination of the individual's actions as interacting with the environment).
3. General social factor (interactions among children or between children and adults).
4. Educational and cultural factors (Berry and Dasen, 1974; Dasen, 1977).

Piaget saw the first three as all leading to universality as they constitute the synchronistic (constant) nucleus. He considered the fourth to be less important. Cultural differences or influences were seen as superficial and in no way affecting the underlying cognitive structure.

Cultural Relativists

The Relativists attempted to determine whether those properties of thought described by Piaget as basic to the acquisition of intelligence were universal or if they were controlled by cultural factors (Berry and Dasen, 1974). Most cross-cultural studies in genetic psychology question whether cognitive development in non-Western cultures follow the same sequential succession of stages, and if so, whether they appear at approximately the same age levels (Berry and Dasen, 1974). They debated that there may be a particular biological adaptation to the environment which, throughout the life span, creates the abilities observed on any test occasion.

The Relativists considered that cultural influences or

differences develop different kinds of thinking in each culture which are pertinent or relevant to the respective cultures. They saw each culture as "different but equal" (Dasen, 1977) and believed that Piaget's theory of universality was culturally biased, based upon white middle-class values and, that the results were typical of what could be expected from any European classroom situation. They also maintained that insufficient research had been carried out and that this could account for the ambiguous or negative results.

Piaget admitted that the first results were based on a "somewhat privileged population" (Dasen, 1977), but considered that it was up to the Relativists to supply empirical data to contradict his theory. He accepted a time lag of two to four years in non-Western cultures, attributing this to the child's cultural milieu. He also noted that this was consistent with the social factor of his theory.

The basic problem here is whether human relations follow the same course of development in different societies or whether, as certain social psychologists maintain, we must expect to find great differences or at least significant variations in different social environments (Dasen, 1977).

However, in his, *Psychology of Intelligence* (Piaget, 1967) he stated:

. . .the social environment even more than the physical environment affects intelligence through the media of language (signs) content of interaction (intellectual values) and rules imposed on thought (collective logical or pre-logical norms).

J.W. Berry, noted Cultural Relativists, has made a fundamental challenge to the Universalist school:

The ethnocentrism inherent in our discipline has become obvious as we have attempted to generalize our concepts and laws of behavior in other cultural settings . . . indigenous conceptions of intelligent behavior often differed widely and hence differences could not be considered merely as quantitative levels on a single universal cognitive dimension (Berry and Dasen, 1974).

Similarly, Vernon (1969) asks for recognition of what is considered to be intelligent behavior in other cultures when he stated:

We must try to discard the idea that intelligence is a kind of universal factor, a trait which is the same in all cultural groups. Clearly it develops differently in different physical and cultural environments. It should be regarded as a name for all various cognitive skills which are developed in and valued by the group. In Western civilization it refers mainly to grasping relations and symbolic thinking, and this permeates to some extent all the abilities we show at school, at work, or in daily life. We naturally tend to evaluate the intelligence of other ethnic groups on the same criteria, though it surely would be more psychologically sound to recognize that such groups require, and stimulate the growth of different mental as well as physical skills in coping with their particular environments, i.e. that they possess different intelligences (Berry and Dasen, 1974).

Bruner (1966) is another who disagreed with Piaget's beliefs. He emphasized the role of culturally transmitted technologies and their internalization and predicted that the rate of cognitive development could be partly determined by ecological or cultural factors or by cultural demands (Furby, 1971; Dasen, 1975).

The majority of researchers have been concerned with comparing a Western with a non-Western culture and in most cases, the findings have clearly indicated discrepancies in cognitive development and in the ages reported for the

appearance of concrete operations. This has been interpreted by those favoring the Universalist position as demonstrating retardation or primitive thinking.

The Relativists view this as testifying to the "cultural empiricism" (Buck-Morss, 1975) of Piaget and his supporters in that they ignore significant differences and variations in concepts in each culture. They accuse Piagetian researchers of being guilty of attempting to ascertain the characteristics of an ideal type in Western culture and apply it to non-Western cultures (Dasen, 1977).

Most findings seem to support the view that children little influenced by Western cultures fall behind middle class European children in most, if not all of the conservation tasks by an interval of two to four years (Dasen, 1977).

A number of studies have found that in both non-Western societies and in low socioeconomic class Western societies, children lag behind in their concept development when compared to middle-class Western children. Many studies have supported the view that unschooled children are less advanced than children of the same age and culture who have attended school, particularly of the Western type. The consequences of rural and urban residence, linguistic handicaps and contact with Europeans have also been identified as significant factors.

As Laurendeau-Bendavid summarized:

Those variables or decalages are usually in a predictable direction, the greater the extent of education, industrialization or urbanization in a

culture, the faster the rate of thought development (Dasen, 1977).

Variation in the conservation of quantity, weight and volume has also been observed in certain cultures (DeLemos, 1966; Heron and Simonsson, 1969; Heron, 1971; Dasen, 1974). These studies found omissions and variations. Piaget has been unable to account for this "horizontal decalage" (Dasen, 1977) and proponents of cross-cultural Relativism viewed this as another factor casting additional doubt on the theory of Universalism.

Sequence of Substages and Tasks

Feldman et al. (1974) carried out research comparing Eskimo children undergoing successful adaptation to Western culture to a population in Kentucky, U.S.A. The purpose of the research was to gain relevant evidence that Piaget's hypothesis of cognitive development could be characterized in terms of an invariant sequence of stages even though the form of adaptation in the Eskimo culture was different from that of the Kentucky sample. He hypothesized that:

Cognitive development has a particular structure and because of its interactive basis, that structure will appear in (virtually) all people (Feldman et al., 1974).

In both the Alaskan and Kentucky samples he found evidence supporting the view that cognitive development was organized in an invariant sequence of stages. Furthermore, the age of onset for the abilities was the same for the Eskimo as for the Kentucky sample.

Opper (1971) investigated the universality of intellectual development in children in rural and urban areas in Thailand. Her aim was to identify the sequence of substages for seven concrete operational tasks and the types of reasoning used in performance of those tasks. She concluded that the similarities in the sequential stages and types of reasoning pointed to the existence of similar underlying mental processes, irrespective of the wide difference in their environments. She considered that the nature and types of objects found in their contexts were unimportant for intellectual growth:

In other words it would seem as if mental processes develop as a result of general interaction with the environment regardless of the contents of this environment. Intellectual development does not depend upon specific types of objects with which to interact. Environments with a degree of diversity are universal features (Dasen, 1977).

Dasen (1974) in a study of Australian Aborigines of low and medium contact with Europeans, found that some of the former group did not develop concrete operations. In the medium contact group, the incidence of operational thinking was less in adults than in school children.

DeLemos (1969) also carried out tests between two groups of Australian Aborigine children living in remote mission stations. Her results indicated that conservation appeared later among aboriginals and that those acquiring the concepts of conservation did so qualitatively in exactly the same way as described by Piaget. She found that there was a close correspondence between the answers and explanations of the

aboriginal children and those of Europeans. However, some children did not acquire the concepts of conservation. Some found conservation of weight easier than quantity.

Heron and Simonsson (1969) cite an earlier work among Australian Aborigine children by DeLemos in 1966.

She gave not one but a series of conservation tasks in which weight came third (after quantity and length) for the Elcho sample and fourth (after number, quantity and length) for the Hermanssburg sample. Of seventy children of all ages from both samples, 27 had not achieved conservation of quality. This is a substantial reversal of Piaget's "Invariant Order" (Berry and Dasen, 1974).

Heron and Simonsson (1969) investigated the conservation of weight in Zambian children. They compared them with children of European extraction and upbringing who were attending a private (fee paying) school with a qualified staff, adequate equipment and materials and a Western type curriculum. This group carried out the tasks in accordance with the Geneva norms. The Zambian children attending a government school which was deficient in staff and amenities with instruction by rote memorization. They found that:

. . . between 40-50% of these urban primary school children cannot conserve weight by the time they leave school at the median stated age of 15 years.

In a later attempt to clarify the situation, Heron (1971) carried out a study among Zambian elementary school children. Some had provided evidence of weight conservation and others had not. He concluded that the non-conservors:

. . . ought to be able to demonstrate weight conservation unequivocally, consistent with their other abilities within the framework of the concrete operational stage (Heron, 1971).

Laurendeau-Bendavid (Dasen, 1977) compared French Canadian children's performance with that of children in Rwanda in central Africa in order to establish universalism of the cognitive stages. She considered that in two such widely diverging cultures, cognitive development would not differ appreciably although there would be some variations (decalages) in chronological age levels. She regarded Piaget as being essentially correct in his theory of universalism.

Cultural influences did not extend so far as to change the very nature of the development of the cognitive structure which always exhibits the same steps and stages and follows the same order (Dasen, 1977).

Further, she concluded that sociocultural factors may have a supporting role, but not a decisive one in determining task success.

Influence of Sociocultural Factors on Task Success

Dasen (1975) was interested in applying Berry's (1966, 1971) theories which linked individual behavior to ecological demands placed upon groups of people partly through cultural adaptation. The Dasen study involved three cultures - Australian Aborigine, Eskimo and Ebrie African. He hypothesized that:

1. If three subsistence type economy populations are placed upon an ecological scale with low food accumulating nomadic groups at one extreme

(Eskimo and Australian aboriginal) and high food accumulating sedentary agriculturalist groups at the other extreme (Ebrie of Ivory Coast) the former are expected to develop spatial concepts more rapidly than the latter will.

2. It is reasonable to expect that the African group under the pressure of its own ecological milieu would develop other concepts more rapidly than would the Eskimo or the Aboriginal group.

His results demonstrated that the relationship between ecology and culture was positive at both ends of the ecological scale in different areas of operational thought. The influence of schooling, techniques of hunting, fishing and adaptation to Western cultural values were found to be significant. These variables demonstrated that the rate of development was not uniform across different areas of concrete operations (Dasen, 1975).

An earlier study by Dasen (1974) had compared two groups of Australian Aborigines (low and medium contact). He found that the rate of development in the two groups was lower than that of European children; however, the medium contact sample was faster in the rate of cognitive development than the low contact group. He concluded that European influence played a significant role.

DeLacey (1970) provided an ecological scale when assessing development of logical thinking from four groups of Australian children. The samples included two full-blooded aboriginal groups of low and medium contact with Europeans and two groups of European-descent children of low and medium socioeconomic class. She found marked differences in

performance between the Aborigine and European samples. Among the aboriginals, there was a consistent and direct relationship between classificatory performance and the degree of contact with Europeans and their technology. It was interesting to note that a small sample of very high contact aboriginals performed at least as well as the white children living in similar situations. Similarly, there was a direct and consistent association between socioeconomic class and test performance among European children.

The study by Price-Williams et al. (1969) is regarded as a classic by researchers, Relativists as well as Universalists. The study clearly demonstrated the influence of cultural factors and experience upon task success. One group of Mexican children came from a village where their parents were engaged in pottery-making and the other group came from a village where the families were engaged in occupations other than pottery-making. The results were dramatic in that the former conserved substance (solid amount) far more significantly more frequently than did the other group but not significantly. The reasons given by the successful children supported the quantitative results. Price-Williams et al. (1969) concluded:

This study suggests that the role of skills in cognitive growth may be an important factor. Manipulation may be a prior and necessary prerequisite in the attainment of conservation but a skill embodies a set of operations with a recognisable end.

Goodnow and Bethon (1966) studying children in Hong

Kong concluded that successful completion of the conservation tasks had direct counterparts with the experiences of the child in that they drew upon past occurrences with which they were familiar. The non-Western sample preferred a hand and eye method of learning in contrast with the Western method of working at combinational tasks mentally. The non-Western sample was able to perform the conservation tasks of weight, volume and surface (area) even though there had been a lack of schooling.

As the children summarized themselves, "A catty of rice may come in different shaped bags, but it is always a catty". He has carried them and he knows.

The authors concluded that the Hong Kong sample employed an alternative type of learning in carrying out the conservation tasks which had been based upon previous cultural experience and which were important for their interaction with their environment.

Influences of Schooling vs. non-Schooling in Urban and Rural Areas

An early researcher in cross-cultural studies of cognitive growth, Greenfield (1966) investigated the effects of education on the Wolof children of Senegal. She considered that schooling was a crucial factor in developing cognitive abilities.

There is a wider gap between unschooled and schooled Wolof children from the same rural village than between rural and urban children. By the eleventh or twelfth year, virtually all the school

children have achieved conservation. Only about half of those not in school have done so (Bruner et al., 1966).

She stated that the important cultural differences lie not so much in the age at which certain concepts appear as in the types of explanations given by the children from different cultures. She hypothesized that the increase in conservation could be attributed to the belief in the magical powers of the experimenter or that she had allowed the children to manipulate the materials for themselves.

Conversely, Kiminyo (1973) was unable to demonstrate differences on the variables of schooling and geographical location. He predicted that cognitive development would be faster in rural children of Kamba (Kenya) than in urban and in unschooled rather than in schooled children. His rationale was that rural unschooled children have more opportunities to be active in their interaction with the environment. His results indicated there were:

No significant differences between a) urban and rural, b) schooling and unschooling, and c) male and female subjects in total scores on conservation tasks. Conversely significant differences were shown to exist between age groups and between types of conservation tasks. The differences between age groups were similar to those reported from the same age groups in European conservation studies.... Results indicated that Kamba children discovered conservation sequentially and in accordance with Piaget's theory of cognitive development.

Al Fakri (1972) demonstrated the effects of an alternative form of education, i.e. the Islamic where there is emphasis upon rote learning. The experimenter pointed out that due to the influences of the educational system and of

cultural deprivation the onset and duration of the stages caused a marked time lag. Whereas Piaget's sample formed the concept of speed at the age of nine, Al Fakri's group of Iraqi children had not done so within the 12-13 years age range. Za'rour and Khuri (Dasen, 1977) found similar results in the concept of speed among Jordanian school children in nearby Amman.

Lloyd (1971) carried out a study involving traditional (Oje) and educated elite Yoruba children in Nigeria. She concluded that the economically and intellectually privileged child performed better than the former. She maintained that the factor of experience was also crucial in shaping cognitive development.

Cross-cultural Methodology

Kamara and Easley (Dasen, 1977) considered that because of the variety of statistical techniques, methodological procedures and variations as well as interpretations, no general conclusions could be drawn from the many studies supporting the Relativists positions. Results could not be considered reliable because:

1. Failure to give attention to age determination including a tendency for the age of subjects to be obtained from official records which are notoriously subject to error.
2. Existence in most studies of serious language or cultural barriers between subjects and interviews.
3. Difficulty of making inferences from data

regarding the substantive issues of alleged retardation because of lack of an appropriate statistical method.

4. Tendency for the data to be collected through performance rather than clinical interviews which alone can determine the competencies underlying performance.

Goldschmit (1973) tested the reliability of his Concept Assessment Kit-Conservation on six international populations - Australian, New Zealander, English, Polish, Dutch and Ugandan. Using an uniform methodology, the results indicated that on the average, the internal consistency of the conservation score was acceptable in all countries and a reliable measure at each age level in age and sex. There was general correspondence in age trends in all six countries but the acquisition rate was less uniform. Except for Uganda, no overall sex differences were found. Goldschmit concluded:

In most responses the Ugandan sample was not comparable to the others as the students came from large rural areas and no reliable data could be obtained on their socioeconomic status and ages may not have been entirely accurate . . . their test behavior was also not comparable which might also account for their lower test scores.

Goldschmit stated that the kit was a reliable measure and that the results were in line with previous research for age trends both in males and females. The scores were fairly consistent from culture to culture whereas acquisition rates were somewhat less uniform.

Summary

A review of the literature revealed insufficient

evidence from research to unequivocally support the position of either the Universalists or the Relativists.

The Universalists remain firm that Piaget's theory of universal intellectual development is valid and that individual differences across cultures seldom affect the qualitative aspects of this development. The rates of development may be related to specific factors, but the sequence remains the same. They affirm that all environments have some degree of diversity but this does not alter the basic underlying structure, irrespective of cultural differences.

The Relativists are equally adamant that cognitive processes vary from one culture to another and reflect the form of thought most valued in each culture. They disagree that cognitive development is universally standardized.

Generally, most studies have found that child who resides in rural areas little influenced by education, Western culture, technologies, industrialization and contact with Europeans lag behind in concept development when compared to middle-class Western children.

The ecological scale of both Dasen (1975) and DeLacey (1970) have presented enlightening results in that they testify to the graduated influence of ecological factors on cognitive development, moving from nomadic to sedentary, hunting-fishing to agriculturist and tribal rites to formal education.

There does appear to be some general laws governing the sequence of intellectual development which is at work in a variety of cultures. Certain biological factors appear

general for all mankind. However, the rate of development is usually effected by ecological and cultural factors.

Perhaps the best summation would be:

Thus we look intensively within cultural systems for the roots of cognitive variation and across cultural systems for those characteristics of cognitive functioning which are universal for all mankind (Berry and Dasen, 1974).

Chapter III

METHODOLOGY

This study was designed to develop a common set of criteria to serve as a basis for instructing students from two diverging groups, one Western and the other non-Western. By establishing a common ground for instruction, the intention was to organize programs that would provide for a more effective convergence of Nigerian cognitive abilities with the British system of education used throughout the school. More specifically, this study sought to:

1. Identify and verify the existence of an underlying cognitive structure in an international student population.
2. Identify the age levels at which conservation occurred in an international student population.
3. Identify the sequence of tasks or variations of this sequence in an international student population.

Place of Testing

The Piagetian conservation tasks were carried out in Zaria Children's School, an international institution of elementary education situated in Queen Elizabeth Road, Kaduna State, Nigeria (Appendix A & D).

The school consisted of 10 classrooms built of plastered concrete bricks arranged in a semi-circle around the school playground and joined by an open, roofed verandah

on the playground side (Appendix E). Classrooms were of single width with windows on both sides to permit free passage of air. School hours were from 8:00 a.m. to 12:45 p.m. to avoid most of the tropical heat. The school site consisted of four acres and was surrounded by a six foot high cyclone mesh fence. The school was developed and run as a traditional British elementary school. The teaching faculty was international with the majority being British trained (Appendix E). The children were required to wear regulation green and white uniforms (Appendix B), the national colors of Nigeria.

Although the school was a private institution, it was responsible to the Ministry of Education, Kaduna State for meeting the required standards and for its curriculum. As a private school, fees were charged, although education in the state and Nigeria was free.

Zaria was one of the major education centers of the Muslim North of Nigeria as well as being an important commercial and rail center (Appendix A & D). Nigeria is an oil rich, rapidly developing country in Africa whose major expenditure is education (approximately 50%). In 1976, Nigeria instituted a nation-wide Universal Primary Education (U.P.E.) scheme.

Description of the Subjects

All subjects were students in grades Reception through to six at Zaria Children's School. One hundred and sixty-seven

students of various nationalities were tested: Nigerian 61; British 28; Indian 17; Nigerian-British 8; Dutch 8; Lebanese 6; Polish 6; Nigerian-German 5; Pakastani 4; American 4; Sri-Lankan 3; Sudanese 3; Filipino 3; British-Pakastani 2; American-French 2; Nigerian-Spanish 1; Nigerian-Finnish 1; Nigerian-Lebanese 1; Ugandan 1; South African 1; Polish-Rhodesian 1; and American-Chinese 1. There were 84 females and 83 males. In the indigenous population there were 29 females and 32 males and in the expatriate population there were 46 females and 45 males. The indigenous-expatriate students numbered 9 females and 6 males. One child was disqualified when it was found he had previously carried out the tasks in his country of origin.

Description of the Examiners

The examiners were the respective classroom teachers, the Headmistress and the coordinator of Remedial Studies. Their nationalities were British 6; American 1; Dutch 1, and South African 1. The tests were organized and supervised by the coordinator of Remedial Studies.

Administration of the six tasks was standardized by demonstrating the tasks, giving the examiners practice and instructions regarding significance of criteria for accurate recording of answers and reasons given by the children. Each teacher received instruction as to the correct use of the various test apparatus and the score sheets. The teachers were also instructed to provide a relaxed atmosphere in order

to solicit the best efforts of each child without implying the answers. Two of the teachers had previously participated in administering the Piagetian conservation tests.

Consideration was given to using the Nigerian assistant teachers ("Nannies") who were Hausa, Yoruba and Ibo but it was decided that as their duties restricted them to Nursery 1 and 2 and Reception classes, the teachers would be in a better position to supervise their respective students, give them confidence and be better able to understand the diversity of accents and usage of English. Employing the Nigerian assistant teachers would have added to the problems of language differences, dialectal interpretations and conflicting tribal loyalties.

Description of the Test Tasks

1. Norman model. The procedures used by Renner et al. (1973) in Norman, Oklahoma, U.S.A. were followed as closely as possible. The study consisted of testing 252 elementary school children from Norman Public Schools. The ages of the children were separated into four month age levels and 12 children assigned to each level to obtain equal groups. Piaget's criteria of establishing a 75% success ratio for each age level was followed for each task i.e. nine or more successful students were necessary to demonstrate conservation. When Renner et al. (1973) spoke of conserving a task at 128 months, they referred to the 125-128 month age level, etc.

Renner et al. (1973) were interested in applying

Piaget's theory as practically as possible to classroom instruction. The findings were to provide the examiners with the students' level of operation in Piaget's Genevan model. In compliance with this information, Renner et al. (1973) devised tasks which would facilitate the operating of the higher cognitive processes. Six conservation tasks were used: number; solid amount; liquid amount; length; area; and weight.

2. Zaria model. Six conservation tasks consisting of number, solid amount, liquid amount, length, area and weight were administered to the students of Zaria Children's School following the procedures used by Renner et al. (1973).

It immediately became apparent that circumstances in Zaria were entirely different and more complex than that of the Norman environment and that the information from Renner et al. (1973) was inadequate. Procedures, interpretations and evaluations had to be modified for the Zaria study. The parameters for comparing the findings are shown in Figure 1.

Apparatus consistent with that used in the Norman study was available in Zaria. Cuisinaire rods (12" and 4") replaced the "rods" (length); Leggo building blocks were used instead of checkers (number) plastiscine had the same properties as clay (solid amount and weight) and small stackable blocks were used to represent the barns (area). Plastic animals were provided from the Nursery classes.

Because of the diverse nationalities, it was necessary to modify one's terminology while at the same time observing

FIGURE 1

PARAMETERS OF COMPARISON FOR NORMAN, OKLAHOMA
AND ZARIA, NIGERIA POPULATIONS

Parameter	Norman	Zaria
Environment	Typical United States urban university town, basically middle-class, similar cultural environment.	Diverse cultural environment and population.
Student population	Uniform	Multinational
Schools	A number	One
# students tested	252	167
Average # students per age level	12	8.7
Success ratio	75%	Difficult to establish at 75%.

the criteria established for valid testing by keeping the instructions simple, explicit and as standardized as possible. It became necessary to use more applicable expressions, i.e. "plot of land" instead of "field" or "pasture"; "pot" instead of "beaker" or "cylinder"; "hut" instead of "barn" or "shed"; "yam-cake" instead of "pancake". At other times it was advisable to reinterpret a situation for which there was no counterpart, i.e. "This is a plot of land which has a fence around it, just like our school fence so that the animals

can't run away". There are usually no fences around local plots of land to keep animals from straying. Occasionally, sorghum stalks are used around fields to keep cattle out or nomadic Fulani herdsmen will erect barriers of thorn bushes to keep their cattle from straying overnight, otherwise sheep, goats and hobbled donkeys roam free.

Before commencing the tasks, the examiners made sure each child had a common starting point by agreeing that the objects (number of counters, size, shape of clay, etc.) were the same, either by viewing, counting, touching or manipulating. It was noticeable that towards the end of the tests several of the older children were beginning to realize that "the same" was the correct answer, connecting it to the examiners original emphasis on this state. The teacher from Class Six stated her pupils were capable of better results as they were "looking for the catch".

During the tests, several children lacking fluency in English could be easily observed listening to the examiner, holding the information in their minds, translating it into the language or dialect with which they were most comfortable, thinking it over, translating it back into English and then deliver the answer. They appeared to be more flexible at doing this than tasks which required demonstrating the reversibility of the conservation tasks.

Procedures

In January of 1977, score sheets were constructed for

the 167 student participants. These students represented the entire school population of indigenous and expatriate students except for those below the ages of five in Nursery 1 and 2. Student information was recorded on sheets that was taken from the school records and application forms completed by the child's parents. In the case of certain Nigerian students whose parents did not speak English, information had been extracted by the Nigerian school secretary using the inter-tribal language of Hausa at the time of the child's application for enrollment.

One class per day was tested for approximately one and a half hours by three teachers, each responsible for two of the six tasks. The first station was adjacent to the classroom entrance. Here, the class teacher received the pupils, checked to see the information recorded on the sheets was correct, conducted the first two tasks (number and solid amount) and recorded the results. When the tasks were completed, the child was sent on to the next station carrying his/her individual score sheet.

Station #2 was at the rear of the classroom, mid-section, and at a distance where normal conversation could not be overheard. Adequate time was given each child to consider the question, answer and give the reason. Only one student at a time was allowed at each test station, the following child being held back until the next station was vacant. No conversation was allowed between students and they were immediately sent to the next-door classroom upon completion of

the tasks. The Headmistress conducted two tasks at Station #2 (liquid amount and length) and recorded the answers.

The coordinator of the study administered the last two tasks (area and weight) at Station #3 which had been placed at the front of the room opposite Station #1. These methods approximated Piaget's "clinical method" as closely as possible without disrupting the school routine.

The complete procedure consisted of the following steps:

1. The tasks were administered to eligible students between January 24, and February 4, 1977. Testing was optional to the students, however, none opted out after receiving permission from their parents. Those students absent due to an extended Christmas vacation were tested immediately upon their return.

2. Three teachers acted as examiners and administered two tasks each. These were administered at stations placed strategically around the classroom.

3. Each child carried a personal score sheet from station to station containing specific information. Each child was privately and individually tested. The child received the score sheet when the examiner had entered the results and reasons. Upon completion of the tasks, the coordinator took charge of the score sheets.

4. Data was extracted from the sheets and recorded on forms divided into four month age levels. This data was categorized by results of:

- a. Age and nationality of 167 Zaria students;
- b. Norman, Oklahoma;
- c. total eligible student population at Zaria, Nigeria;
- d. Zaria indigenous population;
- e. Zaria expatriate population;
- f. Zaria male population;
- g. Zaria female population.

Further information was categorized as:

- h. Norman and Zaria results;
- i. Sequence of conserving tasks by Zaria students;
- j. Conservation of all six tasks by Zaria students;
- k. Highest achievers among Zaria students; and
- l. All Zaria student groups with Norman sample.

Data was gathered and reported in the following categories:

1. Age and nationalities of students at Zaria Children's School;
2. Norman, Oklahoma student population;
3. Zaria, Nigeria international student population;
4. Norman, Oklahoma and Zaria, Nigeria;
5. Sequence of conserving tasks by Zaria population;
6. Conservation of all six tasks by Zaria population;
7. Highest achievers among Zaria population;
8. Zaria indigenous students with Zaria expatriate students and with Norman sample;
9. Zaria male population with Zaria female population and with Norman sample; and

10. All Zaria student groups with Norman student sample.

Procedural problems. Such problems as inaccurate information regarding ages, language discrepancies and misinterpretation of results were largely eliminated because of circumstances prevailing at Zaria Children's School. Accurate records were kept by the school and the information was supplied by the parents of the child or extracted from non-English speaking Nigerians by the Nigerian school secretary using the intertribal language of Hausa.

The examiners were all conversant with the child's accents, modes of expression and limitations of English speech. The tests were conducted in English, the language in which most students were proficient.

It was considered that, due to the multinational and ethnic situation of the Zaria student population, tests should be as standard as possible to reduce the number of variables. The examiners did not probe for answers but allowed each child to explore the possibilities for reasons by giving the child adequate time. It was felt that if the examiners probed, answers could be implied and certain students receive more help than others.

After consideration, it was decided to place the children of mixed (indigenous-expatriate) marriages with the expatriate sample because of the predominating influence of the mother and because of the fact that their experiences were Western. Other indigenous students who had travelled or

lived abroad remained with the indigenous group as they basically retained the Nigerian way of life.

Evaluation Procedures

Upon examination of the results for the total population of the Zaria model, it became obvious that the 75% success ratio established by Piaget et al. (1947) (Evans, 1973) and used by Renner et al. (1973) was not practical. Unlike the Norman model where there was a constant sample of 12 students at each four month age level that allowed for a 75% success ratio of 9 task achievers, the Zaria model varied from 0-16 students. In many cases, this made it impossible to accurately establish a percentage success ratio.

Investigations were carried out at 5% intervals from 50% to 70% to see if any pattern emerged but this procedure proved to be of no value. Allowances were then made for the inconstancy of the age levels, difficulty in accurately assessing the 75% success ratio, English deficiencies and variations and diversity of cultural concepts. By allowing a 0.5 plus factor to any result that barely failed to meet the success ratio requirements, the difficulty was overcome, i.e. 75% of six equals 4.5. If only four students were successful, this was considered acceptable.

Chapter IV

RESULTS

Presented in this chapter are the findings of the six Piagetian conservation tasks (number, solid amount, liquid amount, length, area and weight) administered to the total testable population at Zaria Children's School.

Research Objectives

This study was undertaken because of the decrease in the number of expatriate children and the corresponding increase in the number of below standard students, English-deficient students and students being exposed to the British system of education for the first time. This created a distinct divergence between the two populations particularly in designing instructional programs. The specific aim was to reduce this divergence by developing common criteria for instruction and for developing programs that would provide for a more effective convergence of the cognitive abilities of Nigerian students with the British system of education employed at Zaria Children's School. More specifically, the objectives of this study in an elementary school with an international student population were to:

1. Identify and verify the existence of an underlying cognitive structure in an international student population.
2. Identify the age levels at which conservation

occurred in an international student population.

3. Identify a sequence or sequential variation in the acquisition of the conservation tasks by an international student population.

Data was gathered and is reported in the following categories:

1. Age and nationalities of students at Zaria Children's School.
2. Norman, Oklahoma student population.
3. Zaria, Nigeria international student population.
4. Norman and Zaria.
5. Sequence of conserving tasks by Zaria population.
6. Conservation of all six tasks by Zaria population.
7. Highest achievers among Zaria population.
8. Zaria indigenous students with Zaria expatriate students and Norman population.
9. Zaria male population with Zaria female population and Norman population.
10. All Zaria student groups with Norman student sample.

Student Population

Table I contains a breakdown of the population which was tested. One hundred and sixty-seven students of various nationalities and ethnic backgrounds from grades Reception through to six were given the tests. These nationalities were comprised of: Nigerian 61; British 28; Indian 17;

Table I: Age and Nationality of the 167 Students Tested at Zaria Childrens School, Nigeria

(N=167)

Nationality	Age reported in months:													Totals								
	60-64	65-68	69-72	73-76	77-80	81-84	85-88	89-92	93-96	97-100	101-104	105-108	109-112		113-116	117-120	121-124	125-128	129-132	133-136	137-140	141-144
Nigerian	7	1	5	2	4	3	3	4	3	3	6	4	3	3	1	4	1	2	1	1	0	61
British	6	2		2	2	1	1	3	1	2	2	2	2	2	1	2	1	1				28
Indian	1	1			1					2	2		4	1	1	1	3	1				17
Nig.-British	1	1		2			1		1	1	1	1	1		2	2		1	1			8
Dutch																1						1
Lebanese						2	1							1				2	1			6
Polish							1															6
Nig.-German		1							1					1		2	1		2	1		5
Pakastani		2		1									1	1								4
American									2	1												4
Sri-Lenkan						1			2	1	1											3
Sudanese									2		1											3
Filipino																2						2
Brit.-Pakastani																						2
Am.-French														1						1		2
Nig.-Spanish																						1
Nig.-Finnish																						1
Nig.-Lebanese		1																				1
Ugandan																						1
South African																						1
Pol.-Rhodesian																						1
Am.-Chinese		1																				1
Totals	16	10	5	7	7	10	8	9	8	8	13	9	10	8	2	12	8	7	4	6	0	167

Nigerian-British 8; Dutch 8; Lebanese 6; Polish 6; Nigerian-German 5; Pakastani 4; American 4; Sri-Lankan 3; Sudanese 3; Filipino 3; British-Pakastani 2; American-French 2; Nigerian-Spanish 1; Nigerian-Finnish 1; Nigerian-Lebanese 1; Ugandan 1; South African 1; Polish-Rhodesian 1; and American-Chinese 1. There were 84 females and 83 males. In the indigenous population 29 females and 32 males and in the expatriate population there were 46 females and 45 males. The indigenous-expatriate students numbered 9 females and 6 males.

Norman Model

Table II presents the results of the Piaget conservation tasks carried out by Renner et al. (1973) in Norman, Oklahoma, U.S.A. The results have been placed in four month age levels under the headings of the relevant tasks. Where a success ratio of 75% has been established i.e. nine or more task achievers out of twelve, conservation is considered as being demonstrated. Number was conserved at 84 months, solid amount at 88 months, and weight at 120 months. The children were not consistent in their ability to conserve length at 128 months, area at 132 months, and liquid amount at 88 months.

Zaria Model

Table III presents the results of the Piaget conservation tasks carried out at Zaria Children's School, Kaduna State, Nigeria. The procedures established by Renner et al. (1973) were followed. However, due to the inconsistency of

Table II: Results of Piagetian Conservation Tasks Carried Out at Norman, Oklahoma

Months	Sample	75% Success ratio of 12	Number	Solid Amount	Liquid Amount	Length	Area	Weight
60-64	12	9	3	2	2	-	1	1
65-68	12		7	2	-	2	2	3
69-72	12		6	3	4	1	2	1
73-76	12		5	7	7	3	6	3
77-80	12		8	5	5	3	2	6
81-84	12		9*	5	5	-	3	5
85-88	12		11	11*	9*	6	9	10
89-92	12		11	9	11**	9	8	11
93-96	12		9	9	8**	7	6	8
97-100	12		12	12	11**	9	8	11
101-104	12		12	11	8**	5	7	8
105-108	12		11	9	9	7	8	10
109-112	12		11	10	10	7	7	6
113-116	12		11	11	10	7	7	7
117-120	12		12	12	10	7	6	9*
121-124	12		9	12	11	7	8	9
125-128	12		11	11	10	9*	7	11
129-132	12		12	11	11	12	10*	10
133-136	12		12	12	12	8**	7**	12
137-140	12		12	10	10	10	10	12
141-144	12		12	12	12	12	12	12
Conservation levels			84	88	88	128	132	120

* Levels at which conservation established.

** Inconsistent

Table III: Results of Piagetian Conservation Tasks Carried Out at Zaria Children's School

Months	Sample	75% Success ratio	Number	Solid Amount	Liquid Amount	Length	Area	Weight
60-64	16	12.0	5	-	-	-	5	1
65-68	10	7.5	8	1	-	-	4	2
69-72	5	3.75	2	-	1	-	1	1
73-76	7	5.25	4	-	1	2	3	1
77-80	7	5.25	5	3	1	1	4	2
81-84	10	7.5	6	3	1	1	5	4
85-88	8	6.0	6	4	3	2	4	2
89-92	9	6.75	7	4	4	2	6	2
93-96	8	6.0	5	5	5	1	5	2
97-100	8	6.0	7	4	3	3	6	5
101-104	13	9.75	12	8	5	4	8	7
105-108	9	6.75	7	8*	4	4	6	7
109-112	10	7.5	8	7	4	4	8*	4
113-116	8	6.0	6	6	3	5	6	4
117-120	2	1.5	2	1	5*	3	6	4*
121-124	12	9.0	12	11	2	2	2	1
125-128	8	6.0	8	8	9	6	9	9
129-132	7	5.25	6	6	6	5	6	7
133-136	4	3.0	4	3	7	4	6	5
137-140	6	4.5	5	5	3	5	3	6
141-144	Nil	-	-	-	-	-	-	-
Conservation levels			100	108	120	N/E	112	120

*Levels at which conservation established.

N/E - not established.

the numbers of students in each age level the 75% success ratio was difficult to establish. This was overcome by allowing a 0.5 plus factor to any result that barely failed to meet the success ratio requirement, i.e. 75% of six equals 4.5. If only four students were successful, this was considered satisfactory. There were no pupils at the 141-144 month age level.

In the Zaria study, number was established at 100 months; solid amount at 108 months; both liquid amount and weight were established at 120 months and area at 112 months. Length was not established.

Comparison of Norman and Zaria Models

Table IV presents the results of the Norman and Zaria samples. Both Norman and Zaria conserved weight at 120 months. Zaria established area earlier at 112 months than Norman (132 months). Norman established number, solid amount and liquid amount earlier than Zaria. Whereas Norman established length at 128 months, Zaria failed to establish the age level for this task.

Comparison Among Subgroups of Zaria Sample

Table V presents the results of the Zaria total population and the sequence and percentage of students completing the tasks. The students conserved the tasks of solid amount (quantity), weight and liquid amount (volume) in accordance with the sequence established by Piaget (Dasen, 1977).

Table IV: Results of Piagetian Conservation Tasks Carried Out at Norman Oklahoma and Zaria Children's School, Nigeria

Group	Number	Solid Amount	Liquid Amount	Length	Area	Weight
Norman	84	88	88	128	132	120
Zaria	100	108	120	N/E*	112	120

N/E* - not established.

Table V: Sequence of Conserving Tasks by the Students in Zaria Children's School

(N = 167)

Task	Number of Students Successfully Completing Tasks	Percentage of Students Successfully Completing Tasks
Number	125	74.9
Area	106	63.5
Solid Amount (quantity)	87	52.1
Weight	75	44.9
Liquid Amount (volume)	67	40.1
Length	51	30.5

Table VI lists those nationalities who successfully achieved the conservation of all six tasks. These were in order of rank: Filipino 66.6%; Dutch 50%; Nigerian-German 40.0%; Lebanese 33.3%; American 25.0%; British 21.4%, Indian 17.6% and Nigerian 3.3%. Of the entire testable Zaria population 13.1% conserved all six tasks. The earliest conservation of all six tasks was by a British female at 80 months.

Table VII presents the results of the highest achievers among the Zaria students. These were selected from among the top 90% of each month age level where conservation of one of more tasks was demonstrated. The majority of nationalities was represented. Nothing definite can be extracted from these results due to the inconsistency of nationality numbers.

Table VIII presents the results of the Piagetian conservation tasks carried out by the Zaria indigenous students. Number was established at 100 months; solid amount and area at 108 months; liquid amount at 116 months; weight at 128 months while length was not established.

Table IX presents the results of the Piagetian conservation tasks carried out by Zaria expatriate students. Number was established at 88 months; solid amount at 104 months; liquid amount at 116 months; length at 112 months; area at 100 months while weight was inconsistent.

Table X presents the results of the Piagetian conservation tasks carried out by the Zaria male students. Number was established at 116 months; solid amount was established at 108 months; liquid amount was established at 116 months;

Table VI: Conservation of All Six Tasks by Various Nationalities at Zaria Children's School

Nationality	Total Number per Nationality	Number Conserving All Six Tasks	Percentage per Nationality Conserving All Six Tasks
Filipino	3	2	66.6
Dutch	8	4	50.0
Nigerian-German	5	2	40.0
Lebanese	6	2	33.3
American	4	1	25.0
British	28	6	21.4
Indian	17	3	17.6
Nigerian	61	2	3.3
Totals	132	22	

Percentage per total population conserving all six tasks = 13.1%.

Table VII: Highest Achievers in Conserving Piagetian Tasks By Zaria Students.

Nationality	Total Number per Nationality	High Achievers per Nationality	Percentage per Nationality Conserving All Six Tasks
Filipino	3	3	100
Polish-Rhodesian	1	1	100
Polish	6	5	83.3
Dutch	8	5	62.5
Nigerian-British	8	5	62.5
British	28	16	51.1
Lebanese	6	3	50.0
American	4	2	50.0
American-French	2	1	50.0
British-Pakastani	2	1	50.0
Indian	17	7	41.2
Nigerian-German	5	2	40.0
Sri-Lankan	3	1	33.3
Nigerian	61	10	16.4

Table VIII: Results of Piagetian Conservation Tasks Carried Out by Zaria Indigenous Students

Months	Sample	75% Success ratio	Number	Solid Amount	Liquid Amount	Length	Area	Weight
60-64	7	5.25	1	-	-	-	1	1
65-68	1	0.75	1	-	-	-	1	1
69-72	5	3.75	2	-	1	-	1	1
73-76	2	1.5	-	-	-	-	-	-
77-80	4	3.0	2	1	-	-	1	-
81-84	3	2.25	2	1	-	-	2	-
85-88	3	2.25	1	-	-	1	-	-
89-92	4	3.0	3	1	-	-	1	1
93-96	3	2.25	1	1	3	-	2	1
97-100	3	2.25	2*	2	1	1	2	1
101-104	6	4.5	5	4*	1	1	2	2
105-108	4	3.0	4	2	2	1	3*	3
109-112	3	2.25	3	2	2	1	2	2
113-116	3	2.25	2	2	2*	-	2	1
117-120	1	0.75	1	1	1	1	1	1
121-124	4	3.0	4	3	3	-	3	1*
125-128	1	0.75	1	1	1	-	1	1
129-132	2	1.5	2	2	2	-	2	2
133-136	1	0.75	1	1	1	1	1	1
137-140	1	0.75	1	1	1	1	1	1
141-144	Nil	-	-	-	-	-	-	-
Conservation levels			100	108	116	N/E*	108	128

* Levels at which conservation established.

*N/E - not established.

Table IX: Results of Piagetian Conservation Tasks Carried Out by Zaria Expatriate Students

Months	Sample	75% Success ratio	Number	Solid Amount	Liquid Amount	Length	Area	Weight
60-64	9	6.75	3	-	-	1	3	1
65-68	9	6.75	7	1	-	-	3	1
69-72	-	-	4	-	-	-	-	-
73-76	5	3.75	4	2	1	2	3	1
77-80	3	2.25	3	2	1	1	3	2
81-84	7	5.25	4	2	-	1	3	2
85-88	5	3.75	5*	4	3	2	4	2
89-92	5	3.75	4	3	4	2	5	2**
93-96	5	3.75	4	4	2	-	3	1
97-100	5	3.75	5	2	2	1	4*	4
101-104	7	5.25	7	6*	4	3	6	5
105-108	5	3.75	4	4	2	3	4	4
109-112	7	5.25	5	4	3	3	6	5
113-116	5	3.25	4	4	3*	5*	6	3**
117-120	1	0.75	4	4	3*	3	3	2**
121-124	8	5.6	1	1	1	1	1	-**
125-128	7	5.25	8	8	6	6	7	8
129-132	5	3.75	7	7	5	5	6	7
133-136	3	2.25	4	4	2	4	4	3**
137-140	5	3.75	3	2	4	2	3	2
141-144	-	-	5	4	4	4	5	5
Conservation levels			88	104	116	112	100	1**

* Levels at which conservation established.

** - Inconsistent

Table X: Piagetian Conservation Tasks Carried Out by Male Students at Zaria Children's School.

Months	Sample	75% Success ratio	Number	Solid Amount	Liquid Amount	Length	Area	Weight
60-64	9	6.75	8	-	-	1	3	-
65-68	5	3.75	4	1	-	-	1	1
69-72	2	1.5	-	-	-	-	-	-
73-76	3	2.25	2	2	-	1	1	1
77-80	5	3.75	4	2	-	-	3	3
81-84	8	6.0	4	3	-	-	2	2
85-88	4	3.0	3	2	1	2	-	-
89-92	1	0.75	-	-	-	-	-	-
93-96	4	3.0	2	1	3	-	2	1
97-100	3	2.25	2	5	2	-	1	1
101-104	10	7.5	9	5	4	3	5	5
105-108	5	3.75	3	4*	3	2	2*	3
109-112	4	3.0	3	4	1	1	3	1**
113-116	3	2.25	3*	3	2*	1	3	2
117-120	1	0.75	1	3	1	1	1	-**
121-124	4	3.0	4	3	3	1	3	3
125-128	2	1.5	2	4	1	1	2	2**
129-132	5	3.75	4	4	5	3	4	2**
133-136	2	1.5	2	1	1	1*	2	1
137-140	3	2.25	3	3	2	2	3	3
141-144	-	-	-	-	-	-	-	-
Conservation levels			116	108	116	136	112	1**

* Levels at which conservation established.

1** - inconsistent.

length was established at 136 months; area was established at 112 months; and weight was inconsistent.

Table XI presents the results of the Piagetian conservation tasks carried out by the Zaria female students. Number was established at 80 months; solid amount was established at 96 months; liquid amount was established at 120 months; length was established at 112 months; area was established at 92 months; and weight was established at 100 months. Except for weight, the 113-116 months age level showed a slight inconsistency.

Table XII summarizes the performance of the Norman, Oklahoma, population with the Zaria, Nigeria, population and the Zaria subgroups on the Piagetian conservation tasks.

In the comparison of the total Zaria population with the Norman population, area was established earlier by Zaria (112 months) than Norman (132 months). Weight was established at the same time (120 months). Number, solid amount and liquid amount were established earlier by Norman than Zaria. Length was not established by Zaria.

In the comparison of the indigenous with the expatriate population and with the Norman population, the expatriates conserved number (88 months) earlier than the indigenous group (100 months) and at almost the same time as the Norman group (84 months). The expatriates conserved solid amount (104 months) at almost the same time as the indigenous group (108 months) but both were later than the Norman group (88 months). Both expatriate and indigenous groups conserved

Table XI: Results of Piagetian Conservation Tasks Carried Out by Female Students at Zaria Children's School.

Months	Sample	75% Success ratio	Number	Solid Amount	Liquid Amount	Length	Area	Weight
60-64	7	5.25	2	-	-	-	1	2
65-68	5	3.75	4	-	-	-	3	-
69-72	3	2.25	2	-	1	-	1	1
73-76	4	3.0	2	-	1	1	2	1
77-80	2	1.5	1*	1	1	1	1	1
81-84	2	1.5	2	-	-	1	2	-
85-88	4	3.0	3	2	4	2	2	3
89-92	8	5.6	7	4	4	2	6	1
93-96	4	3.0	3	3*	2	-	3	3
97-100	5	3.75	3	4	1	2	1	4*
101-104	3	2.25	5	3	1	1	5	2
105-108	4	3.0	3	3	1	2	3	4
109-112	6	4.5	4	3	1	4*	4	4
113-116	5	3.75	6	4**	2**	2**	5**	4
117-120	1	0.75	3	3	1	1	1	1
121-124	8	5.6	1	8	6	5	6	6
125-128	6	4.5	6	6	5	4	5	6
129-132	2	1.5	2	2	2	1	2	1
133-136	2	1.5	2	2	2	1	2	2
137-140	3	2.25	3	2	3	2	3	2
141-144	-	-	-	-	-	-	-	-
Conservation levels			80	96	120	112	92	100

* Levels at which conservation established.

** Inconsistent

Table XII: Results of Piagetian Conservation Carried Out At Norman, Oklahoma and Among Subgroups at Zaria Children's School.

Group	Number	Solid Amount	Liquid Amount	Length	Area	Weight
Norman	84	88	88	128	132	120
Zaria	100	108	120	N/E*	112	120
Indigenous	100	108	116	N/E*	108	128
Expatriate	88	104	116	112	100	I**
Male	116	108	116	136	112	I**
Female	80	96	120	112	92	100

N/E* - not established.

I** - inconsistent.

liquid amount at the same time (116 months) but both were later than the Norman group (88 months). The expatriate group conserved length (112 months) earlier than the Norman group (128 months) and which the indigenous group failed to establish. The expatriate group conserved area (100 months) earlier than the indigenous group (108 months) and earlier than the Norman group (132 months). The Norman group conserved weight (120 months) earlier than the indigenous group (128 months) while the expatriate results were inconsistent.

In the comparison of the male with the female population and with the Norman population, the females conserved number (80 months) earlier than the male group (116 months) and the Norman Group (84 months). The females conserved solid amount (96 months) earlier than the males (108 months) but were later than the Norman group (88 months). The females conserved length (112 months) earlier than the males (136 months) and the Norman group (128 months). The females conserved area (92 months) earlier than the males (112 months) and the Norman group (132 months). The females conserved weight (100 months) earlier than the Norman group (120 months) while male results were inconsistent. The males conserved liquid amount (116 months) earlier than the females (120 months) but both were later than the Norman group (88 months).

The earliest group to conserve number was the female group at 80 months. The earliest group to conserve solid amount was the Norman group at 88 months. The earliest group to conserve liquid amount was the Norman group at 88 months.

The earliest groups to conserve length were the expatriate and the female at 112 months. The earliest group to conserve area was the female at 92 months. The earliest group to conserve weight was the female at 100 months.

The female group conserved number (80 months), length (112 months), area (92 months) and weight (100 months) earliest. The expatriates also conserved length earliest at 112 months. Norman, Oklahoma, conserved both liquid and solid amounts earliest at 88 months.

Summary

One hundred and sixty-seven students of various nationalities and ethnic backgrounds in grades Reception through to six in Zaria Children's School, an elementary school in Nigeria, were administered the Piagetian conservation tasks (number, solid amount, liquid amount, length, area and weight).

The goal of this study was to establish a common set of criteria for developing instructional programs for an international student population. More specifically, the researcher sought to:

1. Identify and verify the existence of an underlying cognitive structure in an international student population.
2. Identify the age levels at which conservation occurred in an international student population.
3. Identify the sequence or sequential variation in the acquisition of the conservation tasks in an international student population.

In order to achieve these objectives the researcher gathered data and reported it in the following categories:

1. Age and nationalities of students at Zaria Children's School.
2. Norman, Oklahoma.
3. Zaria international population.
4. Norman, Oklahoma and Zaria, Nigeria.
5. Sequence of conserving tasks by Zaria population.
6. Conservation of all six tasks by Zaria population.
7. Highest achievers among Zaria population.
8. Zaria indigenous students with Zaria expatriate students and Norman population.
9. Zaria male population with Zaria female population and Norman population.
10. All Zaria student groups with Norman student sample.

Analyses of the results revealed that:

1. Performance of the Zaria population was generally comparable with the Norman sample.
2. Female groups performed better than male groups.
3. Expatriate groups generally performed better than the indigenous group.
4. Sequencing of tasks was as predicted by Piaget.
5. A number of nationalities was capable of performing all six tasks.
6. The majority of nationalities was included among the highest achievers.

Chapter V

CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

The goal of this study was to establish a common set of criteria for developing instructional programs for an international student population in Zaria, Nigeria. More specifically, the researcher sought to:

1. Identify and verify the existence of an underlying cognitive structure in an international student population.
2. Identify the age levels at which conservation occurred in an international student population.
3. Identify a sequence or sequential variation in the acquisition of the conservation tasks by an international student population.

Data was gathered and reported in the following categories:

1. Age and nationalities of students at Zaria Children's School.
2. Norman, Oklahoma.
3. Zaria international population.
4. Norman, Oklahoma and Zaria, Nigeria.
5. Sequence of conserving tasks by Zaria population.
6. Conservation of all six tasks by Zaria population.
7. Highest achievers among Zaria population.
8. Zaria indigenous population with Zaria expatriate

population and Norman population.

9. Zaria male population with Zaria female population and with Norman population.

10. All Zaria student groups with Norman student sample.

Conclusions

Analyses of the results of the total Zaria population and the Zaria subgroups revealed that:

1. Performance of the total Zaria population was generally comparable with that of the Norman sample.
2. Expatriate groups generally performed better than indigenous groups.
3. Female groups performed better than male groups.
4. Sequencing of tasks was as predicted by Piaget.
5. A number of nationalities were capable of performing all six tasks.
6. The majority of nationalities were included among the highest achievers.

Based on these findings the following conclusions were reached:

1. The existence of an underlying cognitive structure was common in an international student population.
2. It was possible to identify the age levels at which conservation occurred in an international student population.
3. There was no variation in the conservation of

quantity (solid amount), weight and volume (liquid amount) as predicted by Piaget.

By extracting information from the results of the total Zaria sample, it was possible to establish the entire sequence of tasks in order of accomplishment, identify those nationalities capable of conserving all six tasks, identify the highest achievers among the nationalities, and break the Zaria sample down into indigenous and expatriate groups, male and female groups.

With this information it was possible to reach the conclusion that all nationalities and both sexes had an underlying cognitive structure and processes that were similar and passed through the same invariant order of stages. Placed in a common experience of Zaria Children's School, results became competitive and the ability to excel was influenced by previous experience. This information made it possible to formulate the goal of establishing a common set of criteria for developing instructional programs for an international student population.

Implications

Only in the area task was the level of the Zaria sample established earlier than the Norman. The most obvious explanation is that children attending Zaria Children's School inhabit a different cultural environment from those students residing in Norman, Oklahoma. The Zaria students, both indigenous and expatriate have direct exposure to an

agricultural economy. Such sights as sheep, goats and donkeys roaming free and the seasonal migrations of the Fulani herdsmen with their Zebu cattle are commonplace. There was a direct relationship of the task to their previous knowledge and experience. When exposed to the task their response was one of immediate interest; comments and observations were frequent and answers generally given without hesitation. These findings are in keeping with the work of Price-Williams et al. (1966) among the children of pottery-makers in Mexico and Goodnow and Bethon (1966) who studied children in Hong Kong and concluded that successful completion of the conservation tasks had direct counterparts in the experiences of the child upon which they might draw.

Weight was established at the same time by both Zaria and Norman students. However, the cultural experiences would be widely different. Both indigenous and expatriate students frequent the open markets, witness the transactions between trader and buyer as they haggle for an agreeable price and see the commodity transferred by hand from the trader's container to the customer's bag or bottle. This is normal procedure and differs from those of Western economies where prices are predetermined and goods are prepackaged.

The experiences of the indigenous child were more significant than those of the expatriate. The Nigerian child is sent to the markets by himself to purchase the required goods and upon return home would be queried about the price, quality and quantity (Oshuhor, 1977). The parents of the

expatriate children preferred to purchase edible goods in the supermarkets. This was brought out when the total Zaria population was broken down into indigenous and expatriate results. The former established weight at 128 months but the latter were inconsistent. This once again confirms the findings of Price-Williams et al. (1966) and Goodnow and Bethon (1966) in that it shows a direct relationship of the task to previous knowledge and experience. However, there is a conflict with the work of Heron and Simonsson (1969) when they stated that the children of European extraction attending the private school in Zambia (which appears to be similar to Zaria Children's School) were able to conserve weight according to the Genevan norms, whereas the indigenous Zambian child failed to do so.

The interpretation of weight conservation does not hold true for liquid and solid amounts which were established later than the Norman sample. Neither does a breakdown into indigenous and expatriate samples reveal the preponderance of scores in favor of the indigenous group. This is puzzling as the experiences in the open markets would be similar to weight conservation. Both groups have had the experience of seeing palm and groundnut oil as well as agricultural products transferred from the trader to the customer. In keeping with Heron's findings (1971) in Zambia, there does not appear to be any observable reason why the Zaria population did not conserve solid and liquid amounts at the same time, if not earlier than the Norman sample, two tasks in which they were

experienced. Length was not established by the total Zaria population but enlightening facts emerged when the study was broken down into indigenous and expatriate groups.

1. Sequence of tasks. It was found that Zaria students conserved quantity (solid amount), weight and volume (liquid amount) in correct sequence and did not display any variation or "horizontal decalage" (Dasen, 1977). This is similar to the findings of Heron and Simonsson (1969) when they compared weight conservation among Zambian children from a private (fee paying) school employing a Western system of education to children from a government school where the emphasis was upon rote memorization. The children of European extraction attending the former school carried out the tasks in accordance with the Geneva norms. The Zaria results also demonstrate a significant difference from the findings of DeLemos (1966) among Australian Aborigine children where there was a substantial reversal of Piaget's "Invariant Order" (Heron and Simonsson, 1969) in Berry and Dasen (1974).

The Zaria Children's School is seen as the main coordinating factor for such a variety of nationalities, ethnic groups and diversity of cultural backgrounds, upbringing and languages. The British system of education provided Western concepts and oriented mental abilities. The work of Greenfield (1966) lists schooling as the crucial factor although Kiminyo (1973) is in disagreement in stating that rural unschooled children have more opportunities to interact with their environment and demonstrate conservation. Al Fakri

(1972) and Za'rour and Khuri (Dasen, 1977) show the influence of an alternative type of education, the Islamic where there is little or no emphasis placed upon reasoning ability and instruction takes place through rote memorization and passive acceptance by the students. They maintain this form of education is responsible for the time lag occurring in students from Iraq and Amman. Lloyd (1971) also points out the significance of education among the educated Yoruba elite in Nigeria in comparison to the Oje children educated by traditional tribal methods.

2. Achievers of all six tasks. Once again the significance of Western education can be seen in that a satisfactory number of nationalities showed themselves capable of conserving all six tasks.

3. Highest achievers. The majority of nationalities attending Zaria Children's School were represented among the highest achievers in the Piagetian conservation tasks. This aptly exposed the datum that there is a basic underlying cognitive structure that is common to all nationalities. Where there was a tendency to excel i.e. expatriates - length, total Zaria population - area, females - most tasks; the reason could be traced to personal or cultural experiences or maturation.

The Zaria study while being unique that it tested many nationalities at the one time and place can still be compared with the work of cross-cultural researchers who tested one Western to one non-Western culture and have found

that there is a basic underlying cognitive structure which is common to both.

Among these is Feldman et al. (1974) who concluded that the Eskimo undergoing successful adaptation was capable of the same cognitive development as children from Kentucky, U.S.A. The findings of Opper (1971) among Thai urban and rural children demonstrated that no matter how great was the diversity of cultural backgrounds, there existed similar underlying processes. The study carried out by Laurendeau-Bendavid (Dasen, 1977) comparing children from Rwanda, central Africa to those from Montreal, Canada, substantiated the Universalist belief that no matter how opposed were the cultural concepts, cognitive development does not differ appreciably.

Zaria Children's School with its Western and British system of education was a converging point for the orientation of the mental abilities of children from many countries. Education played a significant role which is in keeping with the findings of Greenfield (1966), Lloyd (1971), Heron and Simonsson (1969), DeLacey (1970) and Dasen (1974, 1975).

4. Indigenous-expatriate comparison. Several aspects emerged from this analysis. Although length was not established by the total or indigenous groups, expatriate children established this task well in advance of the Norman population. The most obvious explanation was the previous extensive travel experience of these students. Personal experience on a large scale such as the Norman child does not encounter

gave them a significant advantage in dealing with this task. This previous experience is again a confirmation of the findings of Price-Williams et al. (1966) and Goodnow and Bethon (1966). It also throws light on the studies of Al Fakri (1972) among Iraqi children and Za'rour and Khuri (Dasen, 1977) among Jordanian children in Amman on the concept of speed. Both researchers considered the Islamic system of education responsible for the time lag. It might also be pointed out that the children studied by these two researchers were from a low socioeconomic strata and were devoid of the concentrated travel experience of the Zaria expatriate students.

Both indigenous and expatriate groups conserved area earlier than Norman, Oklahoma, and as previously stated in the comparison of the total Zaria population with the Norman group, this is obviously because of the marked cultural difference in daily exposure to situations which correlated with the task. Zaria students based their information upon previous visual experience.

There was little difference in the total, indigenous or expatriate Zaria samples to conserve number when compared to the Norman sample. This is probably because the elementary curriculum for mathematics does not differ significantly in Western countries.

Both indigenous and expatriate groups established liquid and solid amounts later than the Norman students. As stated earlier, there does not appear to be an explanation for this in view of previous experience. This is similar to

the findings of Heron (1971) in attempting to clarify the failure to conserve weight among Zambian children.

5. Male-female comparison. The female students at Zaria Children's School were more efficient in conserving number, solid amount, length, area and weight in advance of the male students. This is probably due to the earlier maturation processes. However, it is also interesting to note that in number, length, area and weight they were ahead of the Norman sample. The numbers of male and female students were too small to break down further in indigenous and expatriate samples.

Recommendations

1. That the Piagetian criteria be used to set up instructional programs which allow for the convergence of Nigerian cognitive abilities with the British system of education.

2. That further studies be carried out in other private schools in Nigeria that could serve as an alternative means of education.

3. That annual testing be carried out for further study of evolving situations.

4. That further study be carried out among the Fulani children of corresponding ages.

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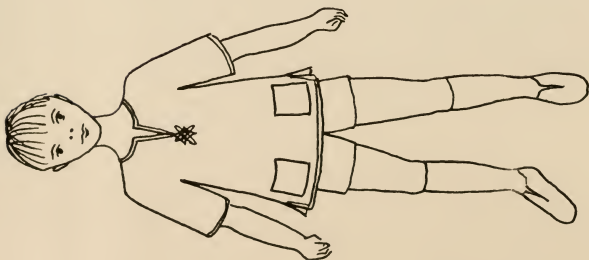
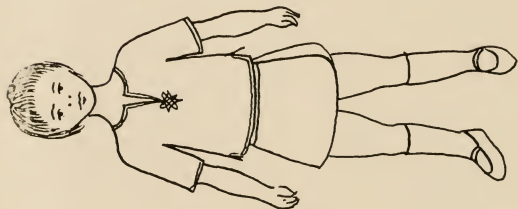
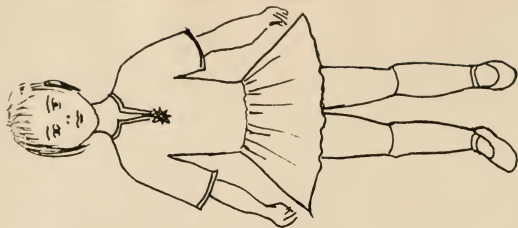
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APPENDIX

APPENDIX A: LOCATION OF NIGERIA



APPENDIX B: SCHOOL UNIFORMS

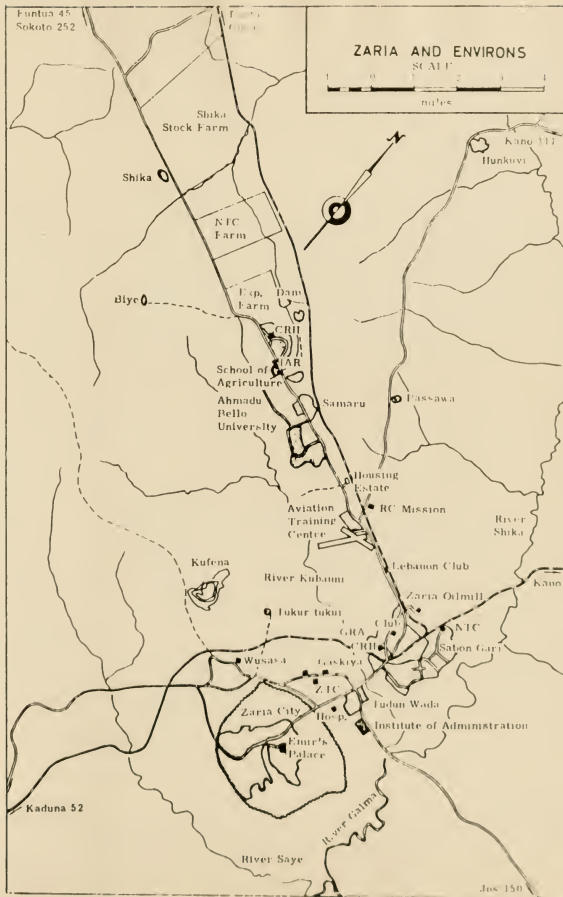


APPENDIX C: STUDENT POPULATION ZARIA CHILDREN'S SCHOOL
 SHOWING 1974-1977 SHOWING INCREASE IN INDIGENOUS
 STUDENTS AND CORRESPONDING DECREASE IN EXPATRIATE
 STUDENTS

	1974 B1, B2 Jan. 18 -	1973 A1, A2 Sept. 21 -	1975 A1, A2 Sept. 23 - Dec. 19	1976 A1, A2 Sept. 21 - Dec. 15	1976 B1, B2 Jan. 13 - Apr. 2	1976 C1, C2 Apr. 20 - July 9	1977 A1, A2 Sept. 21 - Dec. 15	1977 B1, B2 Jan. 11 - Apr. 1
	A	B	C	D	E	F	G	H
Nigerian	75	58	73	84	81	89	91	92
N/Spanish			1	1	1	1	1	
N/Finnish	1	1	2		1	1	1	1
N/Sweedish	1	1	1					
N/German				2			3	5
N/Sudanese		1						
N/Ghanaian	1	1						
N/Lebanese					1	1	1	1
N/British	6	6	13	14	10	11	11	9
British	53	43	46	33	41	39	36	35
B/Pakastani	1	1	2	2	2	2	3	4
B/Swiss	1	1						
B/Indian		1	2	2				
B/Ghanaian				3	1	1	1	1
B/US	1							
U.S. American	9	9	5	3	7	7	4	4
U.S./Chinese				1	1	1	1	1
U.S./French						2	2	2
Canadian	4	3		1	1			
Filipino		1	2	4	2	1	3	4
Sth. African	1	1	3	2	3	3	2	2
Ghanaian	1	1	1	1				

	1974 B1, B2 Jan. 18 - A	1973 A1, A2 Sept. 21 - B	1975 A1, A2 Sept. 23 - Dec. 19 C	1976 A1, A2 Sept. 21 - Dec. 15 D	1976 B1, B2 Jan. 13 - Apr. 2 E	1976 C1, C2 Apr. 20 - July 9 F	1977 A1, A2 Sept. 21 - Dec. 15 G	1977 B1, B2 Jan. 11 - Apr. 1 H
Sud/Ghanaian		1						
Sudanese	4	5	9	7	6	5	5	5
Sud/Egypt	1							
Japanese				2	2	2		
Cameroonian	2	1						
Egyptian	5	7		2	3	2	2	1
Ugandan								2
India	21	22	20	16	26	26	15	19
I/Pakastani		2	1		1	1		
Pakastani	10	10	8	5	10	9	5	4
Pak/Irish	1							
Sri Lankan	8	8	6	4	3	3	3	3
Isralie	1	2				1		
Saudi Arabian					1	1		
Polish	1	1		5	7	5	6	5
Dutch	4	6	6	9	11	12	8	8
Italian	2	2			1			
Swedish	1							
Lebanese	9	4	8	5	5	8	7	8
Polish-Rhodesian				1	1	1	1	1

APPENDIX D: ZARIA AND ENVIRONS



APPENDIX E: STUDENTS AND STAFF OF ZARIA CHILDREN'S SCHOOL



Sri-Lankan, Nigerian, American, Indian, Nigerian, Pakastani,
Indian, British, Lebanese, Nigerian-British, Nigerian



British, British, South African, Egyptian, Sri-Lankan

PIAGETIAN TESTING OF AN INTERNATIONAL
STUDENT POPULATION IN ZARIA, NIGERIA

by

NALDI MORGAN DENNIS

B.S., Kansas State University, 1975

AN ABSTRACT OF A MASTER'S THESIS

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Manhattan, Kansas

1978

This study was undertaken because of the decrease in the number of expatriate students attending Zaria Children's School, Kaduna State, Nigeria and the corresponding increase in the number of below standard students, English-deficient students and students being exposed to the Western system of education for the first time. This created an obvious divergence between the two groups, particularly in designing instructional programs. The intention was to reduce this divergence by developing a common set of criteria for instruction and for programs that would provide for a more effective convergence of abilities of Nigerian students studying under a traditional British system of education employed at the school.

One hundred and sixty-seven students of various nationalities and ethnic groups were administered the Piagetian conservation tasks in January, 1977. The six tasks (number, solid amount, liquid amount, length, area and weight) were applied using the procedures carried out in Norman, Oklahoma, by Renner et al. (1972).

The subjects were students in grades Reception through Six whose ages ranged from five to twelve. Their nationalities were: Nigerian 61; British 28; Indian 17; Nigerian-British 8; Dutch 8; Lebanese 6; Polish 6; Nigerian-German 5; Pakastani 4; American 4; Sri-Lankan 3; Sudanese 3; Filipino 3; British-Pakistani 2; American-French 2; Nigerian-Spanish 1; Nigerian-Finnish 1; Nigerian-Lebanese 1; Ugandan 1; South African 1; Polish-Rhodesian 1; American Chinese 1. There were 84 females

and 32 males. In the indigenous population there were 29 females and 32 males, in the expatriate population 46 females and 45 males, and in the indigenous-expatriate population 9 females and 6 males.

The specific objectives of the study in an international student population were to:

1. Identify and verify the existence of an underlying cognitive structure;
2. Identify the age levels at which conservation occurred; and
3. Identify the sequence or sequential variation in the conservation of the tasks.

Data was gathered and reported in the following categories:

1. Age and nationalities of students at Zaria Children's School.
2. Norman, Oklahoma student population.
3. Zaria, Nigeria international student population.
4. Norman, Oklahoma and Zaria, Nigeria.
5. Sequence of conserving tasks by Zaria population.
6. Conservation of all six tasks by Zaria population.
7. Highest achievers among Zaria population.
8. Zaria and indigenous students with Zaria expatriate students and with Norman sample.
9. Zaria male population with Zaria female population and with Norman sample.
10. All Zaria student groups with Norman student

sample.

Significant results disclosed:

1. Performance of the total Zaria population was generally comparable to that of the Norman sample.
2. Expatriate groups generally performed better than indigenous groups.
3. Female groups performed better than male groups.
4. Sequencing of tasks was as predicted by Piaget.
5. A number of nationalities were capable of performing all six tasks.
6. The majority of nationalities were included among the highest achievers.

It was concluded that all nationalities and both sexes had similar underlying cognitive structure processes that passed through the same invariant order of stages. This information made it possible to formulate the goal of establishing a common set of criteria for developing instructional programs for an international student population.

This study was unique in that it brought together children from many countries including indigenes in a common experience at the same time, in the same location, and permitted immediate comparative analysis. It also considered Piaget's theory of an universal underlying cognitive structure and an invariant order of stages while at the same time perceiving the influence of cultural experiences. The findings should prove beneficial for revising and expanding existing

instructional programs and initiating new ones for indigenous students in rapidly developing countries with English as the major language of instruction.

