5-1967

A Comparison of Two Non-Verbal Intelligence Tests as Predictors of Academic Success of Navajo Students

Stanford S. Larson
Utah State University

A COMPARISON OF TWO NON-VERBAL INTELLIGENCE TESTS AS PREDICTORS OF ACADEMIC SUCCESS OF NAVAJO STUDENTS

by

Stanford S. Larson

A thesis submitted in partial fulfillment
of the requirements for the degree

of

MASTER OF SCIENCE

in

Counseling and Guidance

UTAH STATE UNIVERSITY
Logan, Utah

1967

ACKNOWLEDGMENT

The author wishes to express his sincere appreciation and indebtedness to Dr. Glendon Casto, his Major Professor, for taking time from a busy schedule to give counsel, encouragement, constructive criticism, and help in this study.

The assistance and cooperation of Mr. Lawrence L. Green, Head of the Vocational Department at Intermountain School, is appreciated. Mr. Green obtained permission from both the Superintendent and the Principal for this study to be made. He also issued the memos listing the time, place, and students to be tested. Without his help this study would have been impossible.

To the students of Intermountain School who took part in this study, the author wishes to express thanks.

Special thanks and gratitude is given to the author's wife and family for their interest and help during this study. Special recognition should go to the author's wife for the hours she has spent typing, proof reading, and for the encouragement and understanding she has shown.

The author also wishes to give acknowledgment to his graduate committee: Dr. Glendon Casto, Dr. Ronald S. Peterson, and Professor Robert Publicover.

Stanford S. Larson

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF TABLES

ABSTRACT

A Comparison of Two Non-verbal Intelligence Tests as

Predictors of Academic Success of Navajo Students

by

Stanford S. Larson, Master of Science

Utah State University, 1967

Major Professor: Dr. Glendon Casto
Department: Psychology

This study was a search for a valid and reliable tool for the measurement and appraisal of the Navajo student at Intermountain School whose cultural and bilingual background make many highly verbal tests untrustworthy. The two tests chosen for the study were the Chicago Non-verbal Examination and the Cattell Institute for Personality and Ability Testing Culture Free Test. It was assumed that these tests would call attention to students who had good intellectual ability but were below standard in reading and verbal development and had been overlooked because of their lack of verbal fluency.

The two tests were administered to a random sample of one hundred twenty four students (72 boys and 52 girls) at Intermountain High School. The tests were administered and corrected by the author, care being taken to follow directions in the manual on administering, correcting, and figuring IQ scores.

Statistical treatment was given the obtained data and the findings compared with the standardization sample for each test. Further statistical treatment was given to compare the performance of the boys with the performance of the girls on each test. Grade point averages were obtained for each individual in the sample. A coefficient of correlation between grade point average and IQ scores was figures for both the Chicago Non-verbal and Cattell Institute for Personality and Ability Testing Culture Free Test. A coefficient of correlation between grade point averages and the "G" score from the General Aptitude Test Battery was computed on ninety eight students on which the scores were available.

The results of this study showed that (1) The Chicago Non-verbal Examination seemed to be more interesting and motivating for Navajo students. (2) The Navajo students in this study scored higher than the standardization sample on the Chicago Non-verbal Examination. This is interesting because on most tests the Navajos score below the mean of the standardization sample.

(83 pages)

INTRODUCTION

Statement of the Problem

The importance of understanding the individual student is stressed in today's educational literature. This understanding includes the use of mental tests as a means of estimating the mental capacity of the students. Since 1893, when Binet first started exploring the differences between bright and dull children, mental tests have gained momentum and are accepted today as one of the most important tools psychology has developed for the guidance of human affairs.

According to the 1960 census there are now over 28,000 Navajo students for whom estimates of intellectual capacity are needed. Generally, the lives of many of the students at Intermountain School have been molded by years spent in a spacious, barren, unproductive reservation, where home is a one room hogan, superstition is yet paramount, and disease is inflicted with displeased spirits. It is a long step from the hogan with its small, tightly knit family group to the boarding school, or the public school, with its vast group of strangers. The necessity to learn a foreign language, to adopt a new conflicting set of cultural values and to compete with non-Indian children, plus other conflicting obstacles make this transition difficult.

In the face of these cultural dissimilarities and the expectation of teachers and even of parents that the child make a rapid adaption to the

requirements of successful competition for "good grades", some children succeed with comparative ease; some lag behind; some, unable to identify themselves with the "inside group" at school, insulate or isolate themselves from their surroundings and make little progress, some become emotionally disturbed. The factors of cultural and environmental differences should be kept in mind when evaluating Indian intelligence and potential.

Each culture or subculture fosters the development of a different pattern of abilities. Each culture, partly through the physical conditions of its environment and partly through social traditions, selects certain activities as the most significant. These it encourages and stimulates; other it neglects or actively suppresses. Since all behavior is affected by the cultural milieu in which the individual is reared, and since psychological tests are samples of behavior, cultural influence will be reflected in test performance.

Among the cultural factors that may affect performance on psychological tests are: general traditions and customs, emphasis placed on speed in different cultures, motivation to excel on the sort of tasks sampled by the test, and social expectancy. Emotional maladjustments which in turn may interfere with active intellectual functioning are frequent results of culture conflicts and may affect test results.

Bilingualism is generally recognized as a serious difficulty in comparative psychological testing. Tests that are highly verbal and culturally loaded discriminate against the individual from another culture

such as the Navajo student. Many studies on American Indians and on European and Asiatic immigrant groups have compared test performance on bilingual children with that of monolingual, English speaking children. Such investigations have demonstrated that the substitution of a non-verbal test for verbal test reduced the inferiority of the bilinguals. In some cases the inferiority disappears completely and the bilingual individual surpasses the monolingual individual. Although bilingual individual may have sufficient mastery of English to communicate in ordinary matters and even to attend the English speaking school, they will probably be handicapped when taking a verbal test. Such a person may lack the monolingual's verbal fluency, vocabulary range, and facility in handling verbal relations in English.

A severe criticism of tests dependent on past schooling and school related behavior has been made by some who argue that this type of intelligence test denies many children a fair opportunity. Children who do well on mental tests are encouraged by teachers; but, if they do poorly with school work, a special study of their difficulties is made. If a child with a poor mental test record has trouble with school work, the teacher is likely to accept this as natural and make no deeper inquiry. The child who could do better school work than he has in the past is neglected just because his cultural background or bilingualism lowers his test score. It is the purpose of this study to determine whether or not the Chicago Non-verbal Examination and the Cattell IPAT Culture

Free Test can be used as tools for measuring the intelligence of Navajo students at Intermountain High School and to predict academic success. It is also the purpose of this study to determine which one of these two tests is more suitable for measuring intelligence and predicitng academic success of the Navajo student at Intermountain High School.

Significance of the problem

The value of this study lies in the fact that it is a search for a valid and reliable tool for the measurement and appraisal of the Navajo individual whose cultural and bilingual background makes many tests untrustworthy.

Hypothesis to be tested

The following hypotheses will provide direction to the study:

1. Navajo students will not differ significantly in performance from the standardization group on the Chicago Non-verbal Examination;

2. Navajo students will not differ signficantly in performance from the standardization group on the Cattell IPAT Culture Free Test;

3. There will be sex differences in the obtained IQ scores of Navajo students;

4. The Chicago Non-verbal Examination and the Cattell IPAT Culture Free Test will both show a higher correlation with Grade Point Average than the regularly used verbal type tests.

Assumptions underlying the problem

One of the functions of guidance and administration is the gathering of data by sampling various types of behavior with tests and prediciting future behavior from this data. It is assumed that the tests used in this study will supply data that will enable the counselor, teacher, and administrator to idenify students capable of doing better work if given suitable help, students who have been discriminated against by highly verbal tests. Nunnally (1964) states that non-verbal and culture free tests are useful with children from this country who have led culturally imporverished lives.

It is assumed that these tests will call attention to students who have good intellectual ability but who are below standard in reading and verbal development and have been overlooked because of their different cultural background.

Limitations underlying the problem

This study will be confined to one large off reservation boarding school, Intermountain School, Brigham City, Utah, with an enrollment of approximately two thousand students. It will be further limited to the Intermountain High School, with an enrollment of approximately twelve hundred students for the school year 1966-67, from which a random sample will be drawn.

Definitions of the terms used

1. Chicago Non-verbal examination; a specific test yielding an IQ score and requiring no reading ability.

2. Cattell's IPAT Culture Free Test: a specific test yielding an IQ score and requiring no reading ability.

3. Navajo: a specific Indian tribe located in northern New Mexico and parts of Arizona, southern Utah and Colorado.

4. Validity, predictive: The power of specific tests to predict important future behavior on the part of the same student.

5. Random sample: Every single sampling unit in the population has a chance of being drawn into the sample.

6. "G" factor: general intelligence.

REVIEW OF LITERATURE

The review of literature in this study is concerned with three areas: The first area is the cultural background of the Navajo. Before this study can become meaningful, one must be able to view the Navajo and his culture with the proper perspective. If we do not gain an understanding of his background and culture, we will be in danger of gauging his beliefs and behavior by our understanding of our own culture and not understand the problem facing the Navajo in his transition between two cultures.

The second area is a brief background and history of Intermountain School, where this study was made. This is justified by the fact that Intermountain School is a unique boarding school for Navajo students, and this brief background will add to the understanding of the study.

The third area is a review of the early attempts at making culture free tests, other studies of Indian intelligence, and previous studies using the Chicago Non-verbal Examination and the Cattell IPAT Culture Free Test.

Cultural Background of the Navajo

Population trends

The Navajo is now the largest Indian tribe in the United States. In 1868 there were no more than 15,000 Navajo Indians. The 1960 census shows slightly more than 90,000 tribe members living on or near the reservation.

The idea of the vanishing Indian may apply to other tribes, but not to the Navajo whose birth rate is spiraling upward. The Navajo have a further claim to the interest and attention of the general public in that nowhere else in this country is there a minority group of this size whose way of life and culture differs so markedly from the white culture, and whose problems in adjusting to that culture is as large.

To understand the Navajo one must understand Navajo culture and the way of life they have developed over the years in the rugged plateau country of the southwest that they call home. The reservation upon which the Navajo live consists of about 25,000 square miles and extends into four states--Arizona, New Mexico, Colorado, and Utah. The Navajo belong to the great Athabascan language family which extends from the Dene tribes of the Yukon in the valleys of Alaska south to the Apachean groups, some of which extends to the borders of Mexico.

Reservation

Most Americans seeing the Navajo Reservation for the first time are startled by it. It is a stupendous study in contrasts. A high arid tableland for the most part; it has great physical beauty with mountains, some forests, and geological formation of gorgeous physical colors. However, with an annual rainfall of between five and ten inches, it is not a productive land. When rains do come they are often violent, washing away the land and eroding it into deep gullies and washes. The Navajo people have been economically impoverished throughout most of their history since 1868.

> The Navajo economy has been based largely on sheep. Since the grazing is sparse / even in good times 30 acres are necessary to sustain one sheep/, a large amount of range land is required to support a flock of even modest proportions and sheep must be moved from place to place to find grass and water. This pastoral life has dispersed the Navajo over wide areas. They have not been village dwellers as have the Hopi, and Pueblo peoples, the Papago, and some other tribes. The Navajo have long felt that the services of their children as herders were indespensable to them. Because of the size of the reservation and its sparseness, much of it has been a trackless area with few well developed all-weather roads. This is beginning to change rapidly now, but between the dates of 1868 and 1946 it was certainly true. (Coombs, 1962, p. 3)

A glimpse of Navajo daily life gives some understanding of their culture and a sense of the difference of the ways the Navajo do things as compared to the way other Americans live from day to day. For this reason some space is being taken in this study to give background material so the reader can better understand the reasons and need for this study.

Dress

The dress of the traditional Navajo male is a colorful variation of the cowboy costume--blue denim pants, bright shirts, scarves, and large felt hats. The women's long fluted, calico or velveteen skirts and bright calico or velveteen blouses reflect Spanish influence as well as being a carry over from the fashions worn by the wives of American Army officers in the 1860's. In public, women wear Pendleton blankets draped over their shoulders. Both men and women commonly wear varying amounts of silver and turquoise, coral and abalone shell jewelery, including earrings, bracelets, rings, necklaces and ornate buttons and belts. Some of the men still

wear their hair long, tying it with white woolen yarn, in a knot behind their heads in a style similar to that used by the women. Both men and women often wear scarves tied across their foreheads. A number of the younger men now cut their hair, and an increasing number of the younger women also cut their hair and curl it after the fashions of the white women. Many women wear conventional dresses or combinations of commercial blouses with the traditional skirt.

Homes

> Navajo families live in 'hogans' made of logs and mud. The hogan is a hexagonal structure with no windows, only a door which faces east and a smoke hole in the center of the roof. The people sleep on sheepskins with their feet to the fire, and their heads to the walls--like the spokes of a wheel. The family typically rises at dawn. The men go out to round up the horses; the children take the sheep and goats out to graze in the cool of the morning; the women take out the ashes and start preparing a breakfast of bread, coffee, and sometimes mutton. When the men return with the horses, breakfast is served the family on the floor of the hogan.
>
> After breakfast the men work in the fields or haul wood and water. The children take the sheep and goats out to graze again, while the women remain at home to care for the babies, weave rugs, and attend to general household tasks, such as washing dishes or sweeping out the hogan. A noon meal may be prepared but often is omitted altogether. (McCombe, Vogt, Kluckhohn, 1951, p. 213)

Under the influence of the white culture an increasing number of hogans have windows, stoves, and some even have beds. An increasing number of pickup trucks are also replacing the horse and wagon as a means of transportation.

Nutrition and food

A prosperous family will slaughter a sheep or goat every week throughout the year, but poorer people can not afford that much meat. After the animals throat is cut, it is skinned, quartered, and the meat is hung up in a tree out of reach of the dogs. The habit of eating the internal organs and all edible portions of the animal (much of which the white culture does not use) is a compensation for the deficiency of vegetable greens and is probably the source of many needed vitamins and minerals. Most Navajo are accustomed to tightening their belts and going for days on nothing more than coffee and a little bread, but when the opportunity arises they will gorge themselves with food.

Their diet runs heavily to mutton and "fry bread" made from a dough fried in deep fat. In addition there may be beans and some staple foods, sometimes supplemented by squash, corn, or melons in season if there is a garden; and, as always, there is coffee.

Occasionally there is a trip to the distant trading post, an event that is looked forward to by all the members of the family and that usually takes all day. At the trading post purchases are made of such staples as flour, sugar, coffee, and lard, and sometimes luxuries such as candy, soda pop, and canned fruit. Before the family starts home there is always an exchange of news and gossip with the trader and other Navajo.

Securing a supply of water for drinking and cooking purposes is an every present problem. Much of a man's time must be spent in hauling

water in barrels from distant wells or water holes. Not much of the precious water can be lavished on frequent bathing or hair washing. Finding a supply of wood for fuel is also a time-consuming problem.

To provide bathing facilities in this area of scarce water, a sweat house is constructed. The sweat house is conical in shape and constructed of upright poles covered with earth. Like the hogan the door faces east. Rocks are heated in an open fire and then placed inside the sweat house. The men disrobe, and shouting an invitation to the Holy People (Navajo divinities) to join them they enter the sweat bath. Sacred songs are sung during the bath and afterwards while the bather drys himself by putting sand on his body or throwing himself in the snow.

In the evening another meal is served, and this is often followed by either the grandfather or father giving a talk either educational or ethical in nature to the children. The family retires an hour or two after sundown unless there are visitors. In this case, they may stay up and gossip until quite late.

Family life

> The whole space of Navajo life is leisurely and relaxed most of the time. The daily and annual round of life is geared not to the clock and calendar (as in our society) but to the passage of the natural seasons and the position of the sun during the day. This relaxed informal atmosphere is one of the most difficult aspects of Navajo life for white people to understand. (McCombie, Vogt, Kluckhohn, 1951, p 3)

The basic unit of economic and social cooperation is the biological family, consisting of husband, wife and unmarried children. Contrary to the impressions of white observers, the Navajo woman usually enjoy a position of considerable prestige and influence with the family; they own property. Descent is traced through the mother rather than the father, and the women have a continual source of extra income from their weaving. When a man married in Navajo country, he usually goes to live with the wife's relatives. Hence, two or more biological families tend to be large and complex. Typically it includes an older generation, with or without unmarried children, and with married daughters and their husbands and children living in nearby hogans. Indigent relatives, adopted children, and visitors are usual additions to the extended family. The extended family cooperates closely in agriculture and the care of the livestock and other economic and social duties. Any source of strain between the son-in-law and his mother-in-law is nearly taken care of by the Navajo by making it taboo for the two to see each other.

Besides the family and the extended family, the circle of kinfolk is extended to the people in the "outfit" and the "clan". The outfit is a group of relatives, larger than the extended family, who regularly cooperate on certain occasions, such as planting, harvesting or giving an important ceremonial. Each Navajo belongs to the clan of his mother, but he is also "born for" the clan of his father. The clan is not united in one area but is

spread over the entire reservation. One may not marry with one of his own clan or of his father's clan. A Navajo will always go out of his way to do a service or a favor for a clan relative. Clan members are called brothers, sisters, fathers, or mothers, depending upon the sex and relative age of the two speakers.

Long distance travel to visit and participate in ceremonial "sings" keeps the family and community ties active. Most binding are the relationships between maternal uncle and nephew and between brothers and sisters. These supersede even those between parent and child.

The group opposes an individual's accumulation of much more power or wealth than his fellows have. Though property of various types is personally possessed, ultimate ownership of almost everything rests in the group and is for the group. Simplicity, friendliness, and generosity are highly valued; while stinginess or failure to meet obligations to relatives can bring accusations of witchcraft Thus the fear of such accusations acts as a leveling influence on the Navajo society.

> In the dominant culture of our Nation the spirit of competition with one's peers is considered commendable so long as it does not go to ruthless extremes. Striving to "get ahead in the world," to rise above the crowd by dint of ability, energy and ambition is held to be a high virtue. The opposite has always been true of a Navajo culture. To try to outshine one's peers, to attract special attention to oneself as an individual is considered to be in very bad taste. The major emphasis is on the serving the welfare of the group, particularily the family and the clan. Similarly the Navajo

> and the Anglo concepts of property are quite at variance. People of western European extraction have for centuries had the strongest urges toward private ownership of property. To win a parcel of land, a small business, a nice home, or investment securities which they could call their very own has represented to them security, independence, and pride of achievement. But the Navajo, like other American Indians, has little concept of our concern for the private ownership of property. Land was important only for its use and this could be shared amicably among tribal members. The security of the group comes first and those who had food or other worldly goods shared with those who did not and who were in need. Food, water grass and game belonged to the tribe in common and could be drawn from by all as they needed it. (Coombs, 1962, p. 30)

Childhood

Children are highly valued by the Navajo, and most women bear a child every two or three years during the whole reproductive period. The Navajo feel that the conduct of the parents while the baby is yet unborn has far-reaching effect on he child's birthand its health in later life.

Preparations for the coming of the child are minimal, but a constant and close relationship between mother and baby begins after the first bath and does not end until the child has learned to walk. The infant is nursed by the mother each time he cries for the crying will attract witches. After the fourth week, or as soon as the naval has healed, the child is put on a permanent cradle board. Cradles are made very carefully and represent a great amount of ritual as does the birth of the child.

The Navajo have a great regard for children, watching carefully for the first laugh, and showing a warm interest in the succeeding phases of motor development. Posinsky (1963) tells us that toddlers when they abandon the cradle and begin to walk are permitted a wide range of experimentation and exploration. Restrictions, warnings, and punishment are almost nonexistent for the first two years. Rather, the permissiveness is such that the child moves from person to person and is fondled by each. He persecutes pets (animals take the place of toys), and he explores the fire, learning his limitations through a series of small accidents. Training is minimal. Aggression against siblings or elders is ignored, and only the constant presence of others prevents serious harm from knives and fire. Toilet training does not ordinarily begin before the second year, and most of the children continue to soil themselves, at least several times a week until they are six or seven.

When the child has learned to walk capably and has been weaned, his care is transferred to an older sibling. The weaned child apparently accepts his new position in the group as aggression against the new born child who has replaced him with the mother is rare.

Religion and beliefs

To the Navajo the universe contains two classes of personal forces. These are, "the Earth Surface People", ordinary human beings, both living and dead, the Holy People, who belong to the sacred supernatural world and travel about on sunbeams, lightning, and on the rainbow. This last

group have great powers and can either harm or help the Earth Surface People. The Holy People first lived below the surface of the earth, moving from one lower world to another until a great flood drove them to ascend to the outer world, through a reed. The Holy People develop ways of doing things which were partly practical and partly magical. When they decided to leave for their permanent homes at the east, south, west, north, and zenith and the nadir, they had a great meeting, where they created the Earth Surface People and taught them all the methods they had developed, so the people could build houses, obtain food, marry, travel, trade and could also, protect themselves against disease, war and hunger.

Man is not at the capricious will of these Holy People but is an integral part of this orderly universe and must do his part to maintain harmony or balance among the parts of the cosmos. One result of disorder in these relationships is human illness, and the part played by Navajo ceremonials "sings" is to restore order.

> The essence of life and its constant replenishing, its on goingness, the Navajo call sa'a Naaghai, and they believe that at death a soul rejoins the universal being, as a cup of water is poured into a river. The evil part of the deceased remains as a ghost, or ch'indi'i, which is a constant danger to the living even if the dead person were well disposed. For this reason the Navajo dread and avoid anything to do with the dead, and they abandon hogans in which someone has died.
>
> Acculturated Navajo often retain this fear and the fear of disease and witchcraft after they have lost confidence in the benificient aspects of their religion. A fact that often leads to personal and social disorganization. (Christian, 1964, p. 12)

The Navajo also believe strongly in witches. These evil men or women, acting either separately or in a group, can obtain property and cause illness or death. Like the ghosts of the dead, these people work mostly at night. They often wear the hide of a coyote, a wolf, or sometimes other animals. They are ghouls, and they practice incest.

> Navajo ceremonials fall into a number of groups which are classified on the basis of mythological association, common rituals, and the type of trouble the "sing" is believed to remedy. Thus the Holy Way group of chants deals with troubles that the diagnostician (hand-trembler) has traced to lightning, thunder, winds, snakes, various other animals, and Holy People. Mountain Top Way (in which the famous fire dance takes place) is the treatment for troubles that are believed to have arisen from contact with bears. Life Way chants are employed in the case of bodily injuries, and Evil Way chants are used in curing "ghost" sickness. Sickness caused by Navajo ghosts is treated by one type of Evil Way chant (often one of the Shooting Ways), and sickness arising by molestation by the ghost of foreigners is treated by Enemy Way in which the familiar "squaw dance" takes place. Upon their return to the reservation many of the Navajo veterans were "patients" in the Enemy Way because of their contact with dead Germans or Japanese soldiers during the war. (McCombie, Vogt, Kluckhohn, 1951, p. 140)

Language

The Navajo not only use sounds and inflections completely different from English, but their language structure and patterns require and create a vastly different view of the world. Christian (1964) says their language and other forms of cultural communication absorbed from early childhood give the Navajo a sense of reality quite at variance with that of most people in the United States. Actually, language and

cultural norms lead the Navajo to think almost solely in terms of present interactions. The future simply does not exist for them as a perceptible reality.

There seems to be a number of other factors that conspire to make the learning of English about as difficult as possible for the Navajo pupils. Many are not literate in their own tongue yet have to learn to read, write, and speak in English. They lack many of the experiences which make language meaningful. And to make it even more difficult, there is little similarity between the English and the Navajo languages. Navajo to a considerable extent is a tonal language with the pitch of the voice as well as the sounds conveying meaning. There are many sounds found in Navajo which are not found in English and vice versa. The "th" sound is a particularly hard sound for Navajos, and "this" and "that" often sound "dis" and "dat". It is hard for them to distinguish between the sounds of "b" and "p". When pupils are asked to watch the teachers lips, they are reluctant to do so as it is considered very bad manners in the Navajo culture to stare at another person.

After making this study of the Navajo, it is evident that because of his different cutlural background, language, beliefs, and lack of experiences which could make the English language meaningful to him there is a definite need for a culture fair test of intelligence. And as stated before, it is the aim of this study to compare two such tests in the hope of finding one test that will fulfill this need.

A Short History of Intermountain School

In the fall of 1948, at the suggestion of Utah Senator Arthur V. Watkins, a group of administrators, educators, and other technicians of the Indian service made a visit to the former Bushnell Hospital in Brigham City, Utah to investigate its suitability as a school for Navajo Indian children. Bushnell General Hospital had been opened in 1942 and operated until 1946 as a general hospital by the army. In closing the hospital, all temporary buildings were dismantled and all equipment removed. In a number of cases buildings were only partially completed because expansion was still going on when orders for closing of the hospital were given. Up until the visit of this group no users had been found with programs sufficiently large enough to operate this huge plant that had cost around $14,000,000.

The group saw the possibilities of using the plant as a school and recommended that it be used as a school for Indians. It was recommended that it be used primarily for Navajo, because the Navajo tribe had the largest number of school age children, and because the lack of water on the reservation raised doubt that enough schools could be built on the reservation to educate the Navajo. Nor could the reservation provide support for more than a fraction of the Navajo population.

Discussions were held with community leaders of Brigham City and with leaders of the state. A committee representing the

Navajo tribal council visited the plant, and all recommended it be converted to a school. Some new construction was needed to operate the plant at a maximum efficiency and provide for the largest possible number of children at lowest capital price. Buildings needed included two buildings for class rooms, another gymnasium, and some quarters for personnel. Remodeling existing buildings to change over from hospital to classroom was also necessary. The estimate for remodeling, new construction, reactivation of the utilities, and for needed equipment was $3,750,000. Senator Arthur V. Watkins and Representative Walter K. Granger of Utah introduced a bill for this appropriation in both houses of Congress. This bill was supported by the remainder of both delegations from Utah. The bill passed both the Houses and was signed into law by the President in May, 1949.

On June 4, 1949, the school superintendent and his assistants arrived to commence work. By January of 1950, the remodeling, equiping and hiring of staff had progressed to a point where 540 students were accepted. Since that time the school had steadily grown to an enrollment of 2,200 students.

Special curricula and programs were developed in elementary and secondary academic departments and home economics and vocational subjects. A total program was evolved for the teaching of English, social customs, and vocational skills leading toward off-reservation placement upon each student completing his particular course. Most students coming

to Intermountain are at least 2 years academically retarded because of lack of school facilities and starting school late.

The first graduation took place in the spring of 1954, with the graduation of 28 boys and girls; in 1955 186 more students completed their training; in 1956 a total of 309 students completed their training. These were all Special Program Students.

All graduates were placed on permanent jobs and were visited periodically by staff members to determine if they were adjusting satisfactorily in their new homes and jobs scattered through out the United States.

Recently Intermountail School had inaugurated a regular high school program which has now become accredited with the Northwest Accrediting Association. The first group to graduate from Intermountain with a regular high school diploma was in the spring of 1963. Intermountain also has an academic elementary department complete with remedial teachers, an up to date language laboratory, a home economics department, and a vocational department which teaches both industrial arts and vocational subjects.

Non-Verbal Test, History. Developmental Studies

Cultural differences

Researchers made a number of comparative studies of intelligence hoping to determine whether the intelligence of various other racial groups

is as high, higher, or lower than the whites in the American society. A great many tests have been applied to the study of intelligence in other racial or ethnic groups, most of them representative of the tests developed for and used in the white culture. Amthropologists have been critical of these studies and have tended to attribute differences in test performance to cultural differences rather than innate differences in intelligence.

The interpretation of behavioral differences between racial groups is complicated by the fact that racial groups also differ in culture. The geographical and social isolation which leads to race formation is also associated with cultural differences. Cultural factors often account for group isolation which tends to preserve and augument those cultural differences. When investigating race differences, the question that confronts the investigator is to what extent were cultural factors responsible in producing the obtained differences.

> The particular culture in which the individual is reared may influence his behavioral development through many channels. The operation of environmental forces is not limited to the extent and quantity of educational opportunities available in the school, the home, and the neighborhood. The question is not only one of amount, but of kind. The experiences of people living in different cultures may vary in such a way as to lead to basically different perceptual responses, lend a different meaning to their actions, stimulate the development of totally different interests, and furnish diverse ideals and standards of behavior. (Anastasi, 1958, p. 550)

Cultural influence of test performance

Some striking examples of influence of traditions and customs upon test performance have been recorded by investigators. Porteus

(1931) in his testing of Australian aborigines found it difficult to convince his subjects that they were to solve their problems individually without assistance. In explanation of their behavior he writes:

> . . . the aborigine is used to concerted thinking. Not only is every problem in tribal life debated and settled by the council of elders, but it is always discussed until a unanimous decision is reached. On many occasions the subject of a test was evidently extremely puzzled by the fact that I would render him no assistance, especially, when, as happened in the center, I was testing some men who were reputedly my tribal brothers. This was a matter which caused considerable delay as, again and again, the subject would pause for approval or assistance in the task. (Porteus, 1931, p. 308).

In some cultures time plays a relatively insignificant part in the life of the individual, they can see no reason for hurrying through a task, especially if they find it congenial and interesting. This varying emphasis placed on speed in various cultures has an effect on the individuals score on a timed test. In other cultures it is considered bad form to answer questions in the presence of some one who does notknow the answer, or for an individual to answer a question unless he is absolutely sure he knows the answer. The effect this would have upon intelligence tests in which the subject is advised to "guess" when not sure and is urged to "try his best" on a difficult problem can be readily forseen. The child who refuses to give any answer unless he is completely sure of its correctness will lose many points that he might have earned through partial credit and chance success.

Factors influencing test motivation

Motivation and interest also play an important part in test performance. Some of the tests in current use cannot arouse the same emotional reaction in other cultures as they do in the white culture. This type of activity has no place in the traditional behavior of the individual in some cultures, where in the white culture it resembles everyday school work which is one of the most important things in the individual's life. Differences in the drive to achieve on tests, in school, and in other situations have been found among different social classes and cultures.

Another subtle but powerful influence in the individual's psychological environment is that of social expectancy:

> Perhaps its most pervasive effects, however, are to be found in the case of racial minority groups. Extensive research has been done on racial and national sterotypes. From an early age, the minority group member becomes aware of the characteristic behavior traits associated with his racial or national stereotype. In his daily contacts with family, playmates, teachers, and other adults, he finds constant reminders of what is expected of him. Gradually these expectations become part of his own self concept, which in turn affects his motivation and achievement. By these means, what is expected of an individual tends to determine what he becomes--a tendency that has come to be known as the "self fulfilling prophecy." (Anastasi, 1958, p. 553)

In the American culture, membership in the minority groups tends to be associated with low socioeconomic status. The homes in which the children of immigrants, Negroes, and the American Indian are reared have, on the whole, been far below the native white standard in many respects. When we consider the occupational and educational level of the parents,

income, degree of overcrowding of homes, facilities for health and physical comfort, opportunities for intellectual and recreational facilities, or parent-cild relations, we find clear evidence of underprivileged standing.

One of the controversial issues in psychological intelligence testing today is the bias in some of the items in the stanrardized tests. Eells, Davis, Harvighurst, Herrich, and Tyler (1951) in their book Intelligence and Cultural Differences, argue that the cultural background of the high-status child in the United States better prepares him for making correct responses to standard intelligence test items. They claim the test items are highly saturated with middleclass vocabulary, problems, and objects. They call this a bias in favor of high-status students as compared to low-status students, which leads to higher test scores for those from higher socioeconomic levels.

When the upper middle class is compared with the lower class, it becomes evident that there are differences in the experiences of these children that might be expected to result in differences of performance on intelligence tests which fall into four areas.

1. Cultural differences in home and family life,
2. Cultural differencces in neighborhood and community,
3. Cultural differences in school experience, and
4. Cultural differences in motivation for test performanc. (Havighurst, 1949, p. 45)

The criterion employed for validating most verbal intelligence tests is success in our culture. Scores are correlated with school success or some other cultural success. Thus it would seem that our verbal intelligence

tests are measuring only the ability to succeed in our particular culture. DuBois (1938) standardized a Draw-A-Horce test on Pueblo Indian children, which followed closely the procedure of the Goodenough Draw-A-Man test. In terms of age grade placement and other criteria of "intelligence" the horse test proved to be more valid for the Indian students than the man test. When the tests were administered to both Indian and white children, the Indian students excelled on the Draw-A-Horse test and white children on the Draw-A-Man test, showing cultural influence on test results.

Effect of bilingualism on test performance

As mentioned in the introduction, bilingualism is generally recognized as a serious difficulty in comparitive psychological testing. Although the bilingual individual may have sufficient mastery of the English language to communicate on ordinary matters and even to attend an English speaking school, because of his lack of vocabulary range, verbal fluency, or facility in handling verbal relations in English he may be handicapped on a highly verbal test. Research has shown that the inferiority of the bilingual is greatly reduced and may disappear completely when non-language tests are used. The standing of the groups may even be reversed, especially when the test used is a non-verbal test of the performance type.

Darcey (1946) studied two groups of nursery school children, one biligual and the other monoglot. They were matched in age, sex, and parental occupation. In all cases the second language was Italian. The two groups each consisting of 106 children were given a performance test,

the Atkins Object Fitting Test, and Stanford-Binet. The bilinguals were significantly higher on the object-fitting test but significantly lower than the monoglots on the Stanford-Binet.

Similar results were obtained previously by Arsenian (1937), in a carefully controlled study of 1152 American-born children of Italian parents and 1196 American-born children of Jewish parents, ranging in age from 9 to 14. Degree of bilingualism was ascertained by means of a written questionnaire. The test administered was the Pintner Non-Language Test. The results showed no signficant correlation between extent of bilingualism and intelligence test score in either group. The correlations being .079 for the Italian group and .193 for the Jewish group. Studies on American Indian children and on American-born Japanese children have also shown little or no inferiority on performance tests as compared to significant inferiorities on highly verbal tests.

Early studies of Indian intelligence

Numerous studies of racial mental differences have been reported in the literature; the earliest one reported on the American Indian was made by Rowe (1914). He administered the Stanford-Binet to a sample of 268 Indians and found 94 percent of them below the white norms on the basis of their chronological age. Hunter and Sommermeier (1922) administered the Otis Classification Test to 715 mixed and full-blood Indians and found a correlation of .41 between degree of white blood and IQ. Garth (1925) administered the National Intelligence Test to Indians of various tribes

as well as from various localities, Mexicans, and other ethnic groups. His findings were that Mexicans do better than full-blood Indians but not as good as mixed-blood Indians. Garth also found public school Indian students to be slightly superior to U. S. Government School Indian and a rise in IQ with school grade. He also found that Indian children reared in white homes tested higher than siblings left in Indian environment.

Haught (1934) administered the Pintner-Cunningham Mental Test to little Indian children, the National Intelligence Test to intermediate age children, and Terman Group Test of Mental Ability to the upper age levels. His conclusions were that "Indians make lower scores than white because they are lower in native ability." One thing must be kept in mind, all the tests administered to Indians so far discussed have been the paper and pencil tests that are highly verbal type tests. These studies are similiar to studies that have been made on white children living in isolated rural areas, the mountain country areas of Virginia, and on canal-boats in England where there is very little schooling. These children tend to fall below the average of white children and suffer a decline in IQ as they grow older. Such findings suggest that the observed differences of intelligence may not be due to racial differences.

Early use of non-verbal tests on Indian subjects

To determine the effect of language on test results, Jamieson and Sandiford (1928) administered both verbal and non-verbal tests to 717 Indian students of southern Ontairo who were in attendance at eleven day schools. When the results of the tests were considered, they found that

Indian children on the non-verbal test were only three points inferior to normal white children.

A study that was among the first to suggest that test performance may be affected by culture was made by Klineberg:

> He administered the Pintner-Patterson series of six tests to Indian and white children on the Yakima Indian Reservation and found: (1) that Indian children took longer on form boards but made fewer errors, (2) that comparison of Indian and white groups in terms of total number of points obtained on the Pintner-Paterson Point Scale showed no difference between the two because the Indians made up in accuracy for their inferior speed, and (3) that correspondance of scores with the degree of white blood was lacking. (Havighurst and Hilkevitch, 1944, p. 421)

A study by Garth and Smith (1937) was undertaken to obtain a measure of performances of full-blood Indians on a non-verbal test as compared to a verbal test of intelligence. The tests used were the Pintner Non-language Mental Test and Otis Classification Test. The greatest overlap of standard deviation of Indians on white norms was found in the non-language test. The median mental ages ranged from 1.2 to 2.5 years higher for the non-language test while inferior to the white norms are from 10 to 14 points higher than IQ's from the verbal test. The amount of overlap of Indian 1Q's on the white norms indicates the favorableness of the non-language tests toward the Indian.

Some experimenters have tried to develop tests of intelligence for Indians consisting of tasks and material that are representative of the Indian culture, but none of them have been standardized and placed on the market for use in schools or personnel work.

Arthur (1941) administered the Arthur Performance Scale and the Stanford-Binet to Indian children of elementary and high school age and found the median IQ to be considerably higher on the Arthur which is a non-verbal test. Havighurst and Hilkevitch (1944), tested 800 children from six Indian tribes using the Grace Arthur Point Performace Scale. They found that American Indian children do as well as white children on a performance test of intelligence, and there is differences between tribes and between groups just as there is in the white culture. This study gave contradictory evidence to the statement that Indian children work more slowly on tests than white children. There was some evidence that those children who are least influenced by white culture and education do not do as well on the Arthur tests as students who have had more schooling and white cultural influence, but the evidence is not conclusive. The last conclusion drawn from this study was that a performance test of intelligence would be more valuable for educational placement and guidance of Indian children in the Southwest than an intelligence test which requires much use of the English language.

Howell, Evans, and Downing (1958) administered the Wechsler Adult Intelligence Scale to fifty Navajo males and to fifty Navajo females ages sixteen and seventeen. They used a stratified sample selected according to the procedure used in the Wechsler standardization. They showed a slight, though not significant, superiority over the standardization group on the Block Design and Object Assembly sub-tests. It has been generally

agreed that the Block Design is one of the best sub-tests of the entire scale. Wechsler in The Measurement of Adult Intelligence states ". . . that it seemingly measures much the same thing as verbal tests measure." Presumably this generalization is made because the Block Design tests show a high correlation with the Verbal Scale. One possible interpretation of the relatively good showing of the Navajo groups on the Block Design test might be that it is measuring intellectual ability that is comparatively uninfluenced by cultural differences. There was a greater difference between means of the Verbal Scales than the means of the Performance Scales. Therefore, it would seem that the Verbal Scale is affected more by cultural factors than is the Performance Scale.

> The problem is clear enough: many children and adults are "secretly intelligent," i.e., actually far more intelligent than traditional verbal tests show them to be; for traditional tests are known to reflect not just intelligence, but "intelligence plus" and "plus" being educational opportunity and experience, and general familiarity with the dominant culture. The upper class child from a fourth-generation United States family does have a headstart on traditional, verbal tests of intelligence. The underprivileged child does not, and it is difficult to imagine a more severe handicap than the resulting handicap of under-estimated intelligence, which blights the lives of an appreciable fraction of the population--not only those in backstreets, the Negro youngster, the American Indian, or the Spanish-American, and even the foreign student seeking advanced education here, but also those millions, particularly in rural areas, where cultural stimuli are few. The same handicap would be suffered by an English-speaking youngster forced to have his intelligence evaluated in, say, Spanish. Even where he might understand the words in a literal sense, key cultural connotations might be lost on him. (Cattell, 1957, p. 2)

Studies on culture free and non-verbal tests

As this study is aimed at comparing two tests that are assumed will measure intelligence and predict success of bilingual students of another culture a search of the literature has been made to find two tests that have shown some degree of success in predicting success for this type of student. The two tests chosen are: The Chicago Non-verbal, and the Cattell IPAT Cultural Free Test.

As has been shown most of the intelligence tests depend to some degree upon language and include tasks presented in verbal terms. This is only natural, since the bulk of our learning and thinking makes use of language. For the usual person and in relation to the usual type of academic learnings, aptitude for learning can be tested more efficiently by tasks that involve language than by those that do not. However, for some groups this is not always so. The most obvious example is that of groups who do not speak English or speak it only slightly. When English is not the native tongue and when there has been little opportunity to attend school, a student may suffer a special handicap on a test that is close to school learnings. Therefore, the test results are in a large measure meaningless. For groups of this sort, tests have been developed that do not require language. In some of these just the test task is non-language in character; in others the instructions can be given by pantomine and no language need be used at any point during the test. The non-verbal tests items include pictorial representations and abstract reasoning items involving the geometric symbols and figures.

Development of Chicago Non-verbal examination

Brown (1940) states that the primary purpose for devoping the Chicag Non-verbal Examination was to derive an instrument which gives a measure of general intelligence and which, at the same time would be as free as possible from verbal concepts. He further states that the test is designed specifically for those students who are handicapped in the use of the English language and includes those who come from an environment where there is meager use of the English language or from a home where a foreign language is spoken. It should also be used for children who may have a language or reading difficulty and with adults with similar handicaps.

In selecting the test material the author attempted to adhere to the usual methods and in addition had the following criteria in mind:

1. The tests should be of such a nature that they could be administered by pantomine directions, or oral directions;
2. The pantomine direction should be simple enough to be understood by the first or second grade children;
3. The test material should be adaptive to a wide range of difficulty, i.e., each sub-test should contain material easy enough for six year olds and sufficiently difficult for superior adults.
4. The test should be administered with as little equipment as possible. (Brown, 1940, p. 37)

The ten tests finally selected and used in the Chicago Non-verbal Examination require the following performances:

1. Learning to associate digits with symbols, (common symbol test);
2. Marking out what does not belong in a series of pictures or designs:
3. Counting the number of blocks in a pile;

4. Selecting from a series of geometrical forms two of which can be put together to make a given form;
5. Selecting from a series of design one which is just like a given design;
6. Arranging the parts of a picture to make a complete picture;
7. Numbering pictures according to a certain sequence;
8. Marking the thing that is wrong in each of a number of pictures;
9. Selecting from a series of pictures the one that goes with or is just part of a given picture;
10. Learning of a more difficult type similar to that in sub-test one. (Brown 1940, p. 30)

The reliability by the split half method is .89 as quoted by the test manual and .80 by the test retest method. The criteria used to determine the validity of the test, age, Stanford-Binet, normal frequency distribution of scores and correlation with the Otis and Kahlmann-Anderson Intelligence Test, seems to result in sufficient verification. The authors of the test also recognize one limitation of the test; it tends to rate dull students somewhat lower and bright students somewhat higher.

Paxton (1965) found through his study on 700 Indian adolescents at Sherman Institute, that the Chicago Non-verbal Examination is sufficiently discriminating in the measurement of intelligence to be applicable for use with Indian students of bilingual backgrounds.

Newland and Lawrence (1953) testing a sample of 1440 east Tennessee Negro school children ages six through fourteen by means of the Chicago Non-verbal Examination found the following:

1. At all age levels these Negro children scored not less than the equivalent of two years below the respective age norms for this test. At ages eleven though fourteen the disparity increased to three or more years.

2. At the six and seven year levels the test results lacked completely or largely in discriminability.

3. Limited discriminability between the thirteen and nineteen year levels is indicated.

4. Taking all levels combined, no significant differences were found.

Anastasi (1958) may have the answer as to why the Negro youth did so poorly:

> Investigation on the American Negro have revealed a relatively large inferiority on perceptual and special functions, in comparison to most types of verbal tasks. Negro children do particularly poorly on such tests as the Chicago Non-verbal and the Minnesota Paper and Form Board. (Anastasi, 1958, p. 565)

Although there seems to be a lack of studies made and published in the periodicals on the Chicago Non-verbal Examination, and the study on the east Tennessee Negro children would tend to discourage its use, the author decided to use it for several reasons. It was used successfully by Paxton on Indian adolescents, part of them being Navajo, the particular tribe from which the students in this study will come. Davey (1926) made a study on English students comparing verbal and non-verbal tests and from his studies concluded that verbal mental tests measure the same general factor "g" as does a test similar in form but non-verbal.

After referring to Buros Fifth Mental Measurements Yearbook and reading the following review:

> But the fact remains that the Chicago Non-verbal Examination was an attempt to reduce the cultural contamination present in so many group tests of intelligence. That it

> was not completely unsuccessful is indicated in the fact that results on it have been found to compare favorably with those obtained on the Pintner-non-Language Mental test, the Revised Beta Examination, and others. (Burros, 1959, p 343)

Then it was decided to use the Chicago Non-verbal Examination as one of the tests to be used in this study.

"G" factor in non-verbal tests

Davey (1926) has shown that pictorial "tests of intelligence" involved the same "g" factor as the more commonly used verbal type intelligence test. Line (1931) while investigating visual perception in children, discovered that certain tests involving the education of relations between simple geometrical shapes (i.e., less than pictorial) were highly saturated with "g". Almost simultaneously Fortes (1931) brought evidence towards the conclusion that valid tests of "g" could be made from relation education in simple non-connotative visual material.

Small samples had been used on Davey's, Forte's and Line's work, so Stephenson (1931) undertook a very thorough research and mathematical analysis on 1037 subjects. He confirmed that the same "g" factor ran through verbal and non-verbal tests and proved what until then had only been suspected: that a group factor or "verbal skill" ran through verbal tests.

> With the above assurance Speaman published his visual perception test with pantomine directions in which the items had only their "perceptual" meaning and did not depend on "appreceptial associations," i.e., were geometrical rather

> than pictorial. Arsenian, Lorge, and Zubin investigated the test in this country and first showed that it revealed significant differences between racial groups in situations in which usual tests would have been ambiguous.
>
> Finally the test was included in the large scale factor analysis inquiry at Moosehart, Illinois, under Thurston and others, where it was again shown to be highly "g" saturated and free from any group factor. (Cattell, 1940, p 167-168)

Cattell (1963) published his theory of fluid general ability in contrast to the traditional concepts of crystallized intelligence. The two characterizations of mental activity differ in a variety of ways:

> Crystalized intelligence (g_c) is reflected in cognative performance that has become patterned through early learning experiences. Fluid ability (g_f) on the other hand, manifests itself through adaptive mental behavior in situations so unfamiliar that previously adaptive skills can be of no help in guiding such behavior.
>
> Diversity in cultural interests and opportunities produce more individual idfferences in (g_c) than in (g_f) even before biological maturity (age 15-25) has been reached.
>
> Both types of ability reach their growth peaks at different ages (g_f) leveling off sometime in early adolescence and early adulthood, depending on the length of participation in cultural pursuits.
>
> Standardized tests measuring g_c, show a much smaller sigma than does a test like the IPAT, measuring g_f. The reason is that in a given subculture the previous learning experiences which strongly influence g_c scores are so circumscribed that they tend to reduce the variance at a given age level. One example of the restrictive nature of learning activity may be found in the typical classroom where a wide range of potential is funneled into a narrow-range of performance, as bright pupils are restricted from moving ahead and dull pupils are pushed to achieve more than they can. (Burros 1965, p. 453-454)

An experiment was made by Cattell (1963) to substantiate and prove this theory. This experiment factoring 44 hypotheses-relavent variables measured on 277 seventh and eighth grade boys and girls with sufficient noncognative variables to permit effective rotation of any general cognative factors which might appear demonstrated the existance of two general ability factors. One fits the crystalized ability factor measured in culture-fair intelligence tests. Evidence is offered that the latter is neither a special ability factor nor the so-called "practical ability" (k) factor, but basic general intelligence. These two general abilities appear in a single third-order factor hypothesized to express the "formative fluid ability" partly responsible for the present level of them.

Studies on the Cattell IPAT Culture Free Test

The Cattell IPAT Culture Free Intelligence Test is based on Doctor Cattell's theory of fluid ability and on the premise that general intelligence is a matter of seeing relationships in the things with which we have to deal, that the ability to see relationships can be tested with simple diagrammatic or pictorial materials. He also works on the premise that for a test to be usable in different cultures the pictures should be of forms or objects which are fairly universal, i.e., not peculiar to any group.

> In order to achieve cultural fairness, the IPAT tests were constructed to include mostly nonsense material, universally unfamilar and some commonplace material, universally familiar. The effects of special previous training could, therefore, not be transferred to the problems posed in these instruments, and the supposedly contaminating effect of social class, ethnicity, and even nationality on test results are said to be filtered out. (Buros, 1965, p. 453)

Cattell (1940) grants that his Culture Free Test is not as free of culture influences as are the performance tests. However, he feels that mental dexterity which is so prevelant in performance tests is not heavily saturated with Spearman's "g" factor. Buros (1959) states that on theoritical grounds the IPAT tests are probably more effective tests of "g" than any other culture fair test.

The Cattell manual shows test retest correlation of .82 and split half corrected to full length .70, .86, .87, and .92 for scale 2 forms A and B. It shows a correlation with the revised Stanford-Binet of .56 (a later study yielded .71), with the Otis (mean of ten groups) .73, and the ACE of .59. The correlation with school achievement (Stanford Achievement Test) is .36 as against .25 for the Binet.

There are numerous studies that have been made on Cattell's IPAT Culture Free Intelligence Test. Pierce-Jones and Tyler (1950) tested two groups of students—one group of general psychology students in an arts and craft college and one group of educational psychology students in a university of education. The tests administered were the American College Examination and the Cattell IPAT Culture Free Test. A. C. E. scores were more closely correlated with academic success in the arts and crafts group than in the university group. The Culture Free Test scores correlated to the same extent in both groups.

Cattell, Feingold, and Sarason (1941) administered the Stanford-Binet, the American Council on Education's Psychological Examination

(arithmetical section), the Cattell Culture Free Test, and the Grace Arthur Point Performance Scale to thirteen and fourteen year old high school freshman. The subjects chosen were considered old enough to adjust themselves efficiently to the testing and the training they were to receive and young enough to show improvement of intelligence through training, if such occurs. They were divided into four groups approximately equal in numbers, age, and intelligence. All four groups were tested with all four tests. Group one was trained in verbal knowledge, group two in materials of geometrical nature similar to that of the Culture Free Test, group three in manipulation of form boards and performance tests similar to but not identical with those used in the Arthur Test, and group four was given training in arithmetical and algebraic processes similar to those in the A. C. E. The results showed the A. C. E. most susceptible to culture influences and the Arthur least. The Culture Free Test and Binet vie for second. Since it can be argued the critical ratio is a more comparable indicator of the validity of the difference, Cattell feels that the Culture Free Test can with most accuracy have assigned to it the second position in freedom from cultural contamination.

It would seem from a study of the material found in this research that in some cultures Cattell's Culture Free Test gives a good measure of intelligence while in others the results are not satisfactory. Anastasi and Cordova (1953) administered the Cattell Culture Free Test to 176 Puerto Rican children in grades six to eight. One half received test instruction in English first session and Spanish second session; languages

were reversed for the second group. The split-half reliability ranged from .84 to .92, and speed played a negligible part in obtained scores. Over all performance fell below Cattell norms. Reasons are low socio-economic level of subjects, bilingualism, and lack of test sophistication.

Marquart and Bailey (1955) undertook a study to determine if the Culture Free Test actually could be used to measure across cultures and to check its validity. Seventy one children and adolescents of different economic classes were given the revised Stanford-Binet scale and the Cattell Culture Free Test. It was found that the results on scale one of the Culture Free Test seems to be influenced by culture as the Stanford-Binet. Results on scale two, however, corresponded to expectations. Even though some of the differences are not significant, they are in the expected direction. The results obtained from scale two seems to be less influenced by culture than are results obtained using the Stanford-Binet. Scale two of the Culture Free Test is the test being used in this study.

In the territory of Guam where the influence of western culture and education is being felt and where the students are bilingual, there is a need for a test that will predict school achievement. Cooper (1958) undertook a study to ascertain to what degree, if any, currently available measures of intelligence will fulfill this need. Three group tests, the California Test of Mental Maturity 1960 S form elementary, the Davis Eells Games intermediate level, and the Culture Free Test

scale 2 form A were given 164 pupils in grade five. All the intelligence tests correlated positively with the California Achievement Tests. The correlation coefficients ranged from .53 to .79 as follows: Davis Eells Games .53, Culture Free Test .55, California Test of Mental Maturity .64; neither the Davis Eells Games nor the Culture Free Test offer as much promise as the California Test of Mental Maturity. However, from the point of view of test theory, the fact that these two tests do show pronounced positive correlations with scores on a typical achievement test is highly significant, showing the ability sampled by these two measures are those which in part determine success in a bilingual setting.

In Taiwan, the school population is made up of Chinese students who, in 1950, had arrived in Taiwan from almost every province of the vast Chinese mainland. There were also students born in Taiwan, but whose forefathers came from the Chinese mainland several hundred years before. All of the students are ethnically Chinese, but the two cultural groups have developed under different environmental influences. Rodd (1959) administered the Cattell Culture Free Test to 1290 students in the Taiwan schools and found that on form A and B they reacted in a fashion similar to the standardized group in the United States. The increase in mean scores from form A to form B for the total group of 1290 students was approximately five score points, which is the same as that obtained by Dr. Cattell in the United States. The results showed that the Taiwan group had (a) essentially the same mean as the American

students using the same test, (b) essentially the same standard deviation, and (c) the same mean and standard deviation for boys as for girls. There was no statistically significant difference between the two cultural groups on form B of the Culture Free Test.

The College of Guam is located in the western pacific, and its students come from Guam, Chichi, Jima, Saipan, the Philippines, and the island groups of Palau, Truch, Yap, Ponape, the Marshalls, and others. The languages and cultures of these people are all different from ours (American educators) and from each other. Cooper (1962) administered the Culture Free Test to four different sections in general psychology at the College of Guam, using scale two, forms A and B. Each section was assigned to one of the four possible administrations, i.e., Form A followed by B, etc. The tests were given in December and in June, grade-point averages were obtained. The reliability and predictive efficiency of the tests were analyzed. The raw scores from one form to another possessed satisfactory reliability, but the IQ's showed considerable fluctuation. The possibility was considered that the trouble may lie in the test's norms. The various orders of giving the two forms yielded correlation coefficients between mid-raw scores and grade-point averages varying from .101 to .637. It was concluded that this test is not very useful with students from the western Pacific.

It is interesting to note that while Cooper found the Culture Free Test not useful for the College of the Pacific, Jordhein and Olsen found the

IPAT Culture Free Test suitable for administration to the people, and in particular to the school children, of Truck, Yap, and Palau. These islands are part of the group from which the college students of Guam are drawn. Jordhein and Olsen go on to say:

> It is of some value to know that there is a test available which can be used to assess the intellectual potential of children in a geographic area where customs of various groups differ, and where some of the population have become more "Westernized" than the rest. The value increases as such non-western cultures become aware of the need for an education. (Jordheim and Olsen, 1963, p. 1124)

Alzobail and Jahl (1964) administered the Cattell Culture Free Test to two groups of Iraqui students. The first group consisted of thrity six students in a psychology class at the University of Baghdad, College of Education. The second group was composed of one hundred and three senior students in high school: 40 boys and 63 girls majoring in literature and science. The test instructions were translated into Arabic. It was found for both college group and high school group that time was not a factor in influencing test results. This is in agreement with the statement of Cattell who felt that the time allowed was sufficient. Also in agreement with the findings of Cattell is no significant sex differences. Because the Culture Free Test failed to predict failure or passing on the public examinations of the students, which tests achievement in school, the examiners felt it could not be used on the students of Iraq.

Rao (1965) found the Cattell Culture Free Test to be a useful intelligence test for senior high school and college students in India, and had the following to say:

> For the selection of scholarships and fellowships in terms of the long potential of the individual, rather than in terms of educational opportunities in the immediate past, it becomes vitally important to use good factored intelligence tests. Particularly, when selection is invited in the broader fields of intelligence tests like industrial competence or in human management, non-language tests offer better prediction, than the traditional intelligence tests where a larger part of the variance is due to acquired habits, than even the standardized interviews which are constantly biased by the goodness of speech, dress, maners, etc.
>
> The Culture Free Intelligence Test is one of such singular intelligence tests which can be competently used in a wide range of situations which aims to single the most consistant core of basic mental capacity, as the various subtests are highly loaded with "g". It is also economical in the testing time, but at the same time interesting enough to induce motivation on the part of the testee. (Rao, 1965) p. 19)

Recent practical confirmation of the value of the IPAT Culture Free Test was made by MacArthur and Elley (1963) of the University of Alberta. The aims of this study were to identify and evaluate tests which reduce the dependance on acquired knowledge in order to make possible the improvement of mental testing of children whose backgrounds do not fall within the required range assumed by the background of conventional verbal tests.

> Nine tests and subtests were selected as promising culture reduced measures of general intelligence. In May, 1960 these were given to 271 pupils constituting a stratified sample from the seventh grade population in the public schools of Edmonton. A rapidly expanding Alberta community of nearly 300,000 people. The variables of provincial examinations, averages, socioeconomic status, geographic location, school type and residence mobility were considered in selecting the sample, and a comparison with a random selection from the same

> population in terms of age, sex, occupational status, and Lorge-Thorndike I.Q. showed no significant difference (MacArthur and Elley, 1963, p. 110).

After a comprehensive examination of the nine well-known tests by a complete factor analysis, their findings were that the Progressive Matricies, the I.P.A.T. Culture Fair Test Scale 2, and the Lorge-Thorndike best meet the criteria of high loading on general intellectual ability, little dependence on acquired information, moderate relation with socio-economic status and moderate relation to school achievement. The I.P.A.T. Culture Fair Test Scale 2 had the highest saturation with the general ability factor of all nine tests tried.

MacArthur and Elley (1963) feel that the three most promising tests could profitably be put to greater use in the estimation of intellectual ability and talent identification of people from under-privileged and foreign language background.

After the study and review of the literature it was assumed by the author that the Cattell IPAT Culture Free Test is sufficiently discriminating and culturally fair to be used in this study, therefore it was chosen as the second test.

METHOD AND PROCEDURE

The Chicago Non-verbal Examination and the IPAT Cattell Culture Free Test were administered to one hundred twenty four Navajo students at Intermountain school during the month of November, 1966. The author personally administered and scored the tests using the standardization procedures given in the test manuals. The sample was divided into eight groups: four groups were administered the Chicago Non-verbal Examination followed by the Cattell IPAT Culture Free Test; while the other four groups were administered the Cattell IPAT Culture Free Test followed by the Chicago Non-verbal Examination. This was done to compensate for any practice effect that might have resulted between tests. All tests were administered at the same time of day and in the same room.

The group of one hundred twenty four students were drawn randomly from an alphabatized list of high school boys and an alphabatized list of high school girls that was obtained for the high school department head.

The tests were all corrected by the author, using scoring keys supplied by the test authors. Care was taken to follow the instructions in the manuals in both scoring and figuring IQ's.

Statistical treatment was given to the obtained data as follows: The mean, standard deviation, and standard error of the mean were

computed for the Chicago Non-verbal Examination and the Cattell IPAT Culture Free Test. These were compared with the standardization data from the manuals using critical ratios to determine the significance of the difference between the means found in this study and those found by the test authors.

The sample was then subdivided as to sex, and statistical treatment was given the data to obtain the mean, standard deviation, and standard error of the mean for boys and for girls on each test. Using critical ratios to test the significance of the difference between means, the boys' and girls' performances were compared on each test.

The grades for the past three years and the first semester of this year for each student in the sample were obtained from the registrar. The grade point average was computed for each student and correlated with the IQ scores obtained on the Chicago Non-verbal Examination and the Cattell IPAT Culture Free Test. Scattergrams were made and the product-moment method was used to calculate the coefficient of correlation between grade point averages and the IQ scores obtained on each of the two tests.

The "G" score from the General Aptitude Test Battery was obtained for the sophomores, juniors, and seniors of the sample and correlated with the grade point average using the product-moment method to obtain a coefficient of correlation. This was done to make a comparison between the results of the two non-verbal tests and a verbal type test. The General Aptitude Test Battery is administered each fall to the sophomore

class and used in making vocational training choices. Because it is administered only in the sophomore year, there were no scores for the freshmen, and they had to be dropped from this sample.

RESULTS

Four major hypotheses were tested in this study on Navajo Indian adolescents using the Chicago Non-verbal Examination and the Cattell IPAT Culture Free Test as the measuring instruments.

Hypothesis 1. Navajo students will not differ significantly in performance from the standardization sample on the Chicago Non-verbal Examination.

Table 1 shows the difference between the means, standard deviations, and the standard error of the means for the Navajo students and the standardization sample. Table 2 shows the significance of the difference of the two group means.

Table 1. Comparison of Navajo students and standardization sample on the Chicago Non-verbal Examination

Sample	Sample number	Mean	Standard deviation	Standard error of the mean
Navajo	124	105.70	15.70	1.40
Standardization	1844	100 00	15.00	.35

Table 2. Comparison of Navajo students and standardization sample on the Chicago Non-verbal Examination

Standard error of the difference	Obtained difference	Critical ratio
1.79	5.55	3.10

An examination of the data reported in Table 1 and 2 indicates that there is a significant difference between the mean of the Navajo sample and the standardization sample on the Chicago Non-verbal Examination. Therefore, hypothesis 1, that there would be no difference between the mean is rejected. Navajo students scored significantly higher than the standardization sample.

Hypothesis 2 Navajor students will not differe significantly in performance from the standardization sample on the Cattell IPAT Culture Free Test.

Table 3 shows the difference between the means, standard deviations, and the standard error of the means for Navajo students and the standardization sample. Table 4 shows the significance of the difference of the two group means.

An examination of the data reported in Table 3 and 4 indicates that there is a significant difference between the mean of the Navajo students and the standardizati on sample on the Cattell IPAT Culture Free Test.

Table 3. Comparison of Navajo students and standardization sample on the Cattell IPAT Culture Free Test

Sample	Sample number	Mean	Standard deviation	Standard error of the mean
Navajo	124	93	14.65	1.315
Standardization	4,328	100	16.00	.246

Table 4. Comparison of Navajo student and standardization sample on the Cattell IPAT Culture Free Test

Standard error of the difference	Obtained difference	Critical ratio
1.34	7.00	5.22

Therefore, hypothesis 2, that there would be no difference between the means, is rejected. Navajo students scored significantly lower on the Cattell IPAT Culture Free Test.

Hypothesis 3. There will be sex differences in the obtained IQ scores of Navajo students. Table 5 shows the difference between the means, standard deviations, and the standard error of the mean for Navajo students, comparing boys and girls.

Table 5. Comparison of Navajo students for sex difference on Chicago Non-verbal and Cattell IPAT Culture Free Test

Test	Sample number	Mean	Standard deviation	Standard error of the mean
Chicago Non-verbal Examination - boys	72	104.65	16.80	1.97
Chicago Non-verbal Examination - girls	52	105.90	13.55	1.87
IPAT Culture Free Test - boys	72	91.86	16.00	1.88
IPAT Culture Free Test - girls	52	94.60	12.20	1.69

Table 6 shows the significance of the difference of the means between boys and girls on both the Chicago Non-verbal Examination and the Cattell IPAT Culture Free Test.

An examination of the data reported on Table 5 and 6 indicates that there were no significant sex differences on IQ scores on the Chicago Non-verbal Examination and the Cattell IPAT Culture Free Test. Therefore, hypothesis 3 that there would be a sex difference, is rejected.

Hypothesis 4. The Chicago Non-verbal Examination and the Cattell IPAT Culture Free Test will both show a higher correlation with grade point average than the regularly used verbal type test.

Table 6. Comparison of Navajo students for sex difference on Chicago Non-verbal and Cattell IPAT Culture Free Test

Test	Standard error of the difference	Obtained difference	Critical ratio
Chicago Non-verbal Examination	2.73	1.35	.49
IPAT Culture Free Test	2.35	2.74	1.08

Table 7 shows the product-moment correlation between test scores and grade point average. Table 8 shows the mean and standard deviation for the grade point averages used in the study.

Table 7. Navajo IQ scores correlated with grade point average

Test	Sample number	Standard deviation	Mean	Coefficient of correlation
IPAT Culture Free Test	124	14.65	93.00	0.315
Chicago Non-verbal Examination	124	15.70	105.55	0.284
General Aptitude Test Battery	98	8.19	86.30	0.348

Table 8. Mean and standard deviation of Navajo sample grade point average

	Sample number	Standard deviation	Mean
Grade point average	124	0.455	2.45
Grade point average	98	0.453	2.65

An examination of the data reported on Table 7 and 8 indicates that the Chicago Non-verbal Examination and the Cattell IPAT Culture Free Test do not correlate higher with grade point average than a regularly used verbal type test. Therefore, hypothesis 4 is rejected.

DISCUSSION

An investigation of the data in Table 1 showed the Navajo students with a mean IQ of 105.50 on the Chicago Non-verbal Examination, as compared to a mean of 100 for the standardization sample. This raised two questions. (1) Why did the Navajos score higher on this test than the standardization sample? (2) Why did they score higher on this test than they did on the Cattell IPAT Culture Free Test?

These questions might be answered with the hypothesis that the Chicago Non-verbal Examination was more interesting and more motivating to the Navajo student than the geometric figures of the Culture Free Test. Some evidence of this was the chuckles and laughter at some of the pictures while the students were taking the test. Julie May Largo made the statement that it was the "most fun test she had ever taken." The Navajo have a sense of humor and some of the pictures and objects used in the test seemed to appeal to their sense of humor.

Many of the Navajo students like to draw and look at pictures and seem to enjoy many of the pictures used in the Chicago Non-verbal Examination. Many of the pictures were of animals and objects that the students were familiar with. A study that might be compared to this one was made by DuBois (1938) in which he standardized a Draw-A-Horse Test on Pueblo Indian children. He found that Indian children did better on the Draw-A-Horse Test.

Another interesting point is the fact that most of the Navajo students scored high on the digit symbol portion of the Chicago Non-verbal Test. The digit symbol test consists of associating digits with symbols and placing the appropriate digit under the matching symbol.

Paxton (1965) in his study of Indian students at Sherman Institute, correlated IQ scores from the Chicago Non-verbal Examination with corresponding scores of the California Reading Test, and obtained a coefficient of correlation of 0.60. In this study, the IQ scores from the Chicago Non-verbal Examination were correlated with corresponding grade point averages resulting in a coefficient of correlation of 0.284. This again raised the question of why the lower correlation with grade point average.

Perhaps part of the problem might be in the grading practices at Intermountain High School. The mean score for the group on grade point average was higher than the two point or "C" average expected. As the grades were gathered to be computed for the grade point average, it was found that some students who had a 3.5 reading score on the California Reading Test, and low scores on both the Chicago Non-verbal and Culture Free Test, had "A" grades in English, mathematics and social studies. Other students with a 10.0 reading score who had scored high on the two tests had "C" in the same subjects. After making a survey of a number of the teachers it was found that many of the teachers grade on attitude and effort as heavily or more heavily than on ability.

Some of the teachers have the philosophy that to give a student a low grade discourages the student, but to give the student a high grade encourages and keeps him trying. A philosophy like this tends to give an unrealistic picture of the students academic accomplishments.

The Navajo students show a high degree of finger and manual dexterity and in shop and sewing classes even the slower student usually performs well. They may even surpass the higher academic students. This could also have had an effect on grade point average.

Paxton (1965) on his study of the Chicago Non-verbal Examination and Indian students found a sex difference in performance. This study found no significant difference between boys and girls on either the Chicago Non-verbal Examination or the Cattell IPAT Culture Free Test.

The mean of the IPAT Culture Free Test for the Navajo students was somewhat lower than that for the standardization group. Anastasia and Cordova (1954) in their study of Puerto Rican children found them below the norms of the standardization group. The reasons they gave were bilingualism and lack of test sophistication.

There was no significant difference between the means for boys and girls on the IPAT Culture Free Test, as shown in Table 6. This agreed with Rod (1959), Alzobail and Jahl (1964), and the IPAT Culture Free Test manual, all of which found no signficant sex difference.

In correlation with the Stanford Achievement Test scores the IPAT Culture Free Test manual showed a correlation coefficient of 0.36 as

compared to a correlation coefficient of 0.315 between the IPAT Culture Free Test and grade point average used in this study. The General Aptitude Test Battery showed a correlation of 0.348 between grade point average and the "G" score. This is not a very high correlation but it indicates that the Cattell IPAT Culture Free Test predicts academic success on this type of student nearly as well as the General Aptitude Test Batter "G" score does. With a correlation as low as this, the Culture Free Test is of little value even on group prediction of academic achievement for Navajo students.

Research by Eells, Davis, Havighurst, Herrish, and Tyler (1951) indicate that there are significant differences in intelligence test performance of children and youth from different socio-economic backgrounds. Children from the higher levels nearly always secure the higher intelligence-test scores. Certain status levels provide environments more stimulating to mental growth and generally children tend to acquire the intellectual status characteristic of the environment to which they are exposed in the formative years.

Man's motives are shaped by many factors. The manner in which they are satisfied depends upon the individual's environment and also upon his particular stage of physical, social, and emotional development. One of these motives is the need to achieve, a drive which is greatly influenced by early training. Learning and social factors also play a large part in the development of interests and values. Different environments

apparently foster the development of different patterns of abilities, motives, and drives. A particular environment, because it calls for a particular adaptive behavior, will bring about development of the special motivations and abilities needed.

Some of the critera used in selecting students for Intermountain School are: (1) He or she must be twelve years of age or older; (2) must be three or more years retarded scholastically; (3) must come from remote areas where public or federal schools are not available. Many are referred by the Branch of Welfare or the courts as being neglected or semi-delinquent. Many come from broken homes or homes where drinking is prevalent, and there is a complete breakdown in parental standards and guidance. This has often led to guilt feelings, personal frustrations and withdrawal, or striking out at society by becoming delinquent.

Before attending school, the students have spent from six to twelve years in homes which have taught them Navajo traditions to a varying degree. They are oriented in varying degrees toward Navajo concepts of time and the Navajo lack of assuming that there is need to plan for the future. They are limited in their general experiences, though they have traveled to towns near their homes and near the schools.

Their parents have had little or no schooling. The language spoken in the home is Navajo, a virtually unwritten language. They have had very little contact with books, except at school.

Many of the parents have only a short-term concept of school attendance and, therefore, have not assumed responsibility for encouraging their children to stay in school past the elementary grades or a short-term technical course.

Because of the remoteness of the reservation itself and particularly those areas where Intermountain students come from, they have not been exposed to a technological and mechanical environment. They do have manual skills and finger dexterity, but they have not acquired the skill of using the English language for the communicative purposes of listening, speaking, reading, writing, and for ordering their thought processes so they can learn through the English language.

They are accustomed to failure as an academic way of life. They fail to understand the goals of their educational program and, therefore, lack motivation to achieve these goals. Their experiences have not cultivated in them a high occupational and educational aspiration level. They prefer group effort toward achievement of goals rather than individual success which sets them apart from the group.

The students have shown a lack of experience in problem solving, critical thinking, creative thinking, and dealing with things that are abstract. Problems involving geometrical figures have not aroused as high an interest or as high a desire to achieve a solution among this type of student. The reason being that such an unrealistic problem can arounse a child's desire to achieve a solution only if the child has been trained to evaluate highly success in tests. No matter how unreal and purposeless

the problem, the average high socio-economic group will work hard to solve it if his parents and teachers have prepared him to and expect him to try hard. The Indian student on the other hand has tended to react negatively to any school test, especially if the problems and symbols have no relationships to his experiences.

As has been stated before, "It is a long step from the hogan with its small tightly knit family group to a large boarding school with its vast group of strangers." The necessity to learn a foreign language and adopt a new and conflicting set of cultural values as the Navajo student is doing, is a transition that takes courage and a lot of hard work. The Navajo students should be given credit and complimented for the progress they have made.

The author believes that the Navajo students at Intermountain School vary in intelligence on the normal curve. Nevertheless, it is most difficult to ascertain the capabilities of the students from any verbal type test found because most of the students' learning problems stem from difficulties with the English language and lack of experience which would aid them in taking tests. This study was a search for another type of test with non-verbal and culture fair companents that would give a valid and reliable measurement of the Navajo individual.

The results of this showed that: (1) The Chicago Non-verbal Examination seemed to be more motivating and interesting for Navajo students. (2) The Navajo students in this study scored higher than the

standardization sample on the Chicago Non-verbal examination. This was interesting because on most tests the Navajo score below the mean of the standardization sample. In light of these findings it is recommended that an item analysis study be made on the Chicago Non-verbal Examination and other tests of this type to find valid items for construction of a more suitable and up to date test for use with Navajo students.

SUMMARY

The purpose of this study was exploratory, to compare the Chicago Non-verbal Examination and the Cattell IPAT Culture Free Test as predictors of academic success of Navajo students. The study was made at Intermountain School on a random sample of high school Navajo students.

The four major hypothesis tested were: (1) Navajo students will not differ significantly in performance from the standardization group on the Chicago Non-verbal Examination; (2) Navajo students will not differ significantly in performance from the standardization group on the Cattell IPAT Culture Free Test; (3) there will be sex differences in the obtained IQ scores of Navajo students; (4) the Chicago Non-verbal Examination and the Cattell IPAT Culture Free Test will both show a higher correlation with grade point average than the regularly used verbal type tests.

Research has shown the Chicago Non-verbal to be of interest because it illustrated an attempt to measure conceptual abilities without the use of verbal or numerical content. The manual states that this testing instrument was designed specifically for those children who are handicapped in the use of the English language. The Cattell IPAT Culture Free Test is based on Cattell's theory of fluid ability and on the premise that general intelligence is a matter of seeing relationships in the things with which we have to deal, that the ability to see relationships can be

tested with simple diagramatic or pictorial materials. He also works on the premise that for a test to be usable in different cultures the pictures should be of forms or objects which are fairly universal or not peculiar to any group.

The two tests were administered to a random sample of 124 Navajo Indian high school students resulting in a mean IQ of 105.55, a standard deviation of 15.70 and a standard error of the mean of 1.40 on the Chicago Non-verbal Examination. The IPAT Culture Free Test yielded a mean IQ of 93, a standard deviation of 14.65, and a standard error of the mean of 1.315. Upon comparing the results with those of the standardization group on each test, it was found that the Navajo students scored higher on the Chicago Non-verbal Examination and lower on the Cattell IPAT Culture Free Test. There was a significant difference between standardization group means and Navajo means.

No significant sex differences was found in this study, a result which agreed with studies by Rod (1959), Alozobail and Jahl (1964), and results on the standardization group of the Culture Free Test.

Grade point averages were obtained on each student in the sample, and a coefficient of correlation between the obtained IQ scores and the grade point average was computed for each test. The product-moment method was used yielding coefficient of correlation 0.284 for the Chicago Non-verbal Examination and a coefficient of correlation of 0.315 on the IPAT Culture Free Test. For comparison purposes the "G"

factor of the General Aptitude Test Battery was obtained on ninety eight of the students used in the study. The "G" factor score was correlated with grade point average yielding a coefficient of correlation of 0. 348. None of the coefficients of correlations are high enough for any individual prediction.

Some of the items that may hve influenced the results of this study are: The Navajo come from a culture where competition is not rewarded but discouraged, and group effort is the custom. Many of the parents have only a short-term concept of school attendance and success and, therefore, do not encourage the student. They have become accustomed to failure as an academic way of life and lack motivation. Their experiences in life have not cultivated in them a high education and asperation level. The fact that many teachers grade on attitude and effort as much as on achievement may have had some effect on the high grade point average.

The results of this study showed that: (1) The Chicago Non-verbal Examination seemed to be more motivating and interesting for Navajo students, (2) the Navajo students in this study scored higher than the standardization sample on the Chicago Non-verbal Examination. This was interesting because on most tests the Navajo score below the mean of the standardization sample. In light of these findings it is recommended that an item analysis study be made on the Chicago Non-verbal Examination and other tests of this type to find valid items for construction of a more suitable and up to date test for use with Navajo students.

LITERATURE CITED

Alzobail, Abdul Jahil. 1964. The Cattell Culture Free Test as Tried on Iraqi students. Journal of Educational Research. May-June. 57:476-479.

Anastasi, Anne. 1958. Differential Psychology. Third Edition. The Macmillan Company, New York. p. 542-574.

Anastasi. Anne. 1954. Psychological Testing. The Macmillan Company, New York. p. 239-276.

Anastasi. Anne, and Fernando A. Cordova 1953. Some effects of bilingualism upon the intelligence test performance of Puerto Rican children in New York City. Journal of Educational Psychology. 44:1-19

Arsenian, S. 1937. Bilingualism and mental development. Teachers College Contributor, Education No. 712.

Arthur, Grace. 1941. An experience in testing Indian children. Mental Hygiene. 32:81-100.

Brown, Andrew W. 1940. The development and standardization of the Chicago Non-verbal Examination. Journal of Applied Psychology. 24: part 1, p. 36-47, part 2. p. 122-129.

Brown, A., P. Seymour, and P. Rohrer. 1963. Manual for the Chicago Non-verbal Examination. The Psychological Corporation, New York. p. 1-40.

Burros, O. K. 1959. The fifth mental measurement yearbook. The Gryphon Press, Highland Park, New Jersey. p. 343.

Burros, O. K. 1965. The sixth mental measurement yearbook. The Gryphon Press, Highland, New Jersey. p. 453.

Cattell, Raymond B. 1963. Theory of fluid and crystalized intelligence: A critical experience. Journal of Educational Psychology. 54: 1-22

Cattell, R., and A. S. K. Cattel. 1958. Handbook for the individual or group culture free test of intelligence scale 2 forms A and B. Institute of Personality and Ability Testing, Champaign, Illinois. p. 2-36.

Cattell, R. B. 1957. (Pamphlet). An introduction to culture fair intelligence testing. Institute of Personality and Ability Testing, Champaign, Illinois

Cattell, R. B., S. N. Feingold, and S. V. Sarason. 1941. A culture free intelligence test II, evaluation of cultural influences on test performance, Journal of Educational Psychology. 32:81-100.

Cattell, R. B. 1940. A culture free intelligence test. Journal of Educational Psychology. 31:161-179.

Christian, Jane M. 1964. The Navajo a people in transition. Part I. Southwestern Studies. Monographs published by Texas Western College, El Paso, Texas. p. 9-12.

Coombs, L. Madison. 1962. Doorway toward the light, United States Department of the Interior, Bureau of Indian Affairs. Branch of Education. p. 3-30.

Cooper, J. G. 1962. Culture-free intelligence test in a college of the western Pacific. The Personnel and Guidance Journal. 41:123-125.

Cooper, J. G. 1958. Predicting school achievement for bilingual pupils. Journal of Education Psychology. 49:31-36.

Cronbach, L. J. 1960. Essentials of psychological testing. Harper and Row Publishers, New York. p. 216-217.

Darcy, Natalie T. 1946. The effect of bilingualism upon the measurement of the intelligence of children of preschool age. Journal of Educational Psychology. 37:21-44.

Davey, C. M. 1926. A comparison of group verbal and pictorial tests of intelligence. British Journal of Psychology. 17:25-37.

DuBois, P. K. 1938. A test standardized on Pueblo Indian Children. Psychological Bulletin. 22:271-274.

Eells, L., A. Davis, P. Havighurst, V. Herrich, and R. Tyler. 1951. Intelligence and cultural differences. University of Chicago Press, Chicago, Illinois. p. 12-56.

Fortes, M. 1931. A new appreciation of the theory of nogenesis to the problem of mental testing. Ph. D. Thesis, University of London. (Not seen--quoted by R. B. Cattell. 1940). Journal of Educational Psychology. 31:161-179.

Garth, T. R., and O. D. Smith. 1937. The performance of full-blood Indians on language and non-language intelligence tests. Journal of Abnormal Social Psychology. 32:376-381.

Garth, T. R. 1925. The intelligence of full-blood Indians. Journal of Applied Psychology. 9:382-389.

Haught, B. T. 1934. Mental growth of the southwest Indian. Journal of Applied Psychology. 18:137-142.

Havighurst, R. J., and Rhea R. Hilkevitch. 1944. The intelligence of Indian children as measured by a performance scale. Journal of Abnormal Social Psychology. 39:419-433.

Havighurst, R. J. 1949. Culture and I. Q. Purdue University Studies on Higher Education. 69:42-53.

Howell, Robert J., Lavin Evans, and Lester N. Downing. 1958. A comparison of two test scores for the 16-17 year age group of Navajo Indians with standardized norms for the Wechsler Adult Intelligence Scale. Journal of Social Psychology. 47:355-359.

Hunter, W. S., and E. Sommermeir. 1922. The relation of degree of Indian blood to score on the Otis Intelligence Test. Journal of Comparative Psychology. 2:257-277.

Jamieson, E., and P. Sandiford. 1928. The mental capacity of Southern Ontario Indians. Journal of Educational Psychology. 19:536-551.

Jordheim, G. D., and Inger A. Olsen. 1963. The use of non-verbal test of intelligence in the trust territory of the Pacific. American Anthropology. 65:122-125.

Leighton, D., and G. Kluckhohn. 1948. Children of the people. Harvard University Press, Cambridge, Massachusetts. p. 12-93.

Line, W. 1931. The growth of visual perception in children. British Journal of Psychology. Monograph Supplement No. 15. 1931.

MacArthur, R. S., and W. B. Elley. 1963. The reduction of socio-economic bias in intelligence testing. British Journal of Educational Psychology 33:107-119.

Marquart, D. I., and L. L. Bailey. 1955. Evaluation of the culture free test of intelligence. Journal of Genetic Psychology. 86:353-358.

McCombie, L., E. Z. Vogt, and C. Kluckhohn. 1951. Navajo means people. Harvard University Press, Cambridge, Massachusetts. p. 1-159.

Newland, T. Ernest, and William C. Lawrence. 1951. Chicago non-verbal examination on an east Tennessee Negro population. Journal of Clinical Psychology. 9:44-46.

Nunnally, J. S. 1964. Educational measurements and evaluation. McGraw-Hill Book Company, New York. p. 421.

Paxton, G. S. 1965. Study of the intelligence of Indian adolexcents using the Chicago non-verbal examination. Indian Education. Supplement Issue. 414-s. p. 1-16.

Pierce-Jones, John, and Fred T. A. Tyler. 1950. A comparison of the A. C. E. Psychological examination and the culture free test. Canadian Journal of Psychology. 4:109-114.

Porteus, S. D. 1931. The psychology of a primitive people. Longman, Green and Company, New York. p. 318.

Posinsky, S. H. 1963. Navajo infancy and childhood. Psychiatric Quarterly. 37(2):306-321.

Rao, Shardadba. 1965. A useful intelligence test for senior high school and college students in India. Indian Journal of Psychology. 40(1):19-26.

Rodd, William G. 1959. A cross cultural study of Taiwan's schools. Journal of Social Psychology. 50:3-36.

Rowe, A. 1914. Summerized by T. R. Garth. 1931. Race psychology: A study of racial mental differences. McGraw-Hill Book Company, New York. Chapters 4-5.

Stephenson, W. 1931. Tetrad differences for non-verbal sub tests. Journal of Educational Psychology. 22:167-185.

VITA

Stanford S. Larson

Candidate for the Degree of

Master of Science

Thesis: A Comparison of Two Non-verbal Intelligence Tests as Predictors of Academic Success of Navajo Students

Major Field: Guidance and Counseling

Biographical Information:

Personal Data: Born at Preston, Idaho, September 7, 1918, son of James Alma and Martha Swainson Larson; married June Call, June 9, 1944; five children--James, Suzanne, Dean, Brent, and Gerald.

Education: Attended elementary school in Preston, Idaho, graduated from Preston High School 1937; received Bachelor of Science degree from Utah State University, with a major in Industrial and Technical Education and a minor in Psychology, in 1962; completed requirements for Master of Science degree, specializing in Guidance and Counseling, at Utah State University in 1967.

Professional Experience: 1962 to present teacher of Industrial Arts Machine Shop and Foundry and Vocational Machine Shop at Intermountain School, Brigham City, Utah; worked in industry and as a self employed farmer 1942-1960.