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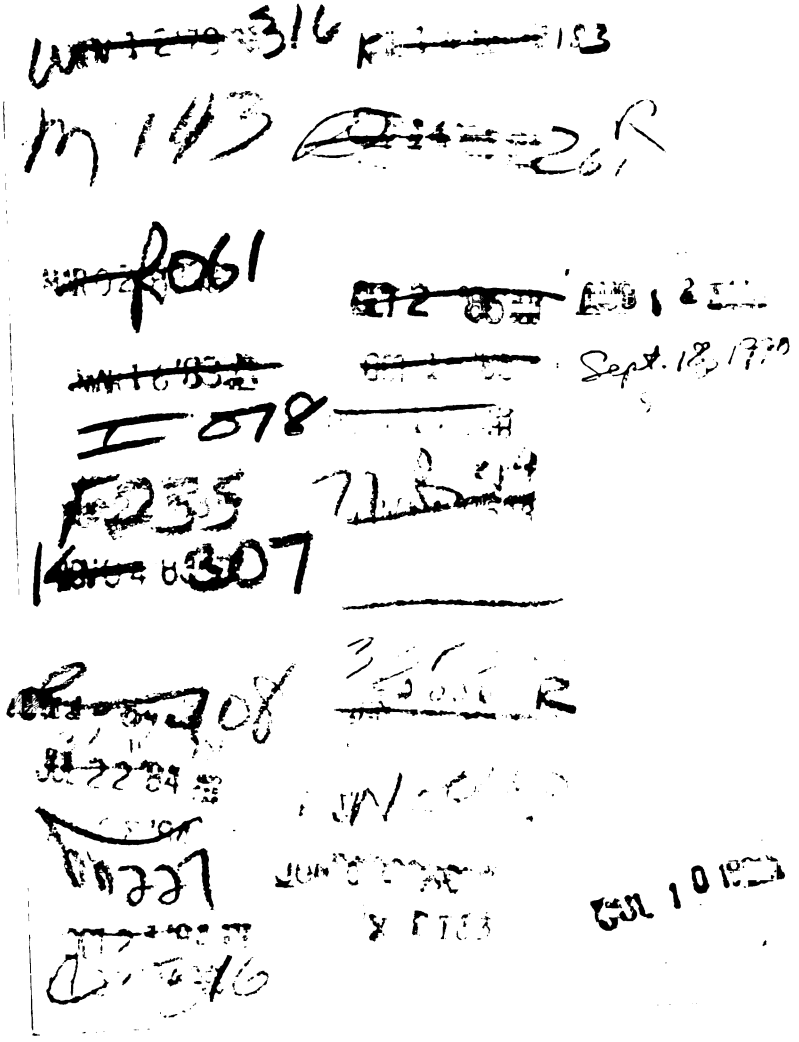

THE EFFECTS OF SCHOOLING ON EQUIVALENCE GROUPING PREFERENCES OF TANGALE ADULTS

by

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ABSTRACT

THE EFFECTS OF SCHOOLING ON
EQUIVALENCE GROUPING PREFERENCES
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The study investigated the effects of schooling on the way adult males of northeastern Nigeria prefer to sort dissimilar stimuli into equivalence groupings.

As western patterns of education spread throughout Africa it is important for educators to be aware of the thinking-process preferences of the learner. It is likely that a student will learn more easily if the structures of the curriculum are similar to the student's preferred and normal manner of structuring dissimilar stimuli.

The data are also useful for continuing development of a theory for causes of cognitive growth in adults.

Previous studies showed differences among cultures in both the rate and the limits of cognitive development. The amount of schooling was often seen to be related to differences in cognitive functioning. The studies did not assume that the differences necessarily indicated cognitive deficits. Differences may indicate appropriate responses to different cultural needs.

Evidence seems to indicate that as children in the western world grow, they shift from using complementary,

thematic and relational criteria to using similar, analytic and superordinate criteria in equivalence grouping tasks. Studies of older adults indicate that once they are freed from the pressures of schooling and careers they do not lose the capacity for using superordinate rules. However, they prefer to use the more natural relational and complementary strategies.

One way to discover how adults prefer to sort dissimilar stimuli into equivalence groupings is to ask them to sort different pictures into groups of pictures that are related. A picture-grouping instrument was constructed and after field-testing, was administered to 130 Tangale males near Biliri in northeastern Nigeria. The sample was composed of illiterate farmers, pastors and teachers.

Independent variables included the amount of schooling, the recency of the schooling, the amount of non-formal education and occupation.

Dependent variables included the number of superordinate equivalence rules used, the number of internal attributes used (i.e., function, material or being attributes), and the number of impersonal linguistic structures used.

Results of one-way analysis of variance showed that schooling affected the number of superordinate grouping strategies used, but the amount of schooling did not account for a difference. Pastors and teachers tended to prefer

superordinate groupings more than did illiterate farmers. The results did not show a relationship between the recency of schooling and the amount of non-formal education for any of the dependent variables.

Fulani language ability was found to be positively related to superordinate rules, external attributes and impersonal linguistic structures. Also, the number of languages spoken correlated positively with superordinate rules and impersonal linguistic structures.

It was concluded that schooling does affect the preference for using superordinate rules. However, the amount of schooling, the recency of schooling, and the amount of non-formal education does not affect a preference for use of superordinate rules, internal attributes or impersonal linguistic structures. Teachers and pastors preferred superordinate rules more than did illiterate farmers. Language ability, especially the ability to speak Fulani, correlated positively with the number of superordinate rules used.

To the Church

in Africa

with whom and for whom

this study was undertaken

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Chapter 1

IDENTIFYING THE PROBLEM

As western patterns of education spread throughout the world, differences between the thought processes of western and non-western people become an important study for educators.

One way of studying the thinking process is to investigate how people group the thousands of stimuli with which their minds are continuously bombarded. These stimuli provide more information than any mind could possibly process. Grouping strategies select the most relevant stimuli, preventing the individual from becoming overwhelmed by the diversity in the environment. Such strategies for grouping relevant stimuli seem to be a learned achievement, and they may be expected to vary with internal growth and with environmental changes. The process by which people group different stimuli into meaningful categories is the focus of the study.

Purpose of the Study

The purpose of the study is to investigate how schooling affects the way adults prefer to group dissimilar stimuli into equivalence groupings. Specifically, the study tests hypotheses about the relationship between the amount and recency of schooling and equivalence grouping preferences as measured by a picture-sorting task administered to Tangale men of northeastern Nigeria. Other hypotheses about the relationship of occupation and non-formal education to equivalence grouping preferences are also tested.

Importance of the Study

The study is important in three ways: 1. it has practical implications for the structure and content of adult education in non-technical societies; 2. it is a continuation of important research methodology by Bruner, Olver and Hornsby (1966), and fits into a growing body of cross-cultural research pertaining to equivalence groupings; and 3. it has significant theoretical implications, because it fills a need for data regarding the cognitive development of adults in a non-western society.

Practical Implications. The entry behavior of the student affects every other curriculum consideration: subject matter, type of instruction, place in the instructional sequence and the objectives of the instruction

(Schulman, 1970). Equivalence grouping preferences are an important aspect of the entry behavior of the learner. They indicate how the learner normally organizes and interprets stimuli in the real world. Thus it is quite possible that a student would learn better if the structure of the subject matter were similar to the way he normally organizes stimuli. For example, if a person usually groups objects using complementary criteria (e.g., grouping things that are normally found together), he may do better in a course (such as history) that emphasizes complementary criteria than in a course (e.g., geometry) which emphasizes superordinate criteria.

Understanding equivalence grouping preferences of adults is especially relevant for Nigeria. Nigerian adults in almost every profession sense the need to be "upgraded" educationally. Twenty years ago, a village pastor may have felt adequately prepared with only four years of formal training. Today he feels threatened and isolated by young people who have more formal education than he has. The pastor is probably unable to discuss world affairs, and he may not be able to speak English, the official language, with the young people in his church. He therefore desires to continue his education. School teachers, factory workers and government employees have similar needs. The desire for continuing education in Nigeria is even greater than it is in many Western countries, where educational standards are not rising as rapidly.

There is little evidence that equivalence grouping preferences of Nigerian adults are the same as those of American adults. Thus a study that describes equivalence grouping preferences of Nigerian adults is important to curriculum designers in Nigeria.

Methodological Implications. Bruner and his associates (1966) developed instruments using pictures, words and objects to measure the development of enactive, ikonic, and symbolic representations of reality in children and adolescents. They used similar instruments in cross-cultural studies. Since the present study uses instrumentation and procedures similar to those described in Olver and Hornsby (1966), it contributes to the process of construct validation.

Theoretical Implications. This section considers the theoretical relationships between cognitive development, cognitive preference and the environment, including the school. The long-term effects of the school on cognitive preferences are discussed.

Cognitive preferences are closely tied with environmental needs. That is, people prefer the cognitive structures that are most useful for their specific environment. Theoretical assumptions indicate that cognitive development is also a result of environmental pressures. Cole (1971) writes that people tend to develop those cognitive abilities which are most useful in a particular culture. Thus both

cognitive preferences and cognitive abilities are directly influenced by cultural and environmental pressures.

Studies done by Bruner and his associates assume that differences in equivalence formations in a picture-sorting task measure various levels of cognitive development. The present study measures cognitive preferences, not cognitive competencies. Yet the presence of a specific cognitive preference would indicate a specific level of cognitive development. In contrast, the lack of a specific preference does not prove that the cognitive development is also lacking. However, because of the relationship of environmental pressures to both cognitive development and cognitive preferences, it is likely that there is a close interface between the two.

Schooling, as part of the environment, has an influence on cognitive preferences. Previous studies have shown that schooling, while not essential, facilitates the development of concrete operational thinking. On the other hand, schooling is necessary, though not sufficient, for the development of formal operations (Laurendeau, 1977).

It is appropriate to ask if schooling produces permanent changes in internal mental structures, or if it merely teaches the skills necessary to pass Piaget-type tests. There may be little long-term change or transfer of actual thinking-process preferences. The school is a powerful environment and seems to have a strong effect on cognitive development. But if the school environment is greatly

different from the out-of-school environment, the long-term effects of schooling may "wear off," particularly if the school is facilitating the development of specific cognitive abilities that are not as useful for normal, out-of-school thinking needs. Possibly the long-term effects of schooling on cognition decrease in a non-technological society, where there is a greater difference between the school and out-of-school environments.

In summary, the study has important implications for designing curriculum for adult education, for continuing the construct validation of the methodology, and for finding answers to theoretical questions concerning the relationship of schooling to cognitive development.

Definition of Important Terms

Terms to be defined include dependent variables, independent variables, and other terms used in the study.

Dependent Variables. The following outline shows the relationship between the categories and sub-categories.

1. Equivalence rule
    a. Superordinate
    b. Complexive
2. Equivalence attributes
    a. External attributes
    b. Internal attributes
    c. Nominal attributes
    d. Subjective attributes

3. Person indicator

    a. Personal

    b. Impersonal

The equivalence rule is the logical reasoning derived from the verbal explanation of the subject as to why the pictures in a group are alike. It is the grouping structure. Two general classes of equivalence rules or structures are analyzed: superordinate and complexive.

Superordinate groupings are made on the basis of a common feature or attribute that is equally appropriate for each picture in the group, (e.g., "The shirt and the tree are both green").

Superordinate groups can be either general superordinate or itemized superordinate. General superordinate construction consists of "stating a common characteristic of the items in the group" (Bruner, 1966, p. 75) (e.g., "The cow and the goat are animals").

Itemized superordinate structures have a generalized property joining the pictures together and explicitly stated in an itemized manner (e.g., "We get meat from the cow and we get meat from the goat").

Complexive groupings are made on the basis of attributes that are individual to each object. There is no one general rule or universal attribute that is common to all the objects in the group (e.g., "The shirt and the tree are green, and the tree and the cactus are living things").

There are other subheadings in the complexive rule structure, but they are not separately analyzed in this study. Instead, this study groups together under complexive structures several subheadings based on the terms in the Olver and Hornby study (1966): hyperordinate, edge matching, key ring, association, collection, multiple grouping and thematic.

Complexive rule structures make equivalence groupings either by grouping several superordinate structures together in one sort or by grouping pictures that complement each other in the real world (e.g., table and chair).

Equivalence attributes are the actual attributes which the men in the study saw when they made the grouping. If the equivalence rule is the structure, then the equivalence attribute is the content of the sort. The equivalence attributes are divided into four general categories: external, internal, nominal and subjective.

External attributes are the characteristics that are perceptible in the picture itself. These are the immediate, non-interpretive qualities such as color or shape (e.g., "The clock and the coin are round" or "The bicycle and the teapot are both black").

Internal attributes are characteristics that are somewhat more interpretive. These include functional properties (e.g., "The banana and the corn are both good to eat"), materials (e.g., "The lantern and the hoe are both made

of metal"), or being (e.g., "The chicken and the snake both breathe").

Nominal attributes are linguistic characteristics of the objects (e.g., "The taxi and the truck are both vehicles"). Pictures are grouped according to a name or a word which the objects have in common in that language.

Subjective attributes are characteristics that express the subject's personal interpretations of the objects. The subcategory includes affective interpretations (e.g., "I don't like snakes and cigarettes"), fiat interpretations (the objects are alike because the subject says they are), or symbolic interpretations (e.g., "The cross and the candle are the same because Jesus is the light of the world").

The third dependent variable is the person indicator in the linguistic structure of the response. When the subject uses the pronouns "I," "we," or "you," the grouping is scored as a personal sort (e.g., "I ride my bicycle to the market to buy a new shirt"). A sort is impersonal when the subject uses impersonal pronouns (e.g., with reference to a hoe and a cow, "They are useful in farming"). The impersonal sort looks at properties that are intrinsic to the object (e.g., "They are..." or "It is..."). The personal sort looks at properties extrinsic to the object (e.g., "You eat them").

The three dependent variables of rule, attribute, and person indicator are considered for each sort. For example, if the subject chose pictures of a hoe, corn and

a cock and then explained, "The cock wakes me up in the morning and I pick up my hoe and farm corn," the rule would be complexive, the attribute would be internal, and the person indicator would be personal.

Independent Variables. Independent variables which require specific definition in this study are "schooling" and "non-formal learning."

Schooling in this study refers to formal schooling, usually based on the western colonial system. Informal and non-formal learning are not called "schooling" in this study.

Non-formal education is sometimes defined as a planned and specific kind of learning (as distinguished from informal learning) which takes place outside of the formal school system. But to merely define non-formal learning in terms of its difference from other forms of education is of little use where an operationalized variable is needed for specific investigation. Therefore, for this study, non-formal education has been given an arbitrary but appropriate definition. It is a variable created from:

1. The number of books owned
2. Experience in theological education by extension
3. Experience in literacy classes
4. Radio ownership
5. The number of languages spoken
6. The number of towns visited (from a specific list)

Other Terms. Cognitive development is defined from the conceptual framework of Piaget.

Cognitive preference is not intended as a measure of cognitive development. Cognitive preference is defined as the way the subject actually makes a specific picture sort. The fact that a subject does not make superordinate groupings does not necessarily mean that he would not be able to do so if thus instructed. It is likely that all the subjects could use superordinate structures if they were given enough guidance (e.g. "Sort out all the pictures of animals"). Cognitive preference is probably closer to the subjects' normal thinking practice, and thus more important for curriculum design purposes than would be a test of cognitive competencies.

Pastor is a technical term used in Nigeria to denote hierarchical status. For this study, the term "pastor" will be used to include anyone in charge of a local church in the Tangale District Church Council (DCC). This includes evangelists, unlicensed pastors, licensed pastors, and ordained pastors.

Research Questions and Hypotheses

The purpose of this study is to inquire into the relationship between schooling and equivalence grouping preferences. Does schooling lead to changes in the thinking habits of the student, and do these new thinking habits continue after the student finishes school? Previous

studies have shown that schooling does make a difference in how children make equivalence groupings (Greenfield, 1966). Studies also show that older adults in non-technological occupations prefer to use more complementary groupings, i.e., to group things that are normally used together in everyday life (Denny, 1974).

The general hypothesis is that schooling encourages people to use superordinate and hierarchical categories, but these category preferences are not as useful as complementary or complexive groupings for everyday thinking needs; thus, they tend to be replaced by more useful complexive thinking habits soon after the person has finished school. This is especially true in a rural, non-technological society.

This general hypothesis, however, may be confounded by conditions that in this study are labeled "non-formal education". Since little previous research has been done on the effects of non-formal education, the present study investigates the relationship between specific out-of-school learning situations and equivalence grouping preferences. Hypotheses have been generated from the findings. In order to investigate the general hypothesis, the following specific hypotheses were formulated:

First, the amount of schooling has an effect on the equivalence grouping task. The more schooling a person has, the more likely he will be to use superordinate structures, internal attributes and impersonal person indicators.

Second, the recency of school has an effect on the equivalence grouping task. The less recent the schooling experience, the fewer superordinate structures, internal attributes and impersonal person indicators will be used.

Third, occupation has an effect on the grouping strategy. Since school teachers are in a continued schooling experience, they will have a greater tendency to use superordinate structures, internal attributes and impersonal person indicators.

Fourth, although there is little theoretical evidence as to the effect of non-formal learning on grouping preferences, it was hypothesized that if non-formal education does facilitate cognitive development, responses of persons with a wide non-formal experience will tend to be similar to those of the highly schooled. However, if schooling in the classroom merely teaches skills which have temporary usefulness, responses of the two groups are not expected to be similar.

Assumptions

Two main assumptions influence this study. First, the responses of the test subjects do have a relationship to the way a Tangale adult would normally organize different stimuli from the real world environment.

Second, it is important for those who design curriculum for Nigerian adults to be aware of how these adults typically

make equivalence groupings in their out-of-school experiences. If the preferences are taken into account, the learning experience will not seem so "foreign." Such an awareness will facilitiate learning and will increase the possibility for greater transfer of learning.

Limitations

There are several limitations to the study because of its exploratory and non-experimental nature.

First, cause-and-effect relationships are explored but are not proven.

Second, the construct validity of the instrument needs further investigation. Presently, the instrument is relied upon only to explore trends and possible relationships.

Third, since the instrument is not intended to measure competencies, the relationship of the findings to cognitive development theory is indirect and preliminary.

Fourth, since the study is cross-sectional, the variables of age and generation are confounded.

Generalizability

While the purpose of the study does not necessitate wide generalizability, the findings concerning illiterate farmers and primary school teachers could be generalized to other farmers and teachers who are male Tangale speakers living in the Tangale tribal area. There is no reason to believe that the pastors in the Tangale DCC are different

from pastors in the two adjacent DCC's who speak Tangale as a first language.

The findings are not directly generalizable to females, to non-Tangale people or to Tangale people with occupations other than farming, teaching or pastoring.

Potential generalizability is increased as the study relates to similar studies in other cultural settings and as findings of other studies contribute to the building of theory.

Overview

In this chapter, the research problem was stated. Three general reasons for the importance of the study were given with operational definitions of the variables. Research questions, assumptions, limitations and generalizability were discussed.

In Chapter Two the review of significant literature is presented under the two main headings of theoretical literature and methodological literature. The theoretical literature includes literature from the fields of anthropology, linguistics and developmental psychology.

In Chapter Three the research methodology is discussed under the two main headings of a general description of the research structure and the research procedures used in gathering the data.

In Chapter Four the findings are presented as they relate to the specific hypotheses of the study.

In Chapter Five the findings are discussed, with special attention given to implications and conclusions.

Chapter 2

REVIEW OF LITERATURE

The purpose of the study is to investigate the effects of schooling on equivalence grouping strategies of Tangale adults. The broader issue includes the question of how environmental and cultural factors influence cognitive development.

The review of literature encompasses both theoretical and methodological literature. Historical perspectives on the issue of culture and thinking are reviewed briefly, focusing on the fields of anthropology and linguistics. A discussion of the general theoretical literature on culture and cognitive development follows. The chapter closes with a look at the more specific literature treating the effects of culture on classification strategies.

Historical Perspective

Anthropologists have long been interested in cross-cultural cognitive differences. In 1899 a study team went to the Torres Straits Islands to conduct comparative studies on the perception and memory of primitive people. Some

of the findings showed that the "natives" had better sensory functions than did their European counterparts, but had less facility in abstract functions. In attempting to explain the differences, the researchers suggested that highly developed sensory functions focus predominant attention on concrete things, and may act as an obstacle to higher abstract mental development (Rivers, 1901, p. 45).

The issue was, "Why do non-western people seem to think differently from western people?" The debate centered around causes of differences and similarities between human beings in different cultural settings.

Boas (1911) wrote that the laws of mental activity are the same for all people, but the manifestations of the mind depend on individual experience. Both western and non-western thought patterns are useful for understanding the world. Both systems can find unity in a world of seeming diversity, and both use an interplay of theory and common sense.

Wundt (1912) wrote that though intellectual potential is the same for all mankind, the intellectual capacities of primitive people have remained on a low plane because of isolation, few environmental pressures, and the limited nature of their wants.

Levy-Bruhl, in his books, How Natives Think (1910) and Primitive Mentality (1926), argued that both mental preferences and mental competencies of primitive people were different from those of people in more advanced

cultures. He gathered data by looking at "collective representations" or systems of belief among primitive societies. He concluded that "primitives perceive nothing in the same way as we do" (1926, p. 43). He further stated that primitives are pre-logical, mystical and entwined with emotional life. They are at a lower evolutionary stage of cultural development. Boas (1911) disagreed with Levy-Bruhl, both in the methodology and in the findings of his study.

Levi-Strauss (1966) studied indigenous categorizing systems of non-western societies, and concluded that differences in systems were the result of different problem-solving needs. He found that primitive test subjects used both complexive and superordinate rules in classifying animals, and that they often classified people into hierarchical totem groups and sub-groups. He discovered that primitive classification systems were based on characteristics that were easily seen and experienced, in contrast to the classification systems of modern science which focus on necessary relationships in the structure of objects. Levi-Strauss assumed a basic human unity, with differences explained in terms of different needs in problem solving.

Linguists are interested in the effects of language on thought patterns. All cultures use language, but there are vast differences in semantics and syntax. Sapir and Whorf (1956) concluded that the semantics of a language determines the structure of thought. Whorf wrote that

the Hopi language "shows a much higher plane of thinking" (p, 84), thus implying that Hopi-speaking people are "better" thinkers because they have a "better" language.

Fishman (1960) wrote that language not only reflects the soul and mind of a people, it shapes the mind and soul. To the extent that a society's "world" is built by its language habits, people with different languages live in different worlds.

A great deal of empirical research has been generated by the hypothesis that language shapes the mind and soul of people. One frequently used type of research is color recognition. The hypotheses of Sapir and Whorf suggest that people who speak languages with few color words would have difficulty differentiating or remembering certain colors. However, most studies on the influence of language on color recognition reject this hypothesis. American Indians are able to distinguish slight color differences even when they do not have the color name in their language (Hoijer, 1956). Greenfield (1966) found that Wolof children tended to classify objects by color more often than by other attributes, even though they used few color words and had to borrow words from the French language.

Harris (1966) found that Zulu children were able to make fine color discriminations, despite the imprecise nature of color words in the Zulu language. But the discriminations were often made through associations rather than by name. A color card would be labeled as "the color of

my father's hut" or "the color of my uncle's largest cow" (p, 12). Harris concluded that color classification was made according to cultural demands and cultural needs, and was not limited by linguistic deficiencies.

Maclay (1958) found that the presence or absence of linguistic categories was not a reliable predictor of non-linguistic behavior among the Navaho.

Brown (1956) concluded that language neither limits nor promotes the availability of possible concepts, but linguistic concept names are tied to the needs of the specific culture. Language is "an inventory of all the ideas, interests and occupations that take up the attention of the community" (p. 311). Language is related to the preferences called for by cultural needs and interests; it is not related to abilities.

Hall (1976) called for further study on the question raised by Whorf. He argued that language should be redefined to include non-verbal communication, since verbal language is limited by its linear structure, making it difficult to predict its effects on complex thinking.

Studies have shown that language as used in reading and writing appears to be powerful in shaping cognitive development (Bruner, 1966b). Whereas spoken language tends to be context-dependent (i.e., the things one talks about are usually in the immediate situation), the language of reading and writing is independent of the immediate context (i.e., words are separated from their object). Schooling

may encourage one to use a word independently of its immediate context and may thus lead to the development of new cognitive structures. Symbolic modes of representation replace ikonic modes when language becomes independent of the immediate context.

In summary, anthropologists and linguists have studied the nature of cognitive similarities and differences between people of different cultures. The question is, "Are some cultures lower on an evolutionary scale, or are cultures equally adapted to meet the differing cognitive problems of their different environments?" If cognitive growth is simply a biological unfolding, one would expect little cross-cultural variation. But if cognitive growth is influenced only by cultural experiences, one would expect little cross-cultural similarity (Berry, 1974, p. 12).

The present study contributes to the subject of culture's role in cognitive development.

Culture and Cognitive Development

In the following section, a review of the significant literature pertaining to the theory of culture and cognitive development is discussed. The study emphasizes the theoretical contributions of Piaget (1966), Bruner (1966), Witkin (1967) and Cole (1975).

Piaget stressed the need for and significance of cross-cultural studies to test his theories of cognitive development (1966). According to Piaget, four important factors

affect cognitive development: 1. biological or epigenetic systems, 2. equilibration or autoregulation factors, 3. social and interpersonal factors and 4. educational and cultural factors. It is impossible to test Piaget's theory of development without cross-cultural studies. In 1966, when Piaget summarized the findings of cross-cultural studies, he concluded that the order of stages in cognitive development was the same in all cultures and was thus biologically controlled. The rate of development appeared to be dependent on social, educational or cultural factors. He commented that there was a need for cross-cultural studies which would measure formal operational thinking, since in many cultures there does not seem to be much progress beyond the level of concrete operations.

Dasen (1972) gave a later summary of cross-cultural findings from Piaget-type research. His research appeared to varify the sequential order of the stages of development. He identified several factors that seem to interact to influence the rate of development: test materials, urban-rural differences, schooling, European contact and nutrition. The studies also showed that one cannot assume that adults of all societies reach concrete operational thinking or formal operational thinking.

Okonji (1971) and Price-Williams (1962) found that if relevant test materials were used there was little lag between African children and European children.

Greenfield (1966) and Price-Williams (1962) found a lag in unschooled children compared with schooled children. Schooled children among the Wolof were more like schooled children in Boston than they were like their unschooled neighbors in the same rural village.

Bovet (1974) hypothesized that logical structures are closely linked to concepts used in regular, everyday activities. Studies among illiterate women in Algeria showed a relationship between experience in bread-baking and skills in conservation of weight. The men were more skilled at conservation of length, supposedly because they walked long distances and could choose shortcuts. Both men and women had difficulty with the conservation of time and speed. These notions did not appear to be common in their daily activities.

Za'Rour and Khuri (1977) found that in Jordanian children the concept of speed was most closely related to school achievement. Al-Fakhir (1977) found a four-year lag in the development of the concept of speed in Iraqi children. He blamed the lag on a poor school system which emphasized rote learning from an authoritatian teacher.

Social interaction between a mother and her child related to the results of conservation tasks in a study by Adjei (1977). He observed mother-child interactions in a puzzle task and then gave the children a conservation task. Dominant mothers who used negative imperatives and

physical interventions tended to discourage self-initiated actions and hindered later results in conservation tasks.

Both Adjei (1977) and Price-Williams (1969) found that children with experience in pottery making did better with conservation of volume skills, but in other tasks they did no better than control children did. Conservation skills appear to be task-specific, with no transfer to other areas of development.

Opper (1977) studied differences between urban and rural school children. She hypothesized that if cognitive development were the result of interaction with the environment, both urban and rural children would have equal interaction with the environment, even though the content of the environment differed. But the results of the study indicated that urban children attained conservation abilities faster than rural children. The content of their interactions with the environment appeared to be significant.

Schooling appears to be an important factor in cognitive development. Kelly (1977) conducted an eight-year study in Papua New Guinea. Schooling facilitated success in concrete operational tasks. However, not even schooled subjects succeeded with the formal operations pendulum task.

Kiminyo (1977) hypothesized that rural Kamba children would develop conservation abilities sooner than urban children because of more active opportunities in the environment. He found age to be the only significant variable,

with no difference resulting from schooling, location or sex.

Goodnow (1966) found that a lack of schooling made no difference in conservation of weight, volume or surface, but schooling did contribute to the development of combinatorial reasoning. She concluded that schooling is not necessary for the development of tasks using perception, but that schooling is helpful in acquiring skills for tasks that must be worked out in the head without concrete referents.

Heron and Simonsson (1969), in a study in Zambia, found that school, by itself, was not enough to promote concrete operations. Schools which evidenced lack of interaction between teachers and students and which encouraged rote learning did little to promote cognitive learning.

The interaction of sociometric status and culture was found to be significant in Australia (de-Lacey, 1970). Europeans achieved concrete operations earlier than aboriginals, and in both cultures persons at higher sociometric levels achieved concrete operations earlier.

The amount of schooling is important. Laurendeau (1977) found that less than six years of schooling made no difference in the development of concrete operations. None of the subjects in Rawanda achieved formal operations unless they had been in school more than six years. The study showed that schooling in excess of six years facilitated the development of concrete operations, and that

schooling is necessary but not sufficient for the attainment of formal operations.

Piaget (1972) recognized the importance of relevant experience when he admitted that adults may reach the formal operations stage only in the specialized areas of their aptitudes and professional specialization. The development of formal structures may be more closely related to cultural factors than to biological factors.

In summary, Piagetian cross-cultural research indicates that whatever stages are achieved are usually developed in the same sequence and may be tied to genetic patterns or potentialities for development. But environmental factors appear to limit or promote both the rate and the limits of the developmental process. No single environmental factor has consistently been shown to determine cognitive development.

A large and growing body of cross-cultural literature is emerging from studies on cognitive style by Witkin (1967). Results of his studies on developmental factors in cognitive style support some of the Piagetian cross-cultural studies. Witkin stated several hypotheses and verified them through research conducted around the world, including Africa. He described cognitive style as a stable, self-consistent mode of intellectual functioning that is organismic, developmental and related to age and the socialization process.

Variables which interact to either promote or hinder the developmental process are parental, societal, ecological and nutritional. For example, mothers in a Temne society are strict and authoritarian and societal structures are tight and well-defined, thus not encouraging the development of the child's articulated cognitive style. Factors which promote development of articulated cognitive style in a child are: mothers who have developed an articulated body concept, mothers who punish consistently and less harshly, tribal structures that are less dominating, a balanced diet, and an occupation such as hunting, cattle herding or sailing (in that these encourage individual mental resourcefulness). Schooling is often an important variable in the development of an articulated and differentiated cognitive style.

Witkin wrote that both global and articulated cognitive styles may be adaptations to social needs. Thus one cannot make a value judgment as to which is "better." Global, or field-dependent, styles have a social orientation that is more sensitive to the needs of group members, while the orientation of articulated, or field-independent, styles is more impersonal. Possibly there is a need for the global style when one lives in close contact with many people and a need for an articulated style when one must make independent decisions in order to survive.

Bruner (1966b) has developed hypotheses on cognitive development which have been tested in many parts of the

world. The stages of development are seen in the manner in which the child represents reality, or events. Young children represent the world through actions, (i.e., an enactive mode). Next they progress to an ikonic or picture representation stage, and finally to the symbolic stage. There are two kinds of pushes toward growth, the internal and biological unfoldings and the external or cultural amplifiers.

Language is the most important tool for promoting cognitive development. Language provides the "temptation" to form concepts with objects. Grammatical structures encourage hierarchical structures of experiences. Words can be used to hypothetically change the real world, which encourages symbolic modes of representation.

Words used in reading and writing provide a more powerful push for cognitive development. Schooling does much to promote the use of words in reference to abstractions. The things one talks about or the things one writes about do not need to be in the immediate situation.

Typically, anthropologists do descriptive studies which provide insights into important events in a society, but they do little to investigate internal cognitive structures. Psychologists, on the other hand, provide insights into internal cognitive structures but pay little attention to everyday manifestations of cognitive development in a given culture. Michael Cole (1974) and his associates

did much to bridge the gap between psychology and anthropology. After ethnographic and psychological studies among the Kpelle of Liberia, Cole (1975) concluded that 1. all people can carry out complex mental tasks, 2. people are good at the kinds of tasks they do most often and 3. cross-cultural measurement techniques do not measure cognitive process, only cultural skills.

For example, Cole contrasted the effective, though subtle, interpersonal communications among the Kpelle with their poor, seemingly egocentric, performance on a stick description task. He concluded that the test was not measuring the cognitive process but was merely measuring the cultural skill of stick description. Cole is eager to disprove the deficit theory of cognitive development, which resulted from the difficulty researchers have encountered in attempting to design instruments. Differences do not mean deficits (Cole and Bruner, 1971). Cole believes that persons in all cultures have equal potential for cognitive capacity, whereas differences in cognitive preferences are explainable in terms of the needs, interests and values of the particular culture.

Traditional people apply complex cognitive skills in social situations but fail to use them in an experimental task. Studies of cognitive development need to take into account the situational variations in which the cognitive process is manifested.

Berry (1976), a cultural relativist and a developmentalist, emphasized the appropriateness of adaptation. The goal of cognitive development is not to reach the "highest" stage of development, but to achieve the most appropriate stage for the natural and cultural environment. Empirical data may show a consistent order of development, but that does not mean that each individual in each society should always move in that direction.

In summary, the theoretical literature of Piaget, Witkin, Bruner and Cole suggests a tendency toward the progressive development of cognitive structures in the individual. Similarities in these developmental structures have been demonstrated in various cultures, leading one to accept a biological unity in all mankind. The differences evidenced in cognitive development result from cultural factors. Piaget, Witkin, Bruner and Cole state that these differences do not necessarily demonstrate deficits, but are probably the most appropriate cognitive structures for the specific environment.

In the next section, theoretical implications are applied to the more specific area of equivalence grouping studies. Since the instrument used in the present study is an equivalence grouping instrument, the following literature review is appropriate.

Culture and Equivalence Grouping

A common way of measuring cognitive differences is to observe how people group various objects into like or similar categories. Bruner (1963) asks the question, "What do people do when they relate one thing to another?" He says that grouping is determined by gradually learned systems. Associations are governed by certain rules or transformations that are imposed on the data by the one making the association.

The rationale behind a particular grouping is significant. Given a set of pictures or objects, there is no reason to believe all persons will automatically make identical groupings. One needs a purpose before identifying an associated cluster. For example, a builder may cluster materials for putting up a shelter, a traveler may associate items for packing a suitcase, and a journalist may group events which are present at the same time. But according to Bruner, the basic purpose of grouping objects or ideas is to reduce the cognitive load. A grouping rule is simpler than all the attributes of all the objects. Grouping rules reflect past experiences in grouping strategies. "When people associate things with each other, they most often do it by the extension or combination of groupings previously formed" (p. 354).

The theory of cognitive development indicates that as children move from ikonic to symbolic models of representation, they tend to group more by superordinate rules and

by functional rather than perceptual attributes. Thus the older child is able to use abstract rules to make hierarchical categories.

Much of Bruner's work is an extension of the studies of Vygotsky (1934) investigating the effects of language on thought. Using wooden blocks of different colors and shapes, together with nonsense words, Vygotsky measured the ability to associate nonsense words with certain concepts. For example, a small flat block was labeled with the concept cev. He discovered three progressive phases of development in children. First the child put the blocks in piles for no reason other than subjective connections. Vygotsky called these subjective connections "heaps." Next the child progressed to the ability to think in complexes. Though the bonds between the objects were concrete and factual, they were not consistent or logical. Complex thinking was found to be a preliminary means for forming a true concept. Finally, the child was able to abstract a single element out of the collection of objects and form a superordinate concept. This stage took place during early adolescence.

Inhelder and Piaget (1964) conducted free classification studies in which they found that younger children made groupings based on inter-relationships (e.g., the baby goes with the crib). Older children tended to classify

on the basis of similar abstracted and superordinate attributes (e.g., the crib goes with the chair because both are furniture).

In summary, the theory of equivalence groupings indicates that complexive or complementary grouping criteria of perceptible attributes indicates less cognitive development than do groupings with superordinate or similar criteria with function attributes.

Picture Sorting Tasks

The present study is adapted from an experiment called "Equivalence Formation With Pictures" by Olver and Hornsby (1966). That study was conducted with ninety Boston school children. The children were given an array of forty-two pictures of familiar objects.

The children were first asked to identify each picture. If a child could not identify a picture, he was told what it was. The children were told to select from the pictures things that were alike in some way. They could select as many pictures as they wished. When the children had completed the grouping, they were asked to tell how the pictures they selected were alike. The pictures were then replaced to their original positions, and the children were asked to "form another group." The task was repeated ten times.

Analysis emphasized the percentage of perceptual and functional groupings, the number of pairs per grouping and the model of grouping (superordinate or complexive).

Findings included the following:

1. Younger children tended to group more by perceptual attributes than by functional attributes.

2. Younger children tended to use more complexive groupings.

4. Younger children tended to group objects by taking themselves as reference points.

Olver and Hornsby (1966) also used a word sorting instrument in Boston. They gave children of different ages a list of words such as banana, peach, potato, meat, milk, water, air and germs. The children were asked to tell how these objects were similar and how they were different. Findings from the study have been used as a basis for several important comparative studies in less developed countries.

Maccoby and Modiano (1969) used an equivalence study in Mexico to compare rural and urban children with the children of Boston. They presented objects including banana, orange, bean, meat, milk and water. Their instrument also included three concepts that were represented verbally: air, germs and a stone. Results showed that urban children used more impersonal functional groupings than did rural children.

Greenfield used an adaptation of the Maccoby instrument in Senegal (1966). She used three sets of pictures that could be grouped by color, shape and function. She reported problems among illiterate subjects in understanding the pictures. She pre-tested the pictures, but in the actual study she did not ask the children what the pictures were until the end of the experiment. Illiterates showed a preference for using color as the common attribute, which may indicate that they could not identify the pictures.

Reich used a similar instrument among the Eskimos. Eskimo children differed from Boston children in using a smaller number of superordinate responses. The instrument included gloves, mukluks, sweater, parka, blanket, stove, fire, sun and ice as objects for classification.

Two things can be noted concerning the studies using picture sorting. The tasks were culturally adapted, and the results tended to distinguish between schooled or urban children, who preferred to use superordinate strategies, and unschooled or rural children, who preferred to use complexive strategies.

Another important study which included picture sorting tasks was that of Kagen, Moss and Sigel (1963). Using an instrument of twenty-two human figures, they found that adults made three kinds of classifications: 1. analytic or descriptive, 2. inferential and 3. relational or thematic.

A correlation was found between picture-sorting preferences and personal characteristics. Analytic adults tended to be more independent in family relationships, were striving for social recognition, had higher I.Q.'s and were persistent in solving problems.

Adults who tended to use more relational strategies in sorting pictures also tended to be more dependent at home, less concerned with social recognition, more anxious in social situations and more passive in problem-solving situations.

As children grew older, they tended to become more analytic and to make groupings by similarity or superordinate rules. Younger children tended to use relational categories.

Winters and Brzoska (1976) used a labeling instrument of projected slides to measure differences in grouping strategies between normal and retarded adults. Normal adults used more efficient superordinate groupings than did the retarded adults.

Another related area of study has to do with developmental differences among elderly adults.

Annett (1959) found in a study of adults that seventy percent of the subjects over forty years of age preferred to group with relational categories, and eight-five percent of the subjects under forty years of age used similar or nominal categories.

Denny (1972 and 1975) and Kogan (1974) obtained similar results when older adults were presented with sorting tasks. Older adults tended to use complementary criteria (e.g., a nail goes with a hammer), as do younger children. Younger adults tended to use similarity criteria (e.g., the nail goes with the pin), as do older children.

There are two possible explanations for the seeming regression in older adults: 1) there is a deterioration caused by neurophysical degeneration, or 2) there is no environmental pressure for the more advanced forms of thought.

Other studies indicate that similarities between elderly adults and young children are more likely a function of similar environmental pressures than a result of physical deterioration. Studies by Denny (1975) and Hornblum (1976) show that both young children and elderly adults can be taught to use the more sophisticated thinking styles, which would seem to indicate that similarities between young children and older adults are not because of neurophysical degeneration in older adults. Denny concluded that schooling and occupational pressures place unnatural demands on the individual to classify with similarity criteria.

> There seems to be more evidence for the position that all individuals are capable of grouping according to either complementary or similarity criteria and that the criterion they use depends upon environmental factors...It may be argued that both young children and elderly adults are capable of grouping according to similarity, but that they simply prefer to use complementary criteria. Neither the young child nor

> the elderly adult experiences much pressure for categorizing in any particular way; under such circumstances, complementary categorization would seem to be the most natural. After all, complementary items are grouped naturally in time and space. One often sees cars in garages and baseballs with bats. Therefore, the relationship between such complementary items is readilly apparent for all individuals and may predominate, unless the individuals are confronted with external pressures for organizing their experience in another way. The transition appears to begin in the young child at about age six, at the initiation of the child's formal education with its attendant emphasis upon similarity relations and more abstract forms of thought. Such demands would certainly continue through one's education and into many occupations. In fact it is only after retirement that many individuals are freed from demands to categorize according to similarity, and it is at this time that there appears to be a return to the use of complementary criteria for categorization (1975, p. 48).

Kogan (1974) concludes that older, healthy, educated adults have not lost the capacity for superordinate modes of classification; "rather, they appear more willing to indulge in an alternate mode when circumstances permit it" (P. 228).

Summary

Anthropologists and linguists have studied cognitive similarities and differences in people of different cultures. While Levy-Bruhl explains differences as deficits due to slower evolutionary progress in certain primitive societies, most researchers explain differences as appropriate responses to specific environments.

The contributions of Piaget, Witkin, Bruner and Cole indicate a basic cognitive unity in all mankind. Differences

in cognitive development result from cultural differences and are not necessarily an indication of cognitive deficits.

Evidence seems to indicate that as children develop, they move from using complementary, thematic and relational criteria to using similar, analytic and superordinate criteria in equivalence grouping tasks. Schooling is an important factor in this developmental process. Elderly adults do not lose the capacity for using superordinate criteria, but they prefer to use the more natural and practical relational, thematic and complementary criteria.

The hypotheses and research questions of the present study continue the investigation by looking at specific cultural factors that influence equivalence grouping preferences among Tangale adults. The research methodology used to investigate the relationship between schooling and equivalence grouping preferences is discussed in the next chapter.

Chapter 3

RESEARCH METHODOLOGY

In this chapter the research methodology is outlined. The research design, including variables, hypotheses and research questions, is described. Instrumentation, sampling, data collection procedures and data analysis are discussed, along with validity and reliability concerns.

The purpose of the research methodology is to test hypotheses concerning the relationship between amount of schooling, non-formal education, occupation and equivalence grouping preferences.

Description of Methodology

The methodology can be described as descriptive, ex post facto, and cross-sectional, designed to explore the effects of schooling and occupation upon picture-sorting preferences in an equivalence grouping task. Since the independent variable, schooling, has not been manipulated except through the sampling of potentially different subjects, the study is not experimental. In a correlational,

ex post facto study, data are collected after events have occurred.

Design over Time

The instrument was administered to each subject ten times in one sitting, making it a "one-shot case study" (Campbell and Stanley, 1963). Since all the pastors in the Tangale church district were tested, random sampling of pastors was not appropriate. Teachers and illiterate farmers were selected by convenience sampling, but were chosen from each of the seven local church council locations to ensure geographical spread.

Design over Variables

In order to limit interpretation of differences in equivalence grouping results, the blocking variables of age, sex, mother tongue and residence were used. Adult males who spoke Tangale as a first language and who were currently living in the Tangale District Church Council (DCC) area were the only ones sampled.

The subject characteristics are the independent variables (amount of schooling, recency of schooling, amount of non-formal education, and occupation). The dependent variables, described as sorting characteristics, are as follows:

1. The rule or reasoning as to why the pictures are alike.

2. The attribute observed in the sort.

3. The personalness or impersonalness of the pronouns used to describe the equivalence.

The three main equivalence rules are superordinate, complexive and thematic. These data were collected from the verbal explanation given by the subjects.

The attributes of the sorting task are those which the subjects described in their verbal responses as to why the pictures were alike. Four main classes of attributes are analyzed: external, internal, nominal and subjective.

External attributes are color and shape. These are the obvious attributes based on perception of the pictures alone with no interpretation needed (e.g., "The cow and the bicycle are both black").

Internal attributes are more interpretive and include function (e.g., "They are used for travel"); place (e.g., "The table and chair go together"); material (e.g., "They are both made of wood"); or being (e.g., "They breathe").

Nominal attributes use a hierarchical categorizing term to say why pictures are alike (e.g., "The cow and goat are animals").

Subjective attributes relate to a personal experience or interpretation of the pictures by the subject. These can be affective (e.g., "I don't like snakes"); symbolic

(e.g., "This candle reminds me that Jesus is the light of the world"); or fiat (e.g., "Because I say they are alike").

The personal pronoun variable is a linguistic measure of the personal or impersonal nature of the sort. A sort is considered personal or impersonal based on the pronouns that are used in the verbal description of why the pictures are alike. An impersonal sort describes in the third person the attributes intrinsic to the pictures (e.g., "They are food"). A personal sort describes, in the first or second person, attributes that are extrinsic to the picture itself (e.g., "I travel by bicycle and taxi").

The subject characteristics were collected in an interview before the sorting task was administered.

Amount of schooling was measured in years of formal schooling. Subjects reported which kinds of schools they had finished, and the interviewer calculated the number of years involved.

Recency of schooling was measured from the data given by the subject as the year he finished his last schooling.

Amount of non-formal education is a created variable based on data concerning the number of books owned, theological education by extension courses taken, literacy classes attended, radio ownership, number of languages spoken and the number of towns visited from a specific list. Each

subject was given one non-formal education (NFE) point for each of the following criteria:

1. If he owned forty books or more
2. If he had attended theological education by extension classes
3. If he had attended literacy classes
4. If he owned a radio
5. If he spoke three or more languages
6. If he had visited four or more towns from a specific list of towns
7. If he read a newspaper more than four times a month.

Each subject was rated on an NFE scale from zero to seven based on the above criteria.

The three main occupations sampled were farmers, pastors, and teachers in local government primary schools.

Hypotheses and Research Questions

Hypotheses of relationship are stated, based on the theoretical foundation of previous research.

Previous studies (Olver and Hornsby, 1966) show that as the amount of schooling increases, there is a greater tendency to use superordinate rules, internal attributes, and impersonal pronouns. Theoretical implications (Bruner, 1966) are that schooling increases the ability to use the more efficient superordinate rule structures. Internal attributes and impersonal pronouns indicate that school

has taught a person to think about an object without its being physically present.

Denney (1974) suggests that the effects of schooling may reverse or "wear off" as schooling becomes less recent.

Hypotheses

H_1 There is a relationship between the amount of schooling and the percentage of superordinate sorting rules used.

H_2 There is a relationship between the amount of schooling and the percentage of internal attributes used in the sorting task.

H_3 There is a relationship between the amount of schooling and the percentage of impersonal pronouns used in the sorting task.

H_4 There is a relationship between the recency of schooling and the percentage of superordinate categories used in the sorting task.

H_5 There is a relationship between the recency of schooling and the percentage of internal attributes used in the sorting task.

H_6 There is a relationship between the recency of schooling and the percentage of impersonal pronouns used in the sorting task.

H_7 There is a relationship between non-formal education and the percentage of superordinate sorting rules used.

H_8 There is a relationship between non-formal education and the percentage of internal attributes used in the sorting task.

H_9 There is a relationship between non-formal education and the percentage of impersonal pronouns used in the sorting task.

H_{10} There is a relationship between occupation and the percentage of superordinate sorting rules used.

H_{11} There is a relationship between occupation and the percentage of internal attributes used in the sorting task.

H_{12} There is a relationship between occupation and the percentage of impersonal pronouns used in the sorting task.

Population

The population of the study was defined as the area of the Tangale District Church Council (DCC) of the Evangelical Churches of West Africa (ECWA). The area is about fifty kilometers from north to south and thirty kilometers from east to west. The area lies about sixty kilometers south of Gombe, in the northwestern part of Nigeria. Kumo and Biliri are the two largest towns in the district. The area is predominantly rural, with the only industry being a cotton mill in Kumo. A hard-surfaced road runs along one side of the DCC. The larger churches are connected by dirt roads.

Oxen are used for plowing, with no mechanized farming observed. Most of the actual farm work is done with a hand hoe. Cotton is the main cash crop, and grain crops of millet and guinea corn are the food staple. Nomadic Fulani cattle herders are common in the area, making milk and meat available in the market.

Missionaries of the Sudan Interior Mission (SIM) have worked in the area for almost forty years--establishing primary schools, a secondary school, a teachers' college, a hospital, dispensaries, many churches, and a Bible Training School for training pastors.

There are sixty-six local ECWA churches in the DCC, with 2,000 members and 15,000 people in attendance. There are about twenty preaching points in addition to the official churches.

Non-Tangale people in the area include many nomadic Fulani cattle herders, some Hausa traders in the market centers, and a Yoruba bakery owner along the main road.

In summary, the Tangale area is rural, but not isolated, with a high percentage of Christians. Its educational and health facilities are above average for rural Nigeria.

Sample

The sample was made up of twenty-eight primary school teachers, forty-six pastors and fifty-six illiterate or semi-literate farmers. The mean age was forty with SD = 13.

For the teachers and pastors, the mean amount of schooling was nine years with SD = 3. The mean recency of schooling was 10.7 years with SD = 9.

Sampling Procedures

Each pastor in the DCC was interviewed. All fit the sampling criteria for age, sex, mother tongue and residence, and were given the picture-sorting task. Due to an error in task administration, one pastor made only nine picture sorts, and his data were eliminated.

The DCC is divided into seven local church councils (LCC's), with about ten churches in each LCC. Teachers and illiterate farmers were selected by a convenience sample, but efforts were made to sample equal numbers from each LCC in order to avoid over-sampling farmers and teachers near the main roads and market towns. Thus the sample is spread throughout the geographical area.

Instrumentation

The instrument is a set of thirty-five individual water color pictures on cards six centimeters square. Each picture represents a common object in the Tangale environment, such as a bottle, a tree, a hat, a table and a bicycle (see Appendix B).

Instrument Development

The following procedure was used to develop the instrument. First, the author compiled a list of sixty objects

thought to be common in the Tangale area. Some items were removed from the list in the interest of balancing the number of objects in each category. For example, there were too many animals and too many methods of travel and too few articles of clothing and round objects. To further refine the list, a Tangale informant gave advice on which objects would be common.

The researcher then gave the artist a written description of each picture, specifying colors and shapes. For example, the artist was asked to draw the coin, clock and ball so that they would all be round and the same size.

Volunteers in the ECWA office tested the pictures informally, and as a result some pictures were eliminated or redrawn. Ultimately, the author chose the thirty-five pictures in the testing instrument.

The author developed the instructions and interview forms first in simple English. Twenty English-speaking students at Kagoro Bible College and Igbaja Seminary then field-tested the instructions and pictures. They were asked to identify each picture before the instructions were read to them. This test revealed that some pictures were difficult to interpret. For example, the mango was too green, and a church building had a southern Yoruba architectural style not familiar to northern Nigerians. As a result, the pictures were modified. The field study also lead to rewriting the instructions. For example,

it was found that the students thought they were to do all ten sorts at once. The instructions had to be clarified to show that they were to do the sorts one at a time.

Hausa Translation

The instrument was translated into the Hausa language and then back-translated into English to assure accuracy. A committee met to discuss the wording of the instrument. This committee included an English-speaking Nigerian whose first language was Hausa and a Tangale informant who spoke Hausa and English as second languages. Criteria for the instrument included an accurate translation from English in proper Hausa which would be understood by Tangale people.

In Hausa there is no word for "similar." If the instructions asked for pictures that were "alike," the Hausa translation would mean "exactly alike" (dai dai). Since no two pictures were exactly the same, this would have caused confusion. The committee did not wish to tell the subjects to group pictures that might be "found together," thinking that such instructions might give cues which would encourage complexive rules. Therefore, special attention was given to the Hausa phrase Kamar da juna ta kowace hanya ("alike in any way").

Another careful Hausa construction was the instruction telling the student to make a grouping ten times. The committee did not want to imply that the subject must try

to use ten different sorting rules and ten different attributes. (The test was to measure grouping preferences, not grouping abilities.) Instructions needed to be open-ended enough for the subject to feel free to use different strategies if he preferred, yet not feel forced to try to find different strategies each time. The Hausa sentence read Ka sake warewa ta wata hanya dabam ("Continue to group them in another way"). The word hanya ("way") is as vague in Hausa as it is in English, meaning anything from a "path" to a "strategy." Thus the term hanya dabam ("another way") seemed specific enough, and yet open enough, to encourage but not force differences in grouping preferences.

Hausa Field-Testing

The Hausa version was field-tested at Tofa Bible Training School where there were some Tangale students. This test resulted in a few changes in the instructions, but no changes were felt necessary in the pictures.

Instrument Reproduction

The author attempted to reproduce the pictures by means of photography, but the first attempt resulted in poor color reproduction. Because his time in Nigeria was limited, and because color prints had to be sent out of the country for processing, he decided to have a second set of pictures painted. Each card was then covered with Saran Wrap to protect it from dirt and water.

Interview booklets were mimeographed, with a set of instructions and ten scoring forms included in each booklet (see Appendix A).

Training of Research Assistants

When the author field-tested the instrument himself, he found that at times the subjects used the pictures as a means of giving a "lecture" on the local culture to the foreign researcher. For example, one grouping included a ten-kobo coin and a mortar. The subject explained that their tribal wedding customs included the practice of putting a coin in the bottom of the mortar to insure plenty of food for the new family. To avoid the possibility that groupings would be made to impress the foreign researcher, it was decided that it would be better to use local Tangale men for the administration of the instrument.

Two capable research assistants were employed to administer the instrument. One was a graduate of Igbaja Seminary, and the other was a man who travelled extensively in the area holding literacy classes and Sunday School seminars. Both men were known by the local pastors.

Training sessions lasted three days. On the first day procedures were demonstrated and theoretical aspects were explained. On the afternoon of the first day they watched the author administer the instrument. On the second and third days, the two of them observed each other administer the instrument to pastors in Kaltungo, a town five

kilometers from the Tangale DCC, but not in the target area. Debriefing of interview techniques took place both during and after each practice interview.

Administration Procedures

The interviewing took place during the months of July and August, 1976.

Language. The interviews were administered in Hausa, the trade language of northern Nigeria. Tangale informants said that Hausa would be easily understood and preferred by the subjects. (Local church services are held in Hausa.) Since the language of administration was Hausa, the study could be replicated in dozens of other tribal groups in northern Nigeria.

Place. The place of the interview varied from the shade of a tree to a large church building. Subjects could at times see other subjects from a distance as they were taking the instrument, but they were always out of hearing distance. To avoid contamination, subjects were asked not to discuss the experience with those who had not been interviewed.

Time. Letters were sent to the leaders of the seven LCC's in the district, setting up an interviewing schedule. All pastors in the LCC would come on a certain day to be interviewed individually. Then in the afternoon, the

research assistants would interview local school teachers and illiterate farmers.

The length of the interviews varied in length from about twenty minutes to an hour.

Procedure. First the interviewer visited for a few minutes with the subject. He then read the instructions, each sentence twice, and asked if there were any questions. The interviewer was told to be informal and to discuss the instructions in the Tangale language if necessary. Usually there was a short friendly discussion about the task.

The interviewer then asked the subject to touch each picture and to name it. If there were any question as to what the picture was, the interviewer was instructed to identify it in Hausa or Tangale and to explain it if necessary. Seldom were pictures not understood; and if there was a problem, once the picture was explained it was usually used in the sorting task.

Then the subject was told to "pick up pictures that are alike and put them here" (a spot pointed to on the table). The subject would make a grouping and the researcher would record which pictures were chosen and in what order. When the sort was finished, the subject would be asked to tell why the pictures were alike. The response was written down verbatim.

The subject was asked to continue to group the pictures another time, or another way (Sake warewa ta wata hanya daban). (He had been told in the initial instructions that he would be asked to make ten groups (Har sau goma). Thus each subject completed the equivalence grouping task ten times.

The author was present periodically during the interviews to insure consistency between interviewers, but he stayed in the background.

Scoring Procedures

Scoring was done from a literal English translation of the data and from the original Hausa interview booklet. A pre-scoring procedure was used as follows: Ten subjects (or one hundred sorts) were scored with a preliminary scoring form and then the scoring form was changed to adapt to actual categorizing strategies. Forty more subjects were scored (four hundred sorts) and the scoring forms were adapted again (see Appendix A). The one hundred thirty subjects were then rescored. This procedure was designed to insure consistency in scoring.

At times, the subjects named more than one rule or attribute in explaining the similarity of a single sort. In such cases, only the first rule or attribute mentioned in the sort was analyzed.

Since there are few pre-conceived groupings, the task is an open-ended, free-association instrument. While the

model measures a more natural thinking process, it also makes for more difficult scoring.

After a period of instruction, a group of five judges was given a random sample of interview forms to score. At least three out of five judges agreed on eighty percent of the sorts, and there was a ninety-eight percent agreement with at least two of the judges.

The data were transferred from the scoring forms to key-punch coding sheets, and then key punched and verified. Random checks were made to insure accuracy at each stage.

Validity Concerns

The primary validity concern in this study is construct validity. One aspect of the study has been to investigate the relationship between the instrument and grouping preferences. Construct validation has come from inferences about the data based on theories of cognitive development, using both logical and empirical approaches.

In considering construct validity, one may ask, "What other factors might account for the findings?" The claim is that the instrument measures differences in grouping preferences which relate to normal thinking patterns and not to grouping competence. There are other possible ways to account for the findings.

1. Could the task be differentiating on the basis of the subject's willingness to cooperate? Observed responses do not warrant such a conclusion. There was

full cooperation of the District Church Council and Local Church Council. The Tangale research assistants took time to visit with the subjects and to answer questions about the project. When the senior researcher suggested that gifts might be appropriate for the adults who took part, the local Tangale leaders seemed insulted. Their attitude was that if the results of the study would be useful in developing a continuing education program for Tangale people, gifts to the subjects for cooperation would be inappropriate. Informal observation also indicated that willingness to cooperate was uniformly high. When news of the interviews spread to neighboring DCC's, those pastors urged the interviewers to come and interview them as well.

2. Is the task differentiating on the basis of the ability to attach meaning to pictures. Because of the care with which the pilot studies were evaluated, resulting in the redrawing of all pictures that caused confusion, it is unlikely that recognition was a significant factor. In fact, almost all the subjects in the study were able to identify all the pictures.

3. Is the task differentiating on the basis of the ability to verbalize reasons for grouping preferences? Verbal skills may have caused some differentiation. However, subjects who used the most efficient kinds of strategies (superordinate, nominal) gave the shortest answers. At

no time was a subject unable to give a reason for a particular grouping. Nevertheless, it would be useful, in a followup study, to compare statistically the frequency of certain picture clusters without taking into account the verbal reasoning behind each grouping.

4. Is the instrument differentiating on the basis of fear of not following instructions or lack of ability to understand the instructions? One could argue that such fear might lock the subject into the same grouping preferences for all ten sorts, especially if no negative feedback was offered after the first sort. If the phenomenon were more common among certain sub-samples, such as younger men or less-educated men, then differences could not be explained as real differences in preferences, thus making the last nine sorts invalid. Several research factors emerge to satisfy this question.

a. Each interview began with an informal visit of five to ten minutes, during which the research assistant attempted to put the subject at ease.

b. The instructions stated that the task was not an examination, and that there were no right or wrong answers. Subjects could make groups in any way they wished.

c. If a subject asked after his first sorting exercise whether he had done it "right," the research

assistant was to repeat in a friendly voice that any grouping was all right.

d. While the Hausa vocabulary might seem open-ended, the wording clearly provided for differences in groupings. The Hausa instruction Ci gaba da wani tari daban could be interpreted to mean, "Continue with another pile," or it could also be interpreted as "Continue with a different pile." These instructions were designed to be a compromise between forcing the subject to use a different strategy for each sort and the less directive suggestion that the task was to simply be repeated. The research interest was whether or not the subject would tend to use different strategies if it was clear that he was free to do so.

1. The data suggest that the subjects did in fact understand the instructions to mean they could do the task differently in subsequent groupings if they wanted to. In fact, no subject used the same grouping of pictures in any two of the ten sorts and no subject used only one grouping strategy throughout all his ten sorts.

2. Since the purpose was to measure preference in terms of tendency, not competence, the purpose would have been defeated if the instructions had been "loaded" to elicit a variety of approaches.

3. If the instructions had clearly stated that subjects were to try as much as possible to use different strategies, the instructions would have been so complicated that many of the subjects would have been afraid to try even the first sort. For example, the Hausa language would have required a statement that for each sort the subject was "to try to choose different pictures with a different number of pictures in each sort, using a different grouping strategy rule each time, using different categories of attributes and using different pronouns in each explanation." It is possible that even university professors in America would be threatened by such instructions, let alone illiterate Hausa farmers!

Other threats to internal validity were minimized as follows:

1. Instrumentation Decay - The research assistants rested often, and did not work more than five hours a day, so that testing accuracy would not decline as the research assistant became tired. Since the study measured each subject only one time, problems of invalidity of history, maturation and mortality can be ruled out.

2. Content validity - Evaluation of the three pilot studies in Kagoro, Igbaja and Tofa supports content validity.

Moreover, the design of the instrument was subject to the advice of the two Tangale research assistants.

Threats to external validity were minimized in the following ways:

1. Experimenter effect - The test used only research assistants who were locally known and trusted.

2. Hawthorne effects - The instructions were purposely open-ended so that the subject did not know what the researchers considered to be the "right" responses. The research assistants tried to make the subject feel at ease and to accept any answers.

It remains for future studies to explore further preferences of equivalence groupings in the picture sorting task and equivalence grouping preferences in the everyday "real" world.

Reliability Concerns

Since the instrument is not claiming to measure competence, but preference, the typical reliability coefficients are not appropriate. The consistency of the responses is not the primary concern.

Scoring reliability is a concern. Because of the open-endedness of the answers, a judgment is needed to evaluate the categorization strategy. Inconsistency in scoring was minimized by scoring and rescoring procedures described in the section on scoring.

Data Analysis

The researcher employed both descriptive and inferential statistical analysis. Figures are used to show trends, using the percentage of each type of response for each grouped independent variable.

It is assumed that superordinate rules, internal attributes, and impersonal pronouns can be totaled for the ten sorts of each individual, giving each subject a score somewhere between zero and ten. It seems logical to assume that a subject who uses nine superordinate responses out of a possible ten has a greater preference for superordinate responses than does a subject who uses only two superordinate responses.

The significance level adopted is alpha = .05 .

Summary

In this chapter, the research methodology of the study has been identified. It can be described as descriptive, ex post facto, and cross-sectional. The study is not intended to be experimental. Theoretical relationships were investigated by testing relational hypotheses.

The picture-sorting task was administered ten times in one sitting to each of the subjects.

The variables included the blocking variables of age, sex, first language and residence to better control for

rival hypotheses other than amount of schooling, recency of schooling, non-formal schooling and occupation. Dependent variables were derived from the picture-sorting task to include the equivalence rule used, the attributes described and the personal pronouns used. The measure included frequency counts on all ten sorts.

The equivalence rules were listed as superordinate, complexive and thematic. The categories of attributes included internal, external, nominal and subjective.

The personal pronouns describe the linguistic distance or closeness of the subject to the objects sorted.

Hypotheses were stated.

The population and sample were described as being adult males who spoke Tangale as a first language and who lived in the Tangale District Church Council in the north-eastern part of Nigeria. The sample included one hundred thirty men from three occupations: illiterate farmers, pastors and primary school teachers.

The instrument was described as thirty-five water color pictures of objects familiar to the Tangale population. The instrument was developed and field-tested for this study. Two Tangale research assistants were trained to administer the instrument.

Subjects were told to group any number of the pictures for ten consecutive groupings of pictures which were alike

in some way. The subjects were asked to explain after each grouping why the pictures they chose were alike.

Validity concerns were discussed. Construct validity was the primary concern. Rival hypotheses were discussed as being possible but unlikely. However, the relationship between the grouping preferences using the instrument and grouping preferences in the "real" world will need to be further investigated in future studies.

Reliability concerns included scoring reliability with an inter-rater reliability. Typical reliability coefficients that measure consistency of response were not considered appropriate for this task.

Data analysis was descriptive with one-way analysis of variance used for inferential analysis.

Chapter 4

FINDINGS

The data collected through the research instrument are reported and analyzed in this chapter. The research question is reviewed. Hypotheses intended to answer the research question have been tested, and the test results are reported. Also reported are other findings which aid in the exploratory nature of the study. Finally, the findings are summarized.

The Research Question

The purpose of the study was to investigate the effect of schooling on the way adults prefer to group dissimilar stimuli into equivalence groupings. The study looked at the relationship between the independent variables of amount of schooling, recency of schooling, amount of non-formal education and occupation to the dependent variables of superordinate rules, internal attributes and impersonal pronouns. A picture-grouping task was repeated ten times by 131 Tangale men of northeastern Nigeria.

Superordinate rules were defined as picture groupings made on the basis of a common feature or attribute that

was equally true for each picture in the group (e.g., "The shirt and the tree are both green").

Internal attributes were defined as interpretive of the properties of the pictures, including functional attributes (e.g., "The banana and the corn are both good to eat"), materials (e.g., "The lantern and the hoe are both made of metal"), or being (e.g., "The chicken and the snake both breathe").

The impersonal pronouns were defined in terms of the linguistic structure of the response. A sort was called impersonal when the subject used impersonal pronouns (e.g., "They are all tools for farming").

Hypothesis Testing

Twelve research hypotheses, identified in chapter three, have guided this study. To test the hypotheses, a one-way analysis of variance test was used. The dependent variables included the picture grouping characteristics of the grouping rule, the grouping attribute and the pronouns used in explaining the similarities among pictures in a chosen grouping. More specifically, the superordinate grouping rules, the internal attributes and the impersonal pronouns were measured. The independent variables included amount of schooling, recency of schooling, amount of non-formal education and occupation.

One-way analysis of variance was used with the combined data from all ten sorting trials for each subject. The

analysis tested for differences in the means of frequencies of the dependent variables for groups from the independent variables.

The Pearson Product Moment correlation technique was used to explore relationships for variables on nominal scales, and z-tests were made for variables with only two means.

Hypothesis 1

The amount of schooling will be positively related to the percentage of superordinate grouping rules used.

The result of the analysis of variance was an F-ratio of 2.88 (df 3, 126) and is significant at the a = .05 level lending support to the hypothesis. The means for the four levels of schooling are shown in Table 4.1.

Table 4.1 Means for Amount of Schooling and Superordinate Rules.

Level of Schooling	M	N
No school	3.67	46
1-4 years	5.90	10
5-8 years	5.00	18
9+ years	5.34	56

Analysis of the means showed the greatest difference was between those who have had at least one year of schooling and those who have had no schooling. Thus, the data lend support to a major portion of the hypothesis, but not to all of it. Schooling does make a difference in the use of superordinate groupings, but the amount of schooling does not appear to be significant.

Hypothesis 2

The amount of schooling will be positively related to the percentage of internal attributes used.

The result of the analysis of variance was an F-ratio of 1.40 (df 3, 126) and was not significant at the a = .05 level. The means for the four levels of schooling are shown in Table 4.2.

Table 4.2 Means for the Amount of Schooling and Internal Attributes.

Level of Schooling	M	N
No school	6.41	46
1-4 years	5.50	10
5-8 years	6.72	18
9+ years	7.25	56

Analysis of the means showed no trends. Therefore it was concluded that the amount of schooling has no effect

on the preference for use of internal attributes. The data did not support the hypothesis.

Hypothesis 3

The amount of schooling will be positively related to the percentage of impersonal pronouns used.

The result of the analysis of variance was an F-ratio of .93 (df 3, 126) and was not significant at the a = .05 level. The means for the four levels of schooling are shown in Table 4.3.

Table 4.3 Means for the Amount of Schooling and Impersonal Pronouns

Level of Schooling	M	N
No school	5.43	46
1-4 years	6.00	10
5-8 years	5.67	18
9+ years	5.39	56

It was concluded that amount of schooling has no effect on the use of impersonal pronouns. The data did not support the hypothesis.

Hypothesis 4

The recency of schooling will be positively related to the percentage of superordinate rules used.

The result of the analysis of variance was an F-ratio of 2.53 (df 3, 126) which was not significant at the a = .05 level. The means for the four levels of recency of schooling are shown in Table 4.4.

Table 4.4 Means for the Recency of Schooling and Superordinate Rules.

Levels of Recency	M	N
No school	3.77	47
1-5 years ago	5.18	34
6-15 years ago	5.08	26
16+ years ago	5.74	23

Analysis of the means showed that the greatest difference was between those who have had no schooling and those who have had schooling. For those who have attended school, the means are almost the same. The preference for superordinate sorting rules does not appear to "wear off" as schooling becomes less recent. Thus the hypothesis was rejected.

Hypothesis 5

The recency of schooling will be positively related to the percentage of internal attributes used.

The result of the analysis was an F-ratio of .66 (df 3, 126) which was not significant at the a = .05 level.

The means for the four levels of recency of schooling are shown in Table 4.5.

Table 4.5 Means for Recency of Schooling and Internal Attributes.

Level of Recency	M	N
No school	6.47	47
1-5 years ago	6.91	34
6-15 years ago	7.35	26
16+ years ago	6.39	23

Analysis of the means showed no trends. The preference for using internal attributes is not related to the recency of schooling. The hypothesis was rejected.

Hypothesis 6

The recency of schooling will be positively related to the percentage of impersonal pronouns used.

The result of the analysis of variance was an F-ratio of .92 (df 3, 126) which was not significant at the a = .05 level. The means for the four levels of recency of schooling are shown in Table 4.6.

Table 4.6 Means for the Recency of Schooling and Impersonal Pronouns.

Level of Recency	M	N
No school	5.53	47
1-5 years ago	4.91	34
6-15 years ago	5.54	26
16+ years ago	6.22	23

The preference for using impersonal pronouns was not related to recency of education. The hypothesis was not supported.

Hypothesis 7

The amount of non-formal education will be positively related to the percentage of superordinate rules used.

The results of the analysis of variance was an F-ratio of .78 (df 2, 127) which was not significant at the a = .05 level. The means for the three levels of non-formal education (NFE) are shown in Table 4.7.

Table 4.7 Means for the Amount of NFE and Superordinate Rules.

Amount of NFE	M	N
Low	4.34	44
Medium	4.82	68
High	5.44	18

Analysis of the means showed a trend toward superordinate preferences as non-formal education increases, but the amount of difference was too small to support the hypothesis.

Hypothesis 8

The amount of non-formal education will be positively related to the percentage of internal attributes used.

The result of the analysis of variance was an F-ratio of .37 (df 2, 127) which was not significant at the a = .05 level. The means for the three levels of non-formal education (NFE) are shown in Table 4.8.

Table 4.8 Means for Amount of NFE and Internal Attributes.

Amount of NFE	M	N
Low	6.48	44
Medium	7.07	68
High	6.17	18

The preference for using more internal attributes by subjects with higher NFE was not supported by the data. The hypothesis was rejected.

Hypothesis 9

The amount of non-formal education will be positively related to the percentage of impersonal pronouns used.

The result of the analysis of variance was an F-ratio of .57 (df 2, 127) which was not significant at the .05 level. The means for the three levels of non-formal education (NFE) are shown in Table 4.9.

Table 4.9 Means for the Amount of NFE and Impersonal Pronouns.

Amount of NFE	M	N
Low	5.61	44
Medium	5.26	68
High	6.05	18

The data did not support a preference for using impersonal pronouns among subjects with high non-formal education. The hypothesis was rejected.

Hypothesis 10

There will be a relationship between occupation and the percentage of superordinate grouping rules used.

The result of the analysis of variance was an F-ratio of 3.23(df 2, 127) which was significant at the a = .05 level. The means for the three occupations are shown in Table 4.10.

Table 4.10 Means for Occupation and Superordinate Rules.

Occupation	M	N
Farmers	3.87	53
Pastors	5.93	46
Teachers	5.93	28

Analysis of the means showed that pastors and teachers had a similar tendency to prefer superordinate rules. Farmers had a lesser tendency to use superordinate rules. No direction was hypothesized. The data supported the hypothesis.

Hypothesis 11

There will be a relationship between occupation and the percentage of internal attributes used.

The result of the analysis of variance was an F-ratio of .16 (df 2, 127) which was not significant at the a = .05 level. The means for the three occupations are shown in Table 4.11.

Table 4.11 Means for Occupation and Internal Attributes.

Occupation	M	N
Farmers	6.64	53
Pastors	6.69	46
Teachers	7.07	28

The data did not show a difference in the percentage of internal attributes used by different occupations. The hypothesis was rejected.

Hypothesis 12

There will be a relationship between occupation and the percentage of impersonal pronouns used.

The result of the analysis of variance was an F-ratio of .12 (df 2, 127) which was not significant at the a = .05 level. The means for the three occupations are shown in Table 4.12.

Table 4.12 Means for Occupations and Impersonal Pronouns.

Occupation	M	N
Farmers	5.36	53
Pastors	5.54	46
Teachers	5.71	28

The data did not show a difference in the percentage of impersonal pronouns used by different occupations. The hypothesis was rejected.

Table 4.13 summarizes the results of the testing of the hypotheses by one-way analysis of variance.

Table 4.13 Analysis of Variance Table.

Hypothesis No.	Source	df	F	Significance Level, p=
1	Amount of schooling & superordinate rules	3, 126	2.88	> .05
2	Amount of schooling & internal attributes	3, 126	1.40	n.s.
3	Amount of schooling & impersonal structures	3, 126	.15	n.s.
4	Recency of schooling & superordinate rules	3, 126	2.53	n.s.
5	Recency of schooling & internal attributes	3, 126	.66	n.s.
6	Recency of schooling & impersonal structures	3, 126	.92	n.s.
7	Amount of non-formal education & superordinate sorting rules	2, 127	.78	n.s.
8	Amount of non-formal education & internal attributes	2, 127	.99	n.s.
9	Amount of non-formal education & impersonal structures	2, 127	.57	n.s.
10	Occupation & superordinate sorting rules	3, 126	3.23	.05
11	Occupation & internal attributes	3, 126	.16	n.s.
12	Occupation & impersonal structures	3, 126	.12	n.s.

Observations

Other relationships were observed in the study. Some of these relationships suggest hypotheses for further studies and are discussed in observations 1-4. Observations 5-8 disconfirm some speculations concerning other relationships.

1. Effects of the Fulani Language. Twenty-seven of the Tangale subjects claimed to speak Fulani as one of their second languages. The Fulani are nomadic cattle herders who live in the Tangale area. Those who claimed to speak Fulani as a second language used more impersonal linguistic structures. The mean for Fulani speakers was 6.78 while the mean for non-Fulani speakers was 5.03 $Z = 3.10$ and $p = .001$). Fulani-speaking men also preferred external attributes ($M = 3.00$) more than non-Fulani-speaking men ($M = 1.04$), ($z = 2.76$, $p = .001$). Fulani-speaking men preferred superordinate groupings ($M = 5.85$) more than non-Fulani-speaking men ($M = 4.39$), $z = 2.47$, $p = .001$).

2. Effects of Occupation on Number of Pictures Used. The use of only two pictures in an equivalence grouping is seen to decrease in children as they get older (Olver and Hornsby, 1966). Occupation made a difference in the mean number of pairs per ten trials: 1. for farmers, $M = 4.69$; 2. for pastors, $M = 3.66$; 3. for primary school

teachers, M = 2.93. The results of analysis of variance show an F-ratio of 3.39 with 2, 128 degrees of freedom and p = .05.

The relationship between occupation and the total number of pictures in ten trials was not significant.

3. Effect of Number of Languages Spoken. There was a weak but significant correlation between the number of languages a subject spoke and the preference for more superordinate rules and impersonal linguistic structures (r = .227, p = .05 and r = .254, p = .05).

4. A Superordinate and Internal Variable. Informal observation seemed to indicate that illiterate farmers used more superordinate grouping rules with color as the attribute. Thus, a new dependent variable was created that looked only at internal attributes which also used a superordinate rule. The new variable which used superordinate criteria for internal attributes was called superordinate/internal.

There was a relationship between the amount of education and the means for superordinate/internal groupings. (F = 10.67 with df = 2, 128 and p = .01). There was also a relationship between occupations and the means for superordinate/internal groupings (F = 7.85 with df = 2, 128 and p = .01). The relationship of age, recency of education and non-formal education to superordinate/internal groupings was not significant.

Figure 4.1 shows the relationship between superordinate attributes and the amount of schooling. The superordinate external attributes (e.g., "They are all the same color") decrease from 53% to 3% as the amount of schooling increases. Superordinate internal attributes (e.g., "They are all made of wood") increase from 30% to 56% as the amount of schooling increases. Nominal attributes (e.g., "They are all animals") do not increase until the amount of schooling reaches twelve or more years.

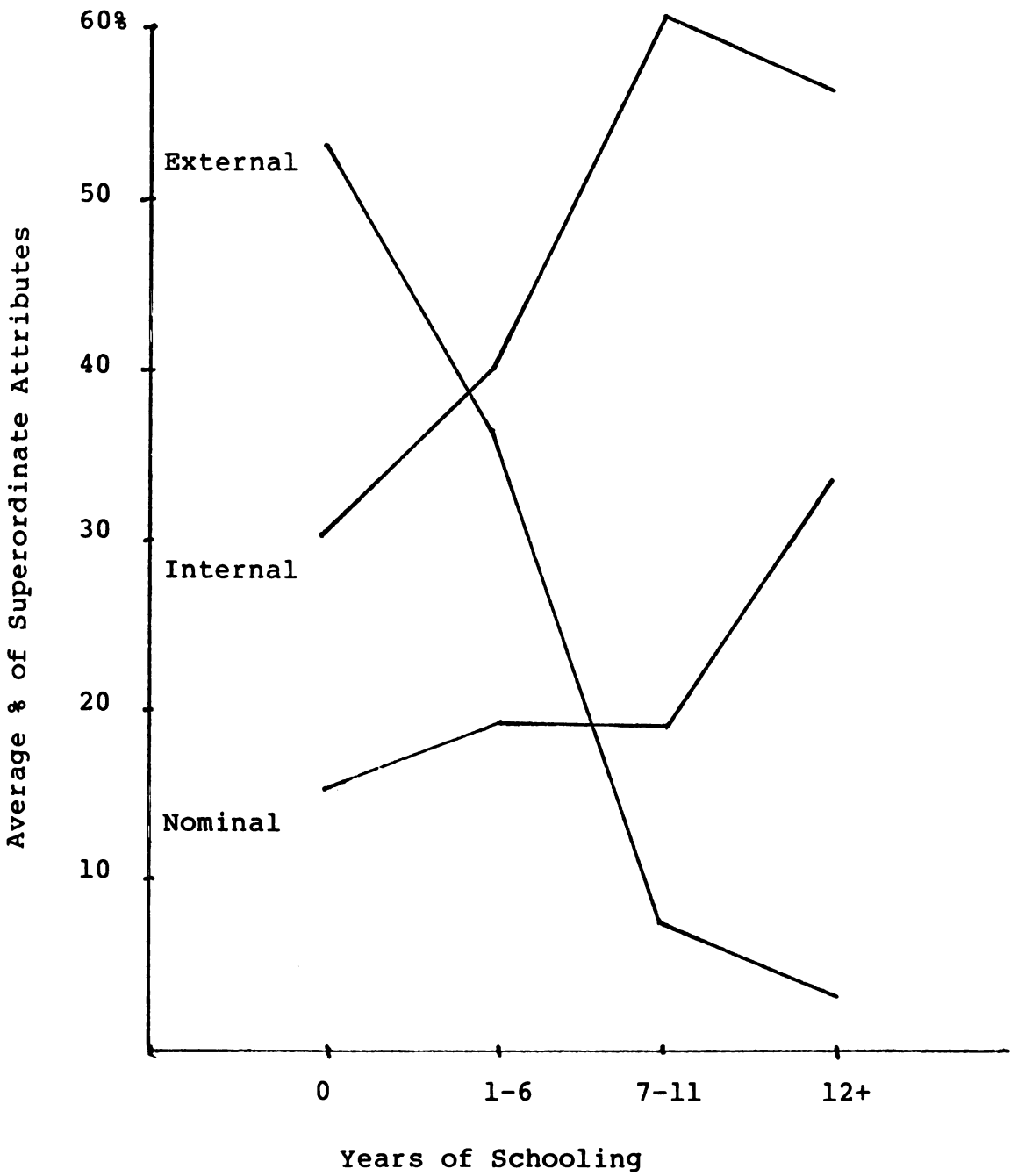
5. Effects of Age. Data on age were collected. Ages were grouped into four categories: Age 20-29, N = 29; Age 30-39, N = 39; Age 40-49, N = 32; Age 50 or higher, N = 31. For the three dependent variables, age did not have a significant effect as an independent variable.

6. Effects of Literacy Classes. There is no difference as measured by superordinate grouping preferences between farmers who have had literacy classes and farmers who have not had literacy classes ($F = .01$, $df = 1, 44$).

7. Effects of Theological Education by Extension. There was no difference in superordinate/internal grouping preferences between pastors who had studied Theological Education by Extension and those who had not ($F = .01$, $df = 1, 45$).

8. Relationship of Schooling to Non-Formal Education. There was a relationship between the amount of schooling and the amount of non-formal education. The means are

Figure 4.1 Superordinate Attributes by Amount of Schooling.



as follows: 1. for those with low NFE, the mean years of schooling were 1.92; 2. for those with medium NFE, the mean years of schooling were 5.00; 3. for those with high NFE, the mean years of schooling were 10.14 with an F-ratio of 26.02 and $p = .001$. There was also a significant correlation between the number of towns visited and the amount of schooling ($r = .380$, $p = .01$).

Summary

In this chapter the results of the study were presented. The twelve main hypotheses were analyzed and other observations about relevant relationships were presented.

One-way analysis of variance was used to test the differences in the mean number of frequencies in the ten sorting trials of the dependent variable with groups of subject characteristics in the independent variable.

A summary of the results is as follows:

H_1 The amount of schooling was related to superordinate rules used.

H_2 The amount of schooling was not related to internal attributes used.

H_3 The amount of schooling was not related to impersonal structures used.

H_4 The recency of schooling was not related to superordinate rules used.

H_5 The recency of schooling was not related to internal attributes used.

H_6 The recency of schooling was not related to impersonal structures used.

H_7 The amount of non-formal education was not related to superordinate rules used.

H_8 The amount of non-formal education was not related to internal attributes used.

H_9 The amount of non-formal education was not related to impersonal structures used.

H_{10} Occupation was related to superordinate rules used.

H_{11} Occupation was not related to internal attributes used.

H_{12} Occupation was not related to impersonal structures used.

The results are summarized in Table 4.14.

Table 4.14 Summary of Main Findings.

	Superordinate Rules		Internal Attributes		Impersonal Structures	
	H	α	H	α	H	α
Amount of Schooling	H_1	>.05	H_2	N.S.	H_3	N.S.
Recency of Schooling	H_4	N.S.	H_5	N.S.	H_6	N.S.
Amount of Non-Formal Education	H_7	N.S.	H_8	N.S.	H_9	N.S.
Occupation	H_{10}	>.05	H_{11}	N.S.	H_{12}	N.S.

Other findings showed that age was not related to any dependent variable.

A superordinate and internal variable showed a significant relationship for amount of schooling and occupation, but not for recency of education and non-formal education.

There was no relationship between literacy classes or theological education by extension (TEE) classes and superordinate grouping preferences.

Fulani language ability was found to be related to a preference for superordinate rules, external attributes and impersonal linguistic structures.

The amount of schooling was found to be related to the amount of non-formal education.

The number of languages spoken correlated positively with the mean number of superordinate rules and impersonal linguistic structures used.

Chapter 5

SUMMARY AND CONCLUSIONS

This chapter presents a summary of the investigation and a discussion of research findings. Conclusions are drawn from the discussion, and implications for teaching and for further research are suggested.

Summary

The study has investigated the effects of schooling on the way adults in northeastern Nigeria prefer to sort dissimilar stimuli into equivalence groupings.

As western patterns of education spread throughout Africa, it is important for educators to be aware of the thinking-process preferences of the learner. It is likely that a student will learn more easily if the structures of the curriculum are similar to the student's preferred and normal manner of structuring dissimilar stimuli.

The study provides data on the adult learner in a non-western, rural society. The data are needed for continuing development of a theory of causes of cognitive growth in adults.

Studies which looked at the relationship between culture and cognitive growth were reviewed. The studies showed differences between cultures in both the rate and the limits of cognitive development. The amount of schooling, also, was often seen to be related to differences in cognitive functioning. It was not assumed, however, that the differences necessarily indicate cognitive deficits. Instead, they may reflect appropriate responses to different cultural needs.

Evidence seems to indicate that as children in the western world develop they move from using complementary, thematic, and relational criteria to using similar, analytic and superordinate criteria in equivalence grouping tasks. Studies of older adults seem to show that once they are freed from the pressures of schooling and careers, though they do not lose the capacity for using superordinate rules, they prefer to use the more natural relational and complementary strategies.

One way to discover how adults prefer to sort dissimilar stimuli into equivalence groupings is to ask them to sort different pictures into groups of pictures that are related. A picture-grouping instrument was constructed and, after field-testing, was administered to 130 Tangale males near Biliri in northeastern Nigeria. The sample was composed of illiterate farmers, pastors and teachers.

Independent variables included the amount of schooling, the recency of the schooling, the amount of non-formal education and occupation. Occupation was considered an appropriate effect of schooling in that one of the occupations selected was that of the school teacher, who would likely continue to prefer a "schooling" thinking style even though his or her actual schooling had finished.

Dependent variables included the number of superordinate equivalence rules used, the number of internal attributes used (i.e., function, material or being attributes), and the number of impersonal pronouns used.

In order to answer the research question concerning the effects of schooling on categorization preferences, the following hypotheses were tested:

H_1 The amount of schooling will be positively related to the percentage of superordinate sorting rules used in the sorting task.

H_2 The amount of schooling will be positively related to the percentage of internal attributes used in the sorting task.

H_3 The amount of schooling will be positively related to the percentage of impersonal pronouns used in the sorting task.

H_4 The recency of schooling will be positively related to the percentage of superordinate categories used in the sorting task.

H_5 The recency of schooling will be positively related to the percentage of internal attributes used in the sorting task.

H_6 The recency of schooling will be positively related to the percentage of impersonal pronouns used in the sorting task.

H_7 The amount of non-formal education will be positively related to the percentage of superordinate sorting rules used in the sorting task.

H_8 The amount of non-formal education will be positively related to the percentage of internal attributes used in the sorting task.

H_9 The amount of non-formal education will be positively related to the percentage of impersonal pronouns used in the sorting task.

H_{10} There is a relationship between occupation and the percentage of superordinate sorting rules used in the sorting task.

H_{11} There is a relationship between occupation and the percentage of internal attributes used in the sorting task.

H_{12} There is a relationship between occupation and the percentage of impersonal pronouns used in the sorting task.

Results of one-way analysis of variance showed that the amount of schooling and the occupation affected the

number of superordinate rule grouping strategies used. The results did not show that recency of schooling or the amount of non-formal education affected any of the dependent variables. Hypothesis one and hypothesis ten were supported.

Fulani language ability was found to be positively related to the use of superordinate rules, external attributes and impersonal pronouns. Also, the number of languages spoken correlated positively with superordinate rules and impersonal pronouns used.

Discussion of Findings

Results of the analysis of the twelve hypotheses were reported in chapter four. Each hypothesis was designed to help answer the research question concerning effects of schooling on equivalence grouping preferences of Tangale adults. In this section interpretations of the findings are presented.

Hypothesis 1. "The amount of schooling will be positively related to the percentage of superordinate sorting rules used." Findings partially support the hypothesis.

The amount of schooling does relate to preferences for superordinate sorting rules over complexive and thematic options. Tangale men with schooling experience preferred to use more superordinate grouping strategies. The greatest difference in mean scores was between those who had no schooling and those who had at least one year of schooling.

There was little difference and no trend apparent between those who had little schooling and those who had more than nine years of schooling. This lack of a trend seems to suggest that while schooling may encourage superordinate sorting preferences, the actual amount of schooling makes little difference. It could be that those who prefer to use superordinate grouping strategies are the ones most likely to go to school. But if schooling does have a causal effect on superordinate sorting preferences, this effect seems to take place in a short period of time and does not appear to increase with more schooling.

Hypothesis 2. "The amount of schooling is positively related to the percentage of impersonal pronouns used in the sorting task." The findings do not support the hypothesis.

At each level of schooling there was a tendency to use impersonal pronouns. The idea that schooling is responsible for the ability to look at objects from an impersonal and more abstract viewpoint is not suggested by the data. The preference for impersonal pronouns (e.g., "They are used for farming") over personal linguistic structures (e.g., "We use them on our farms") does not seem to be an effect of schooling.

Hypothesis 4. "The recency of schooling will be positively related to the percentage of superordinate categories

used in the sorting task." The findings do not support the hypothesis.

While the presence of the schooling experience does make a difference in superordinate sorting preferences, the recency of that schooling is not significant. It appears that the effect of schooling is not significant. It appears that the effect of schooling is long-lasting and does not wear off with time. An alternate explanation is that those with a natural tendency for superordinate sorting preferences are the ones more likely to attend school and that this natural tendency does not wear off.

Hypothesis 5. "The recency of schooling will be positively related to the percentage of internal attributes used in the sorting task." The findings do not support the hypothesis.

Since the amount of schooling does not affect the percentage of internal attributes used, it is not surprising that the recency of schooling is not related either. If internal attributes are the more useful or normal for all groups, one may assume that findings of differences in the variable are measurements of differences in preferences rather than measurements of differences in competencies as taught through schooling.

Hypothesis 6. "The recency of schooling will be positively related to the percentage of impersonal pronouns

used in the sorting task." The findings do not support the hypothesis.

Since schooling does not seem to promote the use of impersonal pronouns, it is not surprising that the recency of schooling has no relationship either. All groups tend to prefer impersonal linguistic structures.

Hypothesis 7. "The amount of non-formal education will be positively related to the percentage of superordinate sorting rules used." The findings do not support the hypothesis.

It appears that the factors which make up the non-formal education variable (literacy classes, extension courses, newspapers read, radio ownership, books owned, languages spoken and towns visited) do not have the same effect on thinking styles that formal schooling has. The result could be interpreted in at least two ways. It could be that non-formal experiences, or "awareness-creating" experiences, do not do as "good" a job of promoting cognitive growth as does formal schooling. On the other hand, it could be that superordinate preferences are more useful for school experiences than they are for the out-of-school world. Thus it may be possible that the non-formal learning experiences do less to hinder the more practical complementary and thematic preferences. The data are not sufficient to support either of the interpretations.

Hypothesis 8. "The amount of non-formal education will be positively related to the percentage of internal attributes used in the sorting task." The findings do not support the hypothesis.

The preference for the use of internal attributes (about 65% in all groups) cannot be attributed to the amount of non-formal education a person has.

Hypothesis 9. "The amount of non-formal education is positively related to impersonal pronouns used in the sorting task." The findings do not support the hypothesis.

Impersonal pronouns were preferred by all groups, even though amounts of non-formal education differed.

Hypothesis 10. "There is a relationship between occupation and the percentage of superordinate sorting rules used." The findings support the hypothesis.

Both teachers and pastors preferred to use superordinate rules more than did illiterate farmers. This result is not surprising, in that sampling procedures were used which intentionally selected farmers with no formal schooling. The hypothesis was included to see if school teachers who spend much time each day in a school setting are different from pastors and farmers in their sorting preferences. It could be that pastors see their church ministry as a schooling task and thus are not different from teachers in their sorting preferences. It is possible that the effects of the schooling background

for both teachers and pastors account for the similarity. Or it could be that farming experiences encourage a more pragmatic thematic or complexive grouping rule.

Hypothesis 11. "There is a relationship between occupation and the percentage of internal attributes used in the sorting task." The findings do not support the hypothesis.

All occupational groups tend to prefer the more useful, but more interpretive, internal attributes.

Hypothesis 12. "There is a relationship between occupation and the percentage of impersonal pronouns used in the sorting task." The findings do not support the hypothesis.

All occupational groups tend to use impersonal linguistic structures.

Other Significant Observations. Age did not have a relationship to any of the dependent variables. Thus the findings do not support the idea that the tendency toward complexive preferences indicates merely a developmental lag in age.

The combined superordinate and internal sorting preference showed effects of amount of schooling and occupation, but still did not show a relationship to non-formal education or recency of schooling. Those with less schooling tended to use external attributes when they used superordinate rules (e.g., "They are all the same color").

Possibly schooling encourages competency as well as preference for the more efficient, yet more difficult, superordinate rule for internal attributes.

Neither literacy classes or theological extension courses made a difference in preferences for superordinate rules. It could be that these educational experiences are not intensive enough or prolonged enough to promote the use of superordinate strategies as does formal schooling experience.

The influence of language in the sorting task was interesting. The ability to speak English was related only to the combined superordinate/internal preferences, with no relationship to superordinate or impersonal pronoun preferences.

However, the ability to speak Fulani was related to superordinate, impersonal pronouns, and external attribute sorting preferences. It would be useful to investigate the daily relationships Tangale men have with Fulani cattle herders, to see if there is a transfer of cultural thinking styles as suggested by the influence of use of the Fulani language. Studies in cognitive style have suggested that a nomadic life style fosters analytic and independent thinking. Findings from this study indicate similar assumptions, in that Tangale men who speak Fulani prefer to use the more analytic superordinate grouping rules and

have a greater tendency to use impersonal pronouns in explaining the sort.

There was a similar correlation between the number of languages spoken and the tendency to use superordinate and impersonal grouping modes. Schooling has no relationship to the linguistic structures, nor did use of English; but the use of Fulani and the number of languages spoken did have a relationship to impersonal modes. It is noted that all the subjects spoke Tangale as a first language. The possibility that second, third and fourth languages can affect sorting preferences should be studied further.

Conclusions

Based on the findings of the study and in answer to the research questions, the following conclusions can be drawn.

1. Persons who have attended school prefer to use superordinate rules more than those who have not attended school.

2. Schooling does not affect preferences for sorting with internal attributes.

3. The number of languages spoken has more effect than schooling has on the use of impersonal linguistic structures.

4. The recency of schooling is not related to any of the dependent variables. Apparently the effects of schooling are stable.

5. Non-formal education is not related to any of the dependent variables. Apparently non-formal education affects a person differently than does formal education.

6. Impersonal linguistic structures are equally preferred by all groups in the study. Apparently schooling does not affect a greater tendency to see objects from an impersonal and objective viewpoint.

7. Pastors and teachers have a greater preference for using superordinate sorting rules than do illiterate farmers. The finding could reflect either the effect of schooling or the effect of occupation.

8. Those who speak Fulani as a second language have a greater tendency to prefer superordinate, external and impersonal modes than do non-Fulani speaking people. The reason for the tendency is unclear, but may be related to cultural differences in the nomadic Fulani. Other studies report that a nomadic life style is related to a greater tendency to use analytic cognitive styles.

Implications

The above conclusions suggest a number of implications for adult education practice and for further research.

In chapter one the need for an appropriate match between the thinking style preference of the learner and the structure of the curriculum was emphasized. The findings of this study show differences in thinking preferences

in the equivalence grouping task. The differences are related to schooling and language. People with schooling have a greater tendency to prefer superordinate groupings. Those who speak Fulani, or who speak more languages, tend to prefer superordinate groupings.

In education practice, it cannot be assumed that illiterate adults are accustomed to using superordinate grouping strategies. Yet in current education models, some subject matter areas and some instructional techniques require the learner to use superordinate strategies. To facilitate learning, subject matter areas could be rearranged in order to put the more thematic-type studies earlier in the shoooling experience and the more systematic subjects later. Instructional techniques which give many examples and do not depend on hierarchical logical structures should be used. These suggestions are most relevant for the earliest years of schooling.

It cannot be assumed either that adults from different language backgrounds have the same thinking preferences. Subject matter structure and instructional techniques may need to vary depending on the linguistic background of the learner. Linguistic influences may be broader than the learner's mother tongue alone.

The findings show another important factor for the educator to consider. Most of the factors that reflect the thinking preferences of a person have no relationship

to the amount of schooling he or she has had. Non-school influences are great. The curriculum developer should be aware of the fact that analysis of adult entry behavior must take into account more than past schooling experiences. Other culturally related experiences must be considered as well.

The study shows that the preference for superordinate modes of thinking is related to schooling and cannot be assumed for newly entering adult students. Linguistic background may also have a relationship to entry behavior. Finally, the educator should consider out-of-school factors in determining the thinking preferences of the learner.

Implications for further research. The findings of the study suggest further areas of research needed in order to answer the research question on factors which affect thinking preferences.

The cause-and-effect relationship of schooling and preference for superordinate thinking modes was not clarified by the findings of the study. One way to further investigate the relationship would be through the use of a longitudinal study, which would indicate if adults with an inclination toward superordinate thinking modes have a greater tendency to go to school or if schooling causes the inclination toward superordinate thinking preferences.

The study has not determined whether the actual equivalence grouping strategies were preferences or competencies. To modify the technique by asking the subject to use a different sorting strategy for each of the ten trials would probably be confusing to the subject. One way to modify the instrument would be to use the same pictures to pose a problem which would stimulate the subject to use different strategies or reward superordinate strategies. One such modification would be the game of "Twenty Questions," in which the subject would try to discover which picture the experimenter had mentally selected. The subject could ask superordinate questions which at once eliminate several incorrect pictures (e.g., "Is it a picture of an animal?"). Or the subject could make inefficient and ineffective guesses (e.g., "Is it the cow?"). The instrument would pose a problem that would reward superordinate responses and thus measure competencies more than preferences.

The generalizability of the study was intentionally limited in order to eliminate as many confounding variables as possible. The study would have a wider generalizability if it were expanded to include rural Tangale women and children, urbanized Tangale, and people of other tribal backgrounds.

The study did not attempt to look at cultural influences (other than schooling) on equivalence grouping strategies.

Yet there are implications that language is a significant variable underlying thinking differences. The influence of the language of the nomadic Fulani seems to be significant and suggests further research.

The findings of the study are not clear as to the influence of non-formal education on equivalence grouping strategies. Further studies could include other out-of-school learning experiences. More sophisticated statistical procedures such as linear regression equations could be used to measure the relative effects of each of the factors and to suggest further hypotheses.

The above suggestions for the practice of adult education and for further research could do much to enhance the learning experience of adults in Africa, where schooling is often valued merely for the certificates achieved. If thinking styles were considered in the development of curriculum for adults, the educational experience could become less frustrating and more relevant to life needs, thus facilitating the personal growth of the individual.

APPENDICES

APPENDIX A

DATA COLLECTION FORMS

The following forms were filled in by the research assistants as the subjects were interviewed.

GABATARWA

Dalilin wannan ziyara, shi ne ina so ne in gana da kai. Zan yi maka wa'dansu tambayoyi. In ka yarda sai ka bani amsoshinsu. Wadannan tambayoyi ba gwadawa ba ce. Amsoshin da za ka ba ni sai taimake mu shirya koyarwa irin ta zamani a cikin Bible School da aikin Ilmin Kirista a cikin ECWA nan gaba.

1. Menene sunanka _____
2. L.C.C. _____
3. L.C.B. _____
4. Menene harshenka? _____
5. Shekarunka na haifuwa nawa ne? _____
6. Ko ka yi aure? _____
7. Littattafai nawa kake da su na kanka? _____
8. Mece ce sana'arka? _____
9. Ta yaya ka koyi wannan sana'a? _____

   _____

10. Wadanne irin makarantu ka yi?

    _____Primary School

    _____Reshen Bible School

    _____B.T.S.

    _____Advanced Bible School

    _____Bridge Course

    _____T.C.

    _____B.C.

    _____Secondary School

    _____Yaki da jahilci

    _____Correspondence School

    _____T.E.E.

_____Craft School

_____Seminary

_____Wadansu dabam

11. Wace shekara ce ka gama makaranta takarshe?

12. Ka kan saurari rediyo? _____

13. Kana da rediyo na kanka? _____

14. Ka kan karanta jarida _____

15. Sau nawa a mako kakan karanta jarida? _____

16. Wace jarida ce kakan karanta _____

17. Shekaru nawa babanka ya yi a makaranta? _____

18. Shekaru nawa mamarka ta yi a makaranta _____

19. Wadanne harsuna ne kuma kake ji _____

_____

20. Ka taba zuwa wadannan wurare?

Gombe

Bauchi

Maiduguri

Jos

Kano

Enugu

Lagos

BAYYANI

1. Ka saurari dukan bayyani kafin ka fara.
2. Dubi dukan hotunan da ke gabanka.
3. Ka fadi sunan kowanne hoto bi da bi
4. Ka nemi hotunan da suka yi kama da juna. Suna iya yin kama da juna ta kowace hanya.
5. Sai ka zabi hotunan da suka yi kama da juna. Za ka tara su wuri 'daya.
6. Bayan ka zabi hotunan da suka yi kama da juna sai ka fadi dalilin da ya sa hotunan suka yi kama da juna. San 'an nan ka ci gaba da zaben wadansu.
7. Ka iya yin amfani da hotuna da yawa bisa ga sonka a cikin tari dabam dabam.
8. Ka iya yin amfani da hoto 'daya a cikin tari dabam dabam.
9. Za ka sami dama ka yi zabe sau 10.
10. Ka iya ka hada hotunan ta hanyarda kake so.
11. Wannan ba gwadawa ba ce.
12. Babu batun amsoshin da suka yi daidai da wadanda ba su yi daidai ba.

giya	zakara	tebur	kujera	masara	taxi	kandir
itace	sa	santali	kobo	agogo	ball	almakashi
buka	riga	takalmi	itacen masara	lorry	fitila	'kirana
hula	akuya	taba	fanta	ayaba	matsefi	majami'a
littafi	maciji	soro	giciye	garma	keke	turmi

ME YA SA KA SA WA'DANNAN A WURI 'DAYA?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

APPENDIX B

PICTURES USED IN THE RESEARCH INSTRUMENT

APPENDIX C

EXAMPLES OF RESPONSES

The first line of each example lists pictures chosen as being alike. A literal translation from Hausa follows, giving the explanation given by the subject and recorded by the researcher as to why the pictures were alike. Each adult made ten sorts and gave ten explanations as to why the pictures were alike.

Example 1

A 40 year old pastor
Total school - 4 years
Recency - 9 years ago
NFE Score - Medium

1. Cross, Bible: The Bible explains to us how Jesus died on the cross.
2. Cap, shirt, show: Man wears a shirt and cap and puts on shoes.
3. Hoe, corn: You cannot get corn until farming is done with a hoe; then corn will appear.
4. Lamp, church: If a man has a house, he puts a lamp in it to give light.
5. Table, chair: Man will sit on a chair and write on the table.
6. Bicycle, lorry (truck): Bicycle and motor are articles for traveling.
7. Hut, tree: If a man has a house, he needs a tree in front of the house so that he can be resting.
8. Cow, goat, cock: We eat the meat of these things. We sell them to get money.
9. Coin, clock: If a man has money he could buy a clock so that he can watch the time for working.
10. Scissors, comb: Scissors can cut the hair of the head. Comb is to comb the head with.

Example 2

A 49 year old pastor
Total school - 12 years
Recency - 9 years ago
NFE score - High

1. Candle, lamp, tobacco: These things use fire; they bring smoke. They can all bring light in the darkness. They can burn a person.
2. Church, house, hut: They are all buildings of mud. Man can go into all of them and take shelter from wind and rain. Man can sleep in them. Their doors could be closed with no one to go into any of them.
3. Tree, cornstalk, cactus: They grow by themselves, they have lives. They all die. They have leaves. They eat food from the ground.
4. Taxi, lorry (truck), bicycle: All of them can run. All of them can fall. They have engines. Man can ride on them. They can deteriorate.
5. Table, chair, cross, mortar: They have been made of dry wood. They can be burned by fire. They could be cut with a metal knife.
6. Ball, shoe: All of the two are made of leather. Man has made them. They could be burned. They could be loosed and made to another thing different.
7. Fanta, wine, teapot: All of them could contain water. They could get broken. All of them are built.

8. Corn, banana: They are fruits of plants. All of them get ripe. They are all eaten. They all soil.
9. Cow, goat, cock, snake: They are all living things. They all eat food. They all run. They are all meat. They could all die.
10. Bible: I have put the Bible alone. The Bible alone among these pictures because it is the only thing that has the word of life. Its word does not change. It gives wisdom to man. The Bible is the inspired word of God. It is not made by us.

Example 3

A 23 year old teacher
Total school - 11 years
Recency - 1 year ago
NFE Score - Medium

1. Candle, lamp, cross, Bible: Because they are the way of our salvation. The follower should have light like the candle and lamp. The Bible and cross are the way of life.
2. Beer, tobacco: Because they cause man to be drunk.
3. Coin: Because it is the root of all evils. It is the one that brings different evils.
4. Church: Because it is where Christians should worship.
5. Shirt, cap, shoe, taxi: Because they are articles of the enjoyment of man. Cap, shirt and shoe for the closing of the secret of man, taxi also for the traveling.
6. Cornstalk, corn, banana: Because they are the food that brings blood to the body.
7. Cock, clock: Because all of them tell us time.
8. House: Because it is the place that Moslems do their worship.
9. Cow, goat: Because they are animals that we tame for getting meat and milk and skin for shoes.
10. Hut: Because it is the place where we sleep in for the covering of our secret.

Example 4

A 22 year old teacher
Total school - 12 years
Recency - 1 year ago
NFE score - Medium

1. Beer, Fanta: These are bottles
2. Bible, cross: These are related because the church has a picture of the cross on its body.
3. Clock, ball, kobo: These three have the same shape.
4. Cornstalk, corn: These all are corn. One is the cornstalk and the other was broken from a cornstalk.
5. Tree, cactus, cornstalk: These are plants. They grow. They bear fruit.
6. Candle, lamp: These are used for giving light by lighting fire on them.
7. Table, chair: They are useful in the work of teaching and writing.
8. Bicycle, lorry (truck), taxi: These help man in traveling.
9. Taxi, lorry (truck): These two, unless oil (gasoline) is put in them they cannot work.
10. Cap, shirt, shoe: These are clothes, they are very useful to man.

Example 5

A 55 year old farmer
Total school - 0 years
Recency - not appropriate
NFE score - Medium

1. Church, comb, banana: Because the color is the same and they are beautiful.
2. House, tree: Because they are the same through their color and they are beautiful.
3. Table, hut: Because their color and beauty have become one.
4. Taxi, cornstalk, corn, cactus: Because their color is the same, that is green. Taxi for traveling, corn for eating and cactus for shade.
5. Cap, truck, Fanta: Because they have beautiful color and they are useful. Truck for traveling, cap we put on the head. There is also something good and sweet to drink.
6. House, cock, cross, chair: Because their color is beautiful. The chair is something for sitting. Here is the cross of Jesus. Here is the European cock. Here is a house for staying.
7. Bible, bicycle, scissors: Because their color is beautiful. Scissors are for cutting cloth, a bicycle is a thing for riding for traveling, but the Bible is greater than them all for it is the word of God.

If man reads it he will know the greatness of God. May God give me knowledge to read his book.

8. Shirt, snake, mortar: Because they are good. Mortar is for pounding corn for porridge which I will eat. The snake is only beautiful, but is not useful. The shirt is beautiful, I wear it, I will look handsome.
9. Cow, teapot, shoe, lamp: Because of seeing them and their colors are good for me. If I put fire in the lamp it will give light to my room. The owner of the lamp should give light as the lamp has light. The shoe is for putting on the foot to prevent the foot from dirt and thorns and stumbling. The teapot is for drinking water. Cows are good wealth. It helps man in farming food for him so that he can help others.
10. Clock, coin, ball, goat: Because all of them are useful to man. Clock is for looking at the time. With money I can buy a shirt or my food and the book of God to study. If I play with the ball I will exercize my blood and I will rest from the heaviness of body. The goat is good riches to sell and pay school fees of my children. The rest I will buy my cloth with.

Other examples from several adults

1. Tree, cock, house, hut, chair, snake: This tree, a man could sit under it on a chair. The one who sits on this chair has a house and hut. In this house there is a cock. In this tree there is a snake which stays in it.
2. Bible, goat scissors, candle, taxi, hoe: This goat is very proud. The pastor has come in his car. He will talk to the goat. Pastor is talking to the goat from the Bible. This scissors is the symbol of God's power, how He cuts the one that is proud, so that he can have light in his heart. The proud man will take a hoe, that is to take the word of God and work with it.
3. Snake, goat, cock, cow: These, all of them breathe.
4. Church, comb, candle, ball, clock, coin: These are human handmade for the enjoyment of his living, but the candle is more useful because it brightens the room.
5. Cock, cow, goat, snake: The cock has life as man does. The cow also has life and she moves as man. The goat also has life; the snake also has life.
6. Banana, cactus, ball. Banana is not a tree, its fruit is food. Its tree does not make fire. Cactus is poison, it kills. The ball brings reward if it is played between country and a country.

7. Cactus, cornstalk, corn, taxi, church, comb: The church and taxi are one in color, and the corn and cactus and cornstalk look the same in their color.
8. Candle, scissors: I need them because they are useful to me. The candle will brighten my house in the time of darkness. It is the medicine for dripping if it is applied. The scissors, because its color looks nice; also because I barb with it and tailors cut cloth with it.
9. Lamp, table, chair, clock, truck: I have seen that these improve our living inside the house. They beautify the inside of the house.
10. Fanta, teapot, candle, banana: These are useful for the building of the family at home. They bring health and the rest of mind. Every human being likes them.

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