12-15-1974

The Feasibility of Test Translation -- English to Navajo

Annabelle R. Scoon

FEASIBILITY OF TEST TRANSLATION--ENGLISH TO NAVAJO

SCOON

THE UNIVERSITY OF NEW MEXICO
ALBUQUERQUE, NEW MEXICO 87106

Policy on Use of Theses and Dissertations

Unpublished theses and dissertations accepted for master's and doctor's degrees and deposited in the University of New Mexico Library are open to the public for inspection and reference work. *They are to be used only with due regard to the rights of the authors.* The work of other authors should always be given full credit. Avoid quoting in amounts, over and beyond scholarly needs, such as might impair or destroy the property rights and financial benefits of another author.

To afford reasonable safeguards to authors, and consistent with the above principles, anyone quoting from theses and dissertations must observe the following conditions:

1. Direct quotations during the first two years after completion may be made only with the written permission of the author.

2. After a lapse of two years, theses and dissertations may be quoted without specific prior permission in works of original scholarship provided appropriate credit is given in the case of each quotation.

3. Quotations that are complete units in themselves (e.g., complete chapters or sections) in whatever form they may be reproduced and quotations of whatever length presented as primary material for their own sake (as in anthologies or books of readings) ALWAYS require consent of the authors.

4. The quoting author is responsible for determining "fair use" of material he uses.

This thesis/dissertation by Annabelle R. Scoon has been used by the following persons whose signatures attest their acceptance of the above conditions. (A library which borrows this thesis/dissertation for use by its patrons is expected to secure the signature of each user.)

NAME AND ADDRESS	DATE

8/1/72—500

This dissertation, directed and approved by the candidate's committee, has been accepted by the Graduate Committee of The University of New Mexico in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

THE FEASIBILITY OF TEST TRANSLATION--

Title

ENGLISH TO NAVAJO

Annabelle R. Scoon

Candidate

Educational Foundations

Department

T Bernard Spalding

Dean

December 15, 1974

Date

Committee

John W. Oller Jr

Chairman

T Bernard Spalding

Daniel B. Berch

This dissertation, directed and approved by the candidate's committee, has been accepted by the Graduate Committee of The University of New Mexico in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

THE FEASIBILITY OF TEST TRANSLATION--

Title

ENGLISH TO NAVAJO

Annabelle R. Scoon

Candidate

Educational Foundations

Department

T Bernard Spalding

Dean

December 15, 1974

Date

Committee

John W. Oller Jr.

Chairman

T Bernard Spalding

Daniel B. Berch

PERMISSION TO COPY OR REPRODUCE COPYRIGHT MATERIAL

THE PSYCHOLOGICAL CORPORATION, 757 Third Avenue, New York, New York 10017,

hereby authorizes

Name: Mrs. Annabelle R. Scoon
Address: 2 Link N.W.
Albuquerque, New Mexico 87120

(Licensee) to copy or reproduce the material identified below as *The Work*, subject to all of the terms, conditions and limitations of this license:

1. *The Work(s)*: The Work(s) means:

   Boehm Test of Basic Concepts, Form A

2. *Authorized Use*: The license granted hereby is specifically limited to the uses set forth below, or specified in Licensee's letter(s) dated 9/23/74 and 11/8/74, and no others.

   To reproduce the Directions, the Navajo translation of the Directions, and the Class Record Form of the Work, as submitted with Licensee's letter of November 8, 1974, in Licensee's doctoral dissertation. This includes permission to submit these portions of the dissertation to University Microfilms for reproduction.

3. *Prohibited Uses*: The license granted herein specifically excludes the right to print, reprint, publish, copy, sell, give away or otherwise distribute the Work, to translate, arrange, adapt, or revise the Work, or to exhibit, perform, represent, record, produce or reproduce the Work, either separately or as part of a larger publication, except as specifically permitted by Section 2.

4. *Reservation of Rights*: All rights in the Work not herein granted to Licensee are expressly reserved by The Psychological Corporation.

   If the use authorized by Section 2 consists of the reproduction or other inclusion of the Work in a book or similar publication, the License granted hereby relates solely to the edition of the publication specified in Section 2, or, if none is so specified, to the edition to be published next after the date of the license. While renewal for subsequent editions may be anticipated, specific permission for extension of this license must be secured.

5. *Non-Transferability*: This license is non-transferable. Any attempt to transfer the license will automatically revoke it.

(over)

C-TD 8/74 500H General

6. *Copyright Notice Required*: Any copy, reproduction, or other use authorized hereby shall be accompanied by the following legend:

Minor rearrangements of the above format may be made in publications for purposes of editorial uniformity, but all the components must be included.

This notice shall appear on the title page (or reverse side of the title page), of each copy of the Work, or, if the Work is reproduced as part of a larger publication, at the foot of the first page on which the Work is reproduced.

If this license covers more than one Work, to be reproduced in one publication, the above model of notice of permission shall be used separately for each separate Work being reproduced, unless a combined form of notice is specifically approved by rider to this license.

7. *Fees*: **None.**

8. *Deposit of Copies*: **None.**

9. *Required Countersignatures*: This license will not be effective until it has been signed by the Licensee and countersigned by an authorized representative of The Psychological Corporation.

ACCEPTED AND AGREED:

Donald R Scott
Licensee

Date 12/8/74

THE PSYCHOLOGICAL CORPORATION

BY [illegible]
Authorized Officer

Date DEC 11 1974

This Agreement will be countersigned and made effective only if it is signed and returned to The Psychological Corporation by **December 31, 1974.**

THE FEASIBILITY OF TEST TRANSLATION--

ENGLISH TO NAVAJO

BY
ANNABELLE R. SCOON
B.A., University of Oklahoma, 1941
M.A., The American University, 1963

DISSERTATION

Submitted in Partial Fulfillment of the
Requirements for the Degree of
Doctor of Philosophy in Education
in the Graduate School of
The University of New Mexico
Albuquerque, New Mexico
December, 1974

ACKNOWLEDGMENTS

Many people have helped me plan and carry out this translation study. First, Dr. Bernard Spolsky, who encouraged me to begin it. Next, Marlene Benally and Irene Silentman who translated the test into Navajo, and Agnes Holm and Dr. Robert Young who checked and double-checked the translation. Dr. Wayne Holm, Principal of Rock Point Boarding School, allowed me the privilege of testing the test in his classrooms. Dr. Elizabeth Willink, Education Specialist at Rock Point, not only assisted in the logistics of testing, but gave me a home while I was there. The teachers--Erie Stuart, Kathy Eghoan, Naomi Iseri, Lola Tingley, Mary Seigara, and Susan Tussin--helped in many ways. Ben Hale and Dr. Young spent hours with me in puzzling over the test results, giving me the benefit of Navajo native-speaker intuition and years of linguistic experience.

In Albuquerque, I am indebted to Dr. Steven Hess, Principal of Griegos Elementary School, and the very kind teachers who let me test their classes with the English version of the test. They were Mrs. Gonzales, Mrs. Long, Mrs. Lawrence, Mrs. Martinez, Mrs. Clawson, and Mrs. Dahmen.

Members of my committee have been very helpful and patient. I wish especially to thank Dr. John Oller, my chairman, for guiding me in bringing my ideas into focus.

Though they will probably never see this paper, I also thank the children who happily played the testing game and gave me the opportunity to look into their world for a brief time.

Finally, thanks to Marion, Pete, Jenny, Johnny, and Henry, whose faith and encouragement made it all possible.

THE FEASIBILITY OF TEST TRANSLATION--

ENGLISH TO NAVAJO

BY
Annabelle R. Scoon

ABSTRACT OF DISSERTATION

Submitted in Partial Fulfillment of the
Requirements for the Degree of
Doctor of Philosophy in Education
in the Graduate School of
The University of New Mexico
Albuquerque, New Mexico
December, 1974

THE FEASIBILITY OF TEST TRANSLATION--

ENGLISH TO NAVAJO

Annabelle R. Scoon, Ph.D.
Department of Educational Foundations
The University of New Mexico, 1974

The school beginner is expected to be able to follow the language of directions and explanations. Navajo children who enter school essentially monolingual in Navajo and shortly have to accomplish school learning tasks in English may face a double handicap if they have not yet labelled in Navajo the concepts needed in beginning English school work.

Measurement of school related concepts in Navajo was attempted by means of a translation of the Boehm Test of Basic Concepts, a test developed from analysis of early school language requirements. It was assumed that the semantic content of such basic concepts is universal, and that vocabulary and syntax in which to express them would be available in Navajo.

This study was made to determine whether the test could be translated into Navajo in a form suitable for assessing the language development of kindergarten, first and second grade Navajo students. The norms from the English test provided a means of comparison of difficulty and discrimination of the test.

Results of administration of the Navajo translated version of the Boehm Test of Basic Concepts strongly suggested that the translated test, though providing a measure of Navajo language development, did

not in all cases measure the same concepts measured by the English test. The most important problems were differences of syntactic complexity, incommensurable semantic range, and unsuitability of the test pictures to illustrate slightly different nuances of concept meaning. Some items were discovered that received similar responses and yet tested somewhat different concepts in Navajo and in English.

It was concluded that the differences between the way Navajo and English organize language forms to express concepts make the maintenance of a similar level of difficulty between sentences with the same basic meaning extremely difficult. Since it has been shown that young children may not master the more complex aspects of their native-language syntax in the early school years, it seems likely that a test translated into Navajo could not be kept to an appropriate level of difficulty.

The translated test reached an acceptable degree of reliability and showed a reasonable distribution of scores and a steady increase of mean score through the three grade levels tested. This indicated that the test has potential value as a Navajo language test, and could be used in this way after removal of ambiguous and awkward items and pictures.

The most challenging unexplained finding of this study is that Navajo students, starting in kindergarten with test scores only ten percent below English scores, improved much more slowly in Navajo than English-speaking students improved in English. It is possible that English language instruction, which is begun during the first grade

and emphasized in the second grade for Navajo students, is slowing their growth in their native language. If this is the case, it may be the price to be paid for becoming bilingual.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

THE FEASIBILITY OF TEST TRANSLATION--ENGLISH TO NAVAJO

Annabelle R. Scoon

The University of New Mexico

Preface

The words American Indian mean different things to different people. To the average citizen he is probably just the antagonist on nostalgic TV westerns, reliving the brief years in which the West was "won." To scholars he has been a subject for useful anthropological studies, providing informants who remember social and political structures no longer used, and speak languages nearly extinct. For storekeepers at trading posts on or near reservations, or civil servants in the Bureau of Indian Affairs he has been a source of income and employment. Short periods of public interest resulting from an outburst by militants or a well-publicized congressional investigation are followed by long periods of apathy and inattention while the public mind is diverted to more newsworthy matters.

Seeing the American Indian's problems in perspective is particularly difficult because there are in fact many Indian groups, with needs as different as those of any other social and economic groups in our society. Attempts to solve "Indian" problems have often ended by creating more problems for some. Diversity has often not been taken into account (Fey & McNickle, 1970).

The present study grew out of a six-year association with Indians as a teacher and educational planner, a capacity that not only brought many educational questions into focus but created an appreciation of the nature and magnitude of the total problem. Deplorable as the record of our nation's past relations with indigenous peoples has been, the problems that exist today must be solved in terms of present needs. Though most other Americans probably wish, as I do, that the past had been different for American Indians, no one of us can know what he would have done had his circumstances been the same as were those of our ancestors, Indian or non-Indian.

CHAPTER I

Background

The education of American Indian children has been a concern of the United States government since the very early years of the nation's history. The first legal provision for training Indians was made in 1794. The U.S. signed a treaty with the Oneida, Tuscarora, and Stockbridge tribes making a promise to provide them a teacher "in the arts of the miller and sawer." The first direct authorization of funds followed in 1802. Up to $15,000 annually was then made available to "provide civilization among the aborigines" (Indian education: a national tragedy--a national challenge, 1969, p. 11).

The matter was turned over to religious groups in 1819, with a budget of $10,000 per year. The act that established this educational policy was called the Civilization Fund, its stated purpose to convert Indians from hunters to agriculturists (Brightman, 1974).

A Bureau of Indian Affairs was set up in the War Department in 1824, since the army, in protecting frontier settlements, was the main branch of the government to have dealings with the Indians. The position of Commissioner of Indian Affairs was created in 1832, but the Bureau remained in the War Department until 1849 when it was transferred to the newly-created Department of the Interior (Brophy & Aberle, 1966).

The Civilization Fund was appropriated annually until the end of the treaty period in 1873. The government's intention for Indian

education remained to make Indians into farmers. As Commissioner Lea stated in 1850, they must "resort to agricultural labor or starve" (Indian education, 1969, p. 11). However, in the nineteenth century formal academic education was not a universal requirement even for the majority culture members. The discrepancy between the education provided for Indians and other Americans was not brought to official public attention until 1928. In that year a report of a study directed by Lewis Meriam of the University of Chicago was published by the Brookings Institution (then called the Institute for Government Affairs). It described in detail the many ways in which the Indian child was not being educated as much or as well as the "average" American child of the period.

In 1926, of 84,553 Indian children of school age, 82.7% were attending some kind of school, compared to 90% of the children of the rest of the population. But of 16,257 children studied individually, only 1,307 were at or above the usual grade for their age, and 4,192 were at the grade appropriate for the number of years they had been in school. The rest, 71%, had been held back one or more years.

The Meriam report further pointed out that many Indian children were being educated in a language they did not know well, and in circumstances that violated their cultural habits. It recommended more Indian teachers who could communicate with the children in their own language, more sympathetic dormitory personnel, and more suitable curricula (Meriam, 1928).

As a response to the Meriam report, President Franklin D. Roosevelt's Commissioner of Indian Affairs, John Collier, made a

number of important changes in the direction of the Bureau of Indian Affairs between 1933 and 1945. These included the institution of some bilingual and bicultural programs, and the writing of some bilingual materials for Navajo children.[1] Public and governmental concern for Indian education that might have been aroused by the Meriam report was overwhelmed however by the major disruptions of the economy that occurred shortly after its publication. The depression and the war that followed turned the minds of the public and lawmakers to other matters, and neither sufficient interest nor money was invested in Collier's ideas for them to succeed (Indian education, 1969).

Of special interest then and now is the fact that a disproportionate number of Navajo children were still not receiving any formal education as late as 1948. It was estimated that in that year only 25% of Navajo children were in school (Coombs, 1962; Aurbach, Fuchs, & Macgregor, 1970). These are the parents of the present generation.

A fully academic focus for Navajo schools did not develop until the period after 1960 (Declaration of Indian Purpose, 1961). By this time, 90% of Navajo children were in school. The number has remained at or above that figure until the present (Statistics concerning Indian education 1968, 1969, 1970, 1971, 1972, 1973). Yet in 1960 James Coleman's report, Equality of educational opportunity (1966) found the average test scores of Indian children low in comparison to majority-culture children. The relevant comparison (p. 20) was:

Grade Level	Median Test Score: Indian	Median Test Score: Majority
First grade		
Nonverbal	53.0	54.1
Verbal	47.8	53.2
Twelfth grade		
Average of five tests, including nonverbal	45.1	52.0

The percentage of Indian students who drop out of school before grade 12 was and remains consistently higher than that of the general population. Thompson reported it in 1959 at 60%, as compared to 32% for the majority. In 1968 the Indian high school dropout figures for Arizona and New Mexico, which include the majority of Navajo students, were 34.7% and 33.9% respectively (Bass, 1969).

In addition, a high percent of students were still well above the expected age for their grade. In 1967-68, in federal schools which were attended by about a third of all Indian children, 29% were two or more years older than the expected age for their grade at grade 1, and 55.1% at grade 12 (Aurbach, *et al.*, 1970).[2]

When the U.S. Senate Subcommittee on Indian Education published its findings in 1969 (*Indian education: a national tragedy--a national challenge*), the recommendations for educational reform were almost identical to those of the Meriam report forty years earlier. It is too early to say whether this report will in the long run meet the same fate as the 1928 Meriam report, the Fund for the Republic report in 1961, the Josephy study in 1968, and the Carnegie Corporation report in 1969.[3] An Indian Education Act was passed in 1972, but

at present the recommendation for greatly increased funding for Indian education has not been supported by appropriations, and the attention of the nation has again been diverted to matters that are of more immediate concern to a larger number of people. In any case, lack of funds seems unlikely to be a major cause of the problem, since federal funds for Bureau of Indian Affairs day schools have been on the average more than twice as much as the money available for public day schools. Federal supplementary support has also been a third more than that given to public schools. In fiscal year 1971, Smith shows that the average funds available per pupil in BIA schools was $2,183 of regular funds plus $230 of categorical funds (Titles I, III, VII of the Elementary and Secondary Schools Act of 1965). The national average at the time was $743 per pupil.

Problems of Indian Children

The question that must be asked in the face of symptoms of educational difficulty among Indian children is whether the fault lies in the child, in the system of education provided for him, or in the interaction between the two.

Cultural disruption. Much evidence has been produced by historians, anthropologists, and sociologists to prove that Indians have been subjected to both subtle and gross forms of deculturation. This has included the destruction of their traditional economic base, political framework, social organization and often religion and language.[4] From the late nineteenth century, Indian survival has

been dependent on learning some new ways of living. Hunters had to become farmers, farmers had to face new climates and soils, and many had to find ways to gain their livelihood in white man's jobs. Dealings with the federal government and the money economy required a new kind of education, and this was available only through majority culture methods and language.

Economic disadvantage. A second factor that could have significant bearing on Indian educational achievement is that the Indian still occupies the lowest rung on the nation's economic ladder, with an average family income reported at between $1,500 and $2,000 per year, and an unemployment rate ten times the national average. Indian health problems are numerous, and life expectancy is a third less than the national average. Alcoholism is still a major problem, disrupting families and communities (Fey & McNickle, 1970; One Feather, 1974).

The correlation between poverty and poor school achievement is well established (Coleman, 1968; Fantini & Weinstein, 1970). It has often been pointed out that the curriculum of schools for middle class children is inappropriate for many students of different background (Coombs, 1962). Furthermore, bilingual children's limited English language ability may prevent them from following any course of study in English. This can be an especially difficult problem for those who, like most Navajos, live in communities in which little English is used. If the student does not see any particular use for

a knowledge of English, beyond that of satisfying the teacher, the motivation to learn to speak it and read it will not be very strong (Thompson, 1953; Tax & Thomas, 1969).

Public schools especially have failed to concern themselves seriously with this problem, since Indians are almost always a minority in the classroom and relatively few teachers are trained to teach English to speakers of Indian languages (Indian education, 1969).

Measurement problems. Solving any educational problem is likely to begin with assessment of the nature and magnitude of the problem. Language is a recognized problem for Indians, yet instruments for testing Indian children's basic language skills are few, except for teacher-made tests for specific small groups in bilingual programs.[5] The construction of the tests has not been reported in detail, and no comparative norm group is available by which to judge them. Indian languages have not been used as the vehicle for formal instruction in the past, so base-line information from standardized tests is not yet in existence.

Tests used in earlier years to assess development or achievement of Indian children have been given in English, or nonverbally. While Indian IQ has proved equal to that of the general population as measured by nonverbal instruments, English verbal IQ has been below the mean.

Havighurst (1970) summarized these findings. The earliest report, by Garth and Smith, 1908, showed a verbal/nonverbal difference of from 10 to 14 points. In 1928, Jamison and Sandiford reported a

5 point difference in favor of nonverbal tests. A study made in 1942, using the nonverbal Grace Arthur Performance Test of Intelligence showed Indian pupils from six tribes with an average IQ score of 100.2. The same group of children was tested a year later using the Kuhlman Anderson Verbal test, and made a mean score of only 82.5, more than a standard deviation below average.

The finding of average IQ when nonverbal measures were used was reaffirmed in 1970 in a study by Kay Levensky in which 1,700 Indian children were tested by the nonverbal Goodenough Draw-a-Man test, and scored an average of 101.5.

A recent study of 75 Sioux children, using the standard set of concept tests developed by Jean Piaget, found Sioux performance almost identical to that of Swiss children of the same age. The few differences were interpreted to be the result of cultural content of the tests, and not related to the children's knowledge of the fundamental concepts being tested.

Nonverbal culture-fair or culture-free tests are intended to measure intelligence without allowing the effects of differential exposure to learning to influence scores. Language is left out as much as possible, since language is learned. The assumption is made that intelligence is an innate quality of the individual, which can somehow be measured. In fact, as Wesman (1970) points out, the intelligence that can be measured by tests cannot be separated from learning experiences.

Culture-fair measures ask the student to do such tasks as to choose a figure that matches a model, or to pick out the two

figures that are the same in an array, or to mark the next one in a series. In addition to the fact that most of the tests require some instructions to be given in words, learned concepts such as "same," "bigger," "member of a set" are involved. Although a minimum of language may be used in the test, past learning is sure to be measured, and innate intelligence only at second hand, as it has facilitated the learning.

Culture fairness, however desirable, is not the point. Learning that has occurred in nonverbal, nonnumerical domains is not highly correlated with the kinds of learning that are required in school (Wesman, 1970). Even if it can be shown that a child "knows" the concepts measured in nonverbal tests, he cannot use his knowledge until he can communicate about it in some language to other speakers of that language. The fact that Indian children score as well as other children on nonverbal measures indicates that they are not mentally inferior, but tells us little about their ability to handle language-mediated learning.

Summary. Three possible sources of Indian children's school problems have been noted. They are: (1) cultural disruption, (2) economic disadvantage, and (3) learning in a second language. Of these, the first is a fact over which individuals have little control. Culture is a growing, changing thing and however bad the past has been, there is no way to erase it.

The economic situation is a factor of primary concern to Indians, and certainly to Navajos, but it cannot be improved directly

by services to children. Tribal leaders expect that in the long run more and better education will lead to improved economic status. This is a major reason for strong Navajo interest in formal education despite its recognized role in acculturation (Birchard, 1970).

The language problem is the one with which this study is concerned. The old idea that every child in the United States would attend public school taught in English and thereby melt into the "melting pot" of the majority culture has proved false in the case of the Navajos. If the general goals of education are to be reached, and every Navajo child given the opportunity to develop his mind to its limits of capability, then new methods and materials must be devised. As yet, the best design for this purpose has not clearly emerged from research and practice. But it is clear that it must involve building upon the Navajo child's strengths, and these cannot be measured in a second language that is not yet mastered. At the same time, language is central to the educational process, which is at base a matter of communication. Language skill must be developed, and if this development is to be assisted in the most efficient manner, it must be measured.

Language: a Special Navajo Problem

Schools are taught in English, and most Navajo children come to school speaking little English--that is the problem simply stated.

Language of the home. A study made by Bass in 1971 indicated that 67% of all Indian students in federal and public schools came

from homes in which native languages were the principal means of communication. For Navajos the figure is even higher. Spolsky (1971) found that in 1970, 68% of all Navajo children entered school without sufficient knowledge of English to function in a classroom where only English was used.

Studies of achievement of Indian students in the 1950's revealed an almost perfect correlation between good school grades and the use of English in the home (Coombs, 1969). Bass's 1971 study reaffirmed the correlation.

The Navajo language situation was foretold in 1946, when it was discovered that 18,000 Navajo children were not in school. Most of them lived far from population centers and had little or no contact with English speakers in their daily life. Partly as a result of concerns expressed by returning Navajo veterans of World War II, a major effort was made between 1948 and 1956 to provide basic education to the many Navajos who were past the usual school age, as well as to younger children. This project, called the Special Navajo Program, is described in detail by Coombs (1962). Nonetheless, by the end of the project in 1959, it had graduated only 3,362 students. This left at least 14,500 Navajos of that generation with little or no formal education.

School readiness. Children beginning their school careers experience a shift from imitation and action as major learning modes to the more abstract learning through explanation and verbally directed activity (Bruner, 1964; White, 1965). Thus the child's level of

language accomplishment is important as a readiness factor. English language preschool activities and materials show recognition of this fact, but they naturally utilize the basic concept words of English.

A number of tests of school readiness have been developed in English. One that is very widely used is the Metropolitan Readiness Test (Harcourt, Brace Jovanovich). Another is the Peabody Picture Vocabulary Test (American Guidance Service) and a third is the Primary Mental Abilities Test (Science Research Associates). These are basic concept tests in a sense, but also language tests. Thus it seems unlikely that they would be helpful in measuring the readiness of Navajo-speaking children to move from preschool to school modes of learning. However, it might be possible to benefit from previous research by using tests already developed, overcoming the language problem by having them translated into the child's native Navajo.

Another method of assessing basic readiness for school learning would be to develop tests directly in Navajo. Tests written directly in Navajo would suffer no possible interference from the forms or meanings of English that might mar a translation. On the other hand, the Navajo child will soon be learning in English. Spolsky (1971) points out that in 1971-72 not more than 10% of Navajo six-year-olds would be reached by bilingual programs, and even though the number is increasing yearly, the great majority will still experience their entire schooling in English. If the forms and concepts of primary-level English do not happen to correspond to those of Navajo, potential problems of the child tested in a directly-written Navajo test might not be identified.

A translated test therefore could have some desirable features. It could identify areas in which the Navajo child is significantly different from the English-speaking child in the concepts to which he has attached language labels. It could give a base line from which teachers can begin to teach language concepts in English. And it could give the teacher some norm of comparison with other school beginners.

Assumptions of the translation project. All the possibilities suggested above depend, of course, on the basic assumption that a test can be translated. This study was planned, therefore, mainly as a test of the feasibility of using the translation process for developing testing instruments in the native language of a Navajo school beginner.

At the start of the project, it was assumed that, given a careful translation and administration, the results obtained from the translated test would be similar to that obtained from the original test. This was based upon a concept of language universals which will be discussed in Chapter II. Secondly, it was assumed that any discrepancies between the English and Navajo results of the test could be explained in terms of identifiable language differences.

If these assumptions are correct, it should be possible to replicate this study using any similar test. The choice of the Boehm Test of Basic Concepts will be explained in Chapter III. The concept of translation feasibility is not meant to be confined to the specific test used in the study.

Endnotes for Chapter I

[1]Several series of readers were prepared to assist Indian children in learning to read and write their native language as well as to read English. The Navajo series included C. S. King, Navajo new world readers; J. B. Enochs, Little man's family; H. Thompson, Navajo life series, Preprimer, Primer, and Coyote tales; Son of Former Many Beads, The Ramah Navahos (English trans. R. Young and W. Morgan; Left-handed Mexican Clansman and others, The trouble at round rock (English trans. R. Young and W. Morgan); R. W. Young and W. Morgan, Navajo historical selections; and A. N. Clark, Little herder series, and Who wants to be a prairie dog?

These books are still in Bureau of Indian Affairs school libraries, and some of them can be obtained from time to time from the Haskell Indian Junior College, Lawrence, Kansas. In 1974, most of them were reported to be temporarily out of print. Navajo historical selection is being reprinted by the Navajo Reading Study at The University of New Mexico.

[2]Public schools have fewer over-age Indian students (4.7% at grade 1 and 10.2% at grade 12) but a higher dropout rate than federal schools, suggesting that they may operate with somewhat different standards (Bass, 1969). Brophy and Aberle (1966) pointed out that federal schools receive the students with the least acculturation, and thus the ones most likely to have language and cultural adjustment problems. Also, of course, the federal schools are segregated, protecting the Indian children from having much interaction with other language and culture groups in the society.

[3]The Fund for the Republic report was subsequently published as W. A. Brophy and S. D. Aberle, The Indian: America's unfinished business. Report of the Commission on Rights, Liberties, and Responsibilities of the American Indian. Norman: University of Oklahoma Press, 1966.

The Josephy study, which was later published, appears in the hearings of the special subcommittee on Indian education of the senate committee on labor and public welfare, vol. 6, appendix. It is entitled, "The American Indian and the Bureau of Indian Affairs--1969: a study, with recommendations."

The Carnegie Corporation report, "Who should control Indian education," also appears in the hearings of the special subcommittee on Indian education, appendix, part 2.

[4]Some recent books describing the Indian problem from different points of view are: D. Brown, Bury my heart at Wounded Knee. New York: Bantam Books, 1970; E. S. Cahn, Our brother's keeper: the Indian in white America. New York: World, 1969; V. Deloria Jr., Custer died for your sins: an Indian manifesto. New York: Avon Books, 1969; J. D. Forbes, The Indians in America's past. Englewood Cliffs, N. J.: Prentice Hall, 1964; A. M. Josephy Jr., The Indian heritage of America. New York: Bantan Books, 1969; and S. Steiner, The new Indians. New York: Dell, 1968.

[5]A local translation of the Stanford Achievement Test was used at Rock Point Boarding School in Arizona as a means of evaluating students in a Title VII project at the school in 1972.

References for Chapter I

Aurbach, H. A., Fuchs, E., & Macgregor, G. The status of American Indian education. An interim report of the National Study of American Indian Education to the Office of Education, U.S. Department of Health, Education and Welfare, University Park, Penn.: Pennsylvania State University, 1970.

Bass, W. P. American Indian high school dropouts in the southwest. Albuquerque, N.M.: Southwestern Cooperative Educational Laboratory, 1969.

Bass, W. P. An analysis of academic achievement of Indian school students in federal and public schools. Albuquerque, N.M.: Southwestern Cooperative Educational Laboratory, 1971.

Birchard, B. A. Boarding schools for American Indian youth. In R. J. Havighurst, Director, National study of American Indian education research reports, Vol. 2 No. 2. Minneapolis, Minn: Office of Community Programs, Center for Urban and Regional Affairs, University of Minnesota, 1970.

Brightman, L. An historical overview of Indian education with evaluations and recommendations. In V. Deloria, Jr. (Ed.), Indian education confronts the seventies. Vol. 1. History and background of Indian education. Tsaile, Ariz.: Navajo Community College, 1974.

Brophy, W. A. & Aberle, S. D. The Indian: America's unfinished business. Report of the Commission on Rights, Liberties, and Responsibilities of the American Indian. Norman: University of Oklahoma Press, 1966.

Bruner, J. S. The course of cognitive growth. American Psychologist, 1964, 19, 1-6.

Coleman, J. S. Equality of educational opportunity. U.S. Department of Health, Education and Welfare, Office of Education. Washington, D.C.: U.S. Government Printing Office, 1966.

Coombs, L. M. Doorway toward the light. U.S. Department of the Interior, Bureau of Indian Affairs, 1962.

Coombs, L. M. BIA sponsored educational research. In Styles of learning among American Indians: an outline for research. Report and recommendations of a conference held at Stanford University, August 8-10, 1968. Washington, D.C.: Center for Applied Linguistics, 1969.

Declaration of Indian purpose. Report of a conference at the University of Chicago, June, 1961. Mimeographed.

Fey, H. E. & McNickle, D. Indians and other Americans: two ways of life meet. New York: Harper & Row, 1970.

Havighurst, R. J. The mental development and school achievement of Indian children and youth. In Author, Director, National study of American Indian education research reports, Vol. I No. 3. Minneapolis, Minn.: Office of Community Programs, Center for Urban and Regional Affairs, University of Minnesota, 1970.

Indian education: a national tragedy--a national challenge. 1969 report of the committee on labor and public welfare of the United States Senate, made by its special subcommittee on Indian education, Nov. 3, 1969. Washington, D.C.: U.S. Government Printing Office, 1969.

Meriam, L. The problem of Indian administration. Baltimore: Johns Hopkins Press, 1928.

One Feather, G. American Indian community colleges. In V. Deloria Jr. (Ed.), Indian education confronts the seventies. Vol. 5, Future Concerns. Tsaile, Ariz.: Navajo Community College, 1974.

Smith, S. & Walker, M. Federal funding of Indian education: a bureaucratic enigma. Washington, D.C.: Bureau of Social Science Research Inc., 1973.

Spolsky, B. Navajo language maintenance II. Six-year-olds in 1970. Navajo Reading Study Progress Report No. 13, University of New Mexico, 1971.

Statistics concerning Indian education. Fiscal years 1968, 1969, 1970, 1971, 1972, 1973. U.S. Department of the Interior, Bureau of Indian Affairs, Division of Education. Lawrence, Kansas: Haskell Institute.

Tax, S. & Thomas, R. K. Education "for" American Indians: threat or promise? The Florida FL Reporter, 1969, 7, 15-19.

Thompson, H. Why learn a foreign language? In W. Beatty (Ed.), Education for cultural change. U.S. Department of the Interior, Bureau of Indian Affairs, 1953.

Weinstein, G. & Fantini, M. D. The disadvantaged child: challenge to education. New York: Harper & Row, 1968.

Wesman, A. G. Intelligent testing. American Psychologist, 1968, 23, 267-274.

White, S. H. Evidence for a hierarchical arrangement of learning processes. Advances in Child Development and Behavior, 1965, 2, 187-220.

CHAPTER II

Theories Relating to Concepts and Translation

This English-Navajo test translation project is based on these considerations:

1. Young Navajo children learn little English at home; 85% of those in federal schools enter school essentially monolingual (Spolsky, 1971).

2. A large percent of these children will be taught entirely in English, from textbooks designed for English-speaking children and teachers (Holm, 1972). Though Navajo materials are being written,[1] and this situation will change, large-scale Navajo-language instruction is probably well in the future.

3. Navajo and other linguistically different children are comparable to English-speaking children in their basic cognitive development at the beginning of their school years, but many soon fall behind (Furth, 1964; Havighurst, 1970; Voyat, 1970).

Since the learning problems are manifested at a relatively early stage in the school sequence, the subject matter chosen for testing is an aspect of the linguistic-conceptual development of the Navajo child from about 6 to 8 years old. Readiness for school learning has long been recognized as an important variable in children's performance. The choice of age 6 or thereabouts as the best school-starting age has been generally validated by the studies

of Jean Piaget and his colleagues, as well as by the developmental stages identified by Arnold Gesell (1946) and Erik Erikson (1968) in their different ways.

Concept readiness. The child at about 6 or 7 reaches a stage that Piaget calls "concrete operation," in which he becomes able to order objects into classes, conceptualizing things as the same in some way though they are not identical; place them in logical series; and keep the relations between them in mind even when manipulation must be done with symbols, rather than with objects (Bruner, 1960). This logic of relations and seriation requires a certain level of language development, since the relational concepts are not as simply delimited as concepts of objects, actions, or attributes.

Comparison, for example, always involves the relations between two or more referents, but the relations are not simple and unvarying. A book is "larger than" a pencil, but one book may be "larger than" another, and the larger can become the smaller in another set. One can be shorter than another but at the same time thicker, heavier, or wider. The number of instances of correct perception needed to establish these concepts is greater than the number needed to pin down the concept of "book," or "walk," or "pretty," in their common usages. There would be more chances for misconceptions, or more likely, incomplete conceptions.

Piaget's studies showed that children who had not reached the stage of concrete operations and ability to form what he calls "vectors," would almost invariably describe objects one dimension

at a time rather than comparatively. Training the child to use the language of comparison seldom influenced his understanding of the concept. Piaget concluded that language does not constitute the source of logic, but is on the contrary developed out of logic (Piaget & Inhelder, 1969).

If this is the case, a measure of native-language development should be of value to teachers, even those who are teaching the children in a non-native language. Language development would serve as a clue to the level of logic the child had reached, since without special training the language would not have outstripped the concepts.

Translatability. Three important questions must be considered in relation to the feasibility of translating a test into another language. One is whether a test can be translated in such a way that similar knowledge is being measured in the two languages. This question depends on another: is it ever possible to express even almost the same meaning in two languages? Assuming that it is, a third question of a slightly different nature must be whether or not the test, if translated and administered, will yield information of value to educators in planning programs for students. The first question is empirical, the second philosophical, and the third pragmatic.

Although the first two questions could be studied by administering and analyzing the results of any type of translated test, the most efficient use of the students' time would certainly require that the answer to the third question be affirmative. The test used here will, I believe, meet that criterion. Before discussing the test itself,

however, the theoretical questions of translatability and the relation of language to cognitive development will be further investigated.

Theoretical Considerations

Three general theoretical areas are relevant to the questions mentioned above. These are the theory of language relativity, language universals, and language and thought. They find an illustrative meeting point in the situation of the Navajo child who develops his basic linguistic competence before encountering the English language, but must accomplish a shift into English before applying his cognitive ability to the tasks of the school.

If the child has difficulty, is it specifically related to the differences between his two languages? The theory of linguistic relativity that has come to be known as the Sapir-Whorf hypothesis maintains that the way in which a specific language encodes perceptions of the phenomenal world importantly determines the way in which a member of a culture experiences that world (Whorf, 1971).

There is another possiblity. Thought processes might be slowed or stunted because of language change. This could certainly result if thought depends on language, or if a certain level of language development is necessary before cognitive operations can be performed (Vigotsky, 1962).

The third theory, concerning linguistic universals, is based on the conception that the principles of organization of languages are universal reflections of properties of mind, though coded into

lexicon, syntax, and phonology in many and vastly different ways (Chomsky, 1972). Proponents of this theory of language and cognition maintain that at the deepest level of syntactic and semantic structure, all human languages are much alike (Katz & Postal, 1964; Fillmore, 1968; Greenberg, 1971; Katz & Nagel, 1974). In this view, a language change would involve the learning of new encoding forms for already existing meaning patterns, but the patterns themselves would not have to be changed at the most basic level.

Language relativity. Relativists hold that differences in the way various languages have come to encode meanings strongly influence or even determine the way in which new members of the social group learn to experience their world and their being. This theory exerted a major influence in the first half of the twentieth century, leading structural linguists such as Leonard Bloomfield, Charles Fries, and James Gleason to concentrate on the internal analysis of languages and phonological, morphological and syntactic systems with minimal attention to meaning, since by definition meaning would be essentially unknowable by a member of another culture (Werner, 1970).

The decision to proceed in this manner was influenced by earlier students of language, such as Wilhelm von Humboldt, who examined the question of language differences in the middle of the nineteenth century, and came finally to the conclusion that the differences between nonrelated languages so far outweighed their similarities that man could be said to "live in the world exclusively as language presents it" (Fishman, 1960, p. 324).

Edward Sapir, an early student of American Indian languages, who was familiar with von Humboldt's work, agreed that:

> the "real world" is to a large extent unconsciously built up on the language habits of the group. No two languages are ever sufficiently similar to be considered as representing the same social reality. The worlds in which different societies live are distinct worlds, not merely the same world with different labels attached (1961, p. 69).

Benjamin Lee Whorf was one of Sapir's students. Impressed by the extreme differences between Hopi and "Standard Average European," he maintained that structural differences between languages reflected essentially noncomparable ways of experiencing reality. A language change would require a changed world view. In his strongest statement of this view Whorf said:

> . . . thinking follows a network of tracks laid down in a given language . . . . The individual is utterly unaware of this organization and is constrained completely within its unbreakable bonds (1971, p. 256).

Arguments against relativity. Though the idea of the uniqueness of each language system was generally accepted by linguists in the first half of the twentieth century, it was questioned by psychologists. The claim that an extremely different way of organizing linguistic expressions was evidence of a totally different world view had not, they thought, been empirically demonstrated. The major evidence was the linguistic expression itself, certainly a circular argument (Fishman, 1960). While structural linguists were for the most part leaving the semantic content of language out of their analyses as being unstructured and therefore not an appropriate subject of study (Gleason, 1962), psychologists examined the relation between language and meaning.

Studies by Suci (1960) and Osgood (1960) showed a high degree of cross-cultural agreement in the semantic structures of Hopi, Zuni, Spanish, Navajo and an English native-speaker control group. These studies brought new depth to the discussion, as Osgood pointed out the difference between denotative and connotative cognition. General cognition across groups appeared to be connotative--the affective "feeling tone" of meaning which contributes to metaphor, simile, synesthesia, and idiom. Phenomena that depend on the structure and lexical categories of the language (noun, verb, etc.) are largely denotative. The many and arbitrary sets of correlations between perceptual events and linguistic events need not show similarity in two languages, yet the meaning can be the same. Implied is the conclusion that translation is possible.

Connotative systems, Osgood maintained, are similar because all members of the human race share many of their most basic experiences. Their linguistic signs will vary along the same basic dimensions. Also, there are many shared relations between organisms and their environment, either innate to the species or learned in similar conditions. These experiential contingencies, such as the relation between the color red and the sensation of heat, the color blue and the sensation of cold, the darkness of night and the sensation of fear are expressed in many languages, but are independent of the structure of any language.

Indeed Whorf himself, despite saying that "no individual is free to describe nature with absolute impartiality" (1971, p. 214),

claimed that his own expression was free from the biases of his language because he was familiar with many languages. He spoke of deeper processes of consciousness upon which language is a superficial embroidery, and claimed that there was a "canon of reference for all observers, irrespective of their languages or scientific jargon" (p. 163).

Whorf thus apparently believed that understanding of meaning is possible between languages, and that he himself was able to do it (Black, 1959).

Language universals. The interest of linguists and philosophers in language universals is much older than the theory of linguistic relativity. It began in the early seventeenth century, developing out of the observation that man alone of all the living creatures has language. Rejecting the occult notions of the medieval scholastics, René Descartes and his followers of the rationalist group attempted to discover or at least to postulate other properties of the human being to account for what was most striking to them: the creative aspect of language use.

The naming of this property as "mind" did not constitute a satisfactory explanation; and the same question is actively under consideration today, despite attempts by behavioral psychologists to dispose of it.

Philosophical grammar was one aspect of the study of the quality of humanness. The main focus of this study of grammar distinguished it from more recent descriptive grammars. The universal grammarians wanted to account for the facts of observed differences

in language usage on the basis of explanatory hypotheses concerning the nature of language and ultimately the nature of human thought. They were little interested in accumulation of data, possibly because most of the languages for which data were available at that time were well known.

Between the seventeenth century and the second half of the twentieth century, however, the major interest of the linguistic community turned away from universal formulations of general validity to those that related only to the observable facts of a specific language. Impetus for this change in focus came from the discovery of languages on the North American continent that were extremely different from the familiar European languages. Comparative studies of Indo-European languages in the nineteenth century had developed a methodology that was very successful in describing the structures of languages, while the techniques of philosophical grammar did not provide appropriate concepts for this effort.

Only in recent years have linguists turned their attention again to the universals of language. The Port-Royal Grammar, originally published in French in 1660, introduced a conception of deep structure and its relation to surface structure of language through transformations. This conception became in part the basis for the theories of transformational generative grammar with which Noam Chomsky's name is centrally associated (Chomsky, 1972).

Other foundations for the concept of linguistic universals were laid by nineteenth century philosophers. Organismic parallels

were drawn in which the human being and whole societies were said to grow and evolve according to innate "laws" of their nature. Kant in his Critique of Judgment (1952) used the term "generation" to refer to this growth according to inward laws. In his Critique of Pure Reason (1952) he said:

> . . . experience is itself a species of knowledge which involves understanding; and understanding has rules which I must presuppose as being in me prior to objects being given to me, and therefore a priori (p. 42).

In an early work, von Humboldt had also shared with Kant the belief that the categories in which the phenomenal world is understood could be found codified in all natural languages. Only later did he come to place increasing emphasis on structural differences, and adopt the approach that rejected the Kantian ideas as well as the older universal grammar.

Yet von Humboldt never abandoned entirely the belief that underlying any human language is a system that is universal; he rather concluded that the universality was not a proper part of the domain of linguistics. He said (quoted in Brown, 1967) that "each language is an echo of the general nature of humanity" and that "man could not understand either himself, or others, if these forms were not like archetypes of his spirit" (p. 104).

Very careful and detailed descriptions of languages in the early twentieth century made the structural differences between them overwhelmingly apparent. But as a response to Chomsky's inference of deeper levels of structure, and particularly as lexicon and meaning came again to linguistic attention, language similarities began

again to be noticed (Greenberg, 1971). Empirical universals proved to be easy to find. Anthropological linguists discovered many facts that were true of all languages, and others that were statistically very probable.

All human natural languages are composed of vocal sounds. All have vowels and consonants, all have determinable structure, all have units analyzable as morphemes, and all have some kind of syntactic topic-comment organization (Greenberg, 1968). Languages that have gender distinctions in the word for my and mine also have such distinctions in second and third person, but not vice versa (Toulmin, 1972).

The range of sounds used in human speech is relatively small in relation to the possibilities of the organism; and there is a measurable, statistically similar frequency of redundancy in all languages. This is apparently related to the human memory capacity.

Finally, there are classes of elements in all languages that can be described as phonological, grammatical, semantic, and symbolic (Greenberg, 1971).

Chomsky, however, looked for universals of a more transcendental sort, features to be demanded of any human language rather than to be discovered in every language. He said (1972):

> . . . certain universal principles must interrelate with specific rules to determine the form (and meaning) of new linguistic expressions (p. 133).

He implied that universal grammar was no more or less than a child's innate schematism for language learning. All children learn their

languages with great speed, on the basis of a limited and degenerate sample. The disparity between what a child experiences in his language learning years, and his ultimate knowledge of language is, in Chomsky's view, "the most striking fact about human language" (p. 159). He defined universal grammar as:

> a study of the conditions that must be met by the grammars of all human languages . . . . So defined, it is nothing other than the theory of language structure . . . linguistic intuition is . . . latent, unconscious knowledge of universal grammar (1972, pp 126-127).

The particular concern of the transformational grammarians was the syntax, as the concern of the descriptive linguists had been with the phonology and morphology of languages. In the area of syntax, many examples were developed to illustrate how varying forms of sentences as they are spoken could have developed from the same underlying meanings; and how similar or identical sentences could evolve from different underlying meanings. The underlying meanings, which transformationalists call deep structures, lack many of the features of morphology and word order that make up the surface expression, but instead they reflect the basic meaningful relations between the elements of the sentence.

This process of decomposing sentences into their basic meaningful relations proved to be widely applicable, and is considered by some linguists as evidence that deep structures of sentences in different languages could be identical. Emmon Bach (1968) suggested that there might be a universal set of base rules for relating form to meaning in order to achieve the universal pragmatic aim of language, communication. Bach concludes:

> Given the logically or physically possible sets of elements available at all levels--phonological, semantic, syntactic--the similarities among languages are far more striking than their differences (p. 113).

As continued transformational research in English has resulted in base rules that are more and more abstract and less like the surface grammar of the language, research on widely different languages has found unexpected similarities. For example, Lakoff (1966) suggested that the classes of adjectives and verbs in English are subclasses of one lexical category. Speakers of Navajo or Vietnamese would immediately recognize their verbs of state, or neuter verbs.

Charles Fillmore (1968) proposed that the grammatical notion "case" deserved a place in the universal grammar. He said:

> . . . the sentence in its basic structure consists of a verb and one or more noun phrases, each associated with the verb in a particular case relation . . . . The various permitted arrays of distinct cases occurring in simple sentences express a notion of "sentence type" that may be expected . . . to be universally valid (p. 21).
>
> The cases comprise . . . a set of universal, presumably innate, concepts which identify certain types of judgments human beings are capable of making about the events that are going on around them, judgments about such matters as who did it, who it was done to, and what got changed (p. 24).

Fillmore stressed the difference between surface and underlying structure, pointing out that the universal character of the base rules can be kept intact by assuming that prepositions, postpositions, and case affixes, whether semantically relevant or not, are all in fact realization of the same underlying syntactic element, case. He went on to suggest that his case grammar may be "semantically justified universal syntactic theory" (p. 33).

The further development of transformational grammar has turned toward the study of semantics, as it becomes apparent that what lies at the base of any linguistic act is the intention of the actor to communicate meaning. In the new generative semantics, Lakoff (1972) claimed that the linguistic elements used in grammar have an independent natural base in the human conceptual system. No syntactic deep structure level artificially separated from the semantic deep structure is necessary.

The interest of linguistic research at present, then, is very strongly directed toward the discovery of universals, which are presumed to exist. Fishman sums up the case (1970):

> a linguistic theory that can specify an adequate grammer (i.e. rules that native speakers implicitly grasp and that constitute their native-speaker competence) will also specify the language-acquiring and language using capabilities of man (p. 12).

Language and thought. The pragmatic question that was mentioned at the beginning of this chapter, whether a translated test will yield information of value to educational planners, depends in part on the importance of language in the development of cognitive skills.

The relation of language to cognitive development has long been of concern to psychologists and learning theorists. There are two basic positions held: one that conceptualization precedes language, after which language is used for encoding thought and building up structures of thought. The other is that the development of the symbolic capacities by means of language is a precondition to thought, and that there can be no real thought without language.

In its most extreme form proponents of the language-before-thought point of view, following Whorf, have held that thinking is a matter of a specific language (Longacre, 1956).

The thought-before-language position stems basically from the rationalist conviction that the thinking being must precede the expressed thought. Opposite to this idea, John Locke's theory was that the individual is born as a blank receptor on which the world impresses its meanings, language being one social tool used for this purpose (Brown, 1967). This dichotomy in the realm of psychology reflects, or is reflected in, the division of linguists between transformational-generative grammarians and descriptive linguists. Psychologists who tend toward the thought-precedes-language side of the argument might be characterized as cognitive theorists or humanists; those who support the language-precedes-thought position are essentially behaviorists.

Thought precedes language. This position, held by Piagetians, is well expressed in the following quotation from Piaget & Inhelder (1969):

> Language learning does not provide . . . a ready-made "lattice" or lens which organizes the child's perceptual world. Rather the lattice is constructed in the process of the development of intelligence--i.e., through the actions of the child on the environment and the interiorization of those actions to form operational structures (p. 163).

The structures of thought thus have their roots in actions, not words. Language, however, is necessary for the elaboration of reasoning into the universal and abstract plane. While children all over the world and across wide ranges of socioeconomic and cultural

differences attain the concrete operations level of development referred to above at about age 6 or 7, the further advance into what is called the "formal operations" stage in adolescence appears to be more variable, subject to factors such as symbolic proficiency (Piaget, 1967; Elkind, 1969). Symbolic proficiency means, in the main, skill in the use of language.

To summarize, childhood thinking stems from perception of and interaction with the environment, and the results of this interaction can be (but not necessarily must be) expressed in the available language. However, as the nature of thinking becomes more abstract, less concerned with concrete objects and actions and more with relations and predictions, thought becomes increasingly dependent on the availability of appropriate language. There is a cybernetic process at work, in which the thinker goes back and forth between his vague internal model of the world embodied in a neural network, and the more precise structures that are fashioned out of words, which in turn allow thinking to proceed far beyond the realm of perception and intuition (Arbib, 1970).

As Voyat (1972) pointed out, success in replicating Piaget's experiments in the development of logical thought with children of other languages and cultures gave credence to the developmental-stage theory. The basic process of cognition may indeed be a function of an active organizational mechanism deriving from actions a child brings to his experience, and language as an instrument of thought may be just a part of an overall intellectual activity. In this case it would be useless, as Piaget (1967) suggested, to teach words to a child before he has acquired the concepts that underlie them.

However, it is difficult to prove that the operations that define intelligence and change with age are logical structures of cognition that are neither dependent on nor derived from language. Since language was used in Piagetian experiments, a basic language capability was assumed. We do not know what the words used in the experiment meant to the child, nor whether he had conceptualized the experiment correctly. The language a child used was taken as an evidence of the mode of reasoning, and there was claimed to be a close connection between the stages of development and the structure of the terms used (Piaget & Inhelder, 1969).

It was strongly implied that the ability to use the correct language in describing a logical situation was the evidence that the concept involved was understood.

Language ability was given a narrow interpretation in these studies, since it apparently meant production ability only. Piaget said that the child at the preoperatory level, before he understands the concept (for example, "longer"), will understand the expression of this concept when it is "integrated into orders or assignments ('Give that man a longer pencil,' etc.)" (p. 90), but will not use it spontaneously. The child then really has the language of the concept, but not in productive form.

Experiments with the perceptually handicapped--deaf and blind--showed a greater slowing of intellectual development from visual lack than from auditory lack, and this was also taken as evidence that language is not essential for logic, at least in the early years.

These studies suffer from the inability of one person to get into the mind of another; no one can know what form of "language" the deaf child may have constructed for himself in response to his life experiences, and perhaps as a tool for learning concepts. However, if Osgood, Suci & Tannenbaum (1958) are correct in their contention that, for most common objects and situations in a child's environment, perceptual signs are established before linguistic signs, it would be likely that the blind child would be slower to learn than the deaf child.

Vigotsky (1962) maintained that the word first plays the role of means in forming concepts, and later becomes its symbol. Words for young children do not represent fully formed concepts, and they serve the needs of communication long before they reach the level of concept development characteristic of fully developed thought. He said:

> Concept formation is the result of a complex activity in which all the basic intellectual functions take part. The process cannot, however, be reduced to association, attention, imagery, inference, or determining tendencies. They are all indispensable but they are insufficient without the use of the sign, or word, as the means by which we direct our mental operations, control their course, and channel them toward the solution of the problem confronting us (p. 58).

Words, then, may not always represent concepts, but concepts must be represented by words if they are to be useful to the child in his further learning processes.

Language precedes thought. The position of the behaviorist school is that thought becomes possible only after learning language. John Watson, the father of behaviorism, tried to prove that thought

was only silent speech--but experimenters who measured the minute vocal chord movements Watson predicted failed to find them consistently (Watson, 1919).

Behaviorists in fact seldom speak of thought, since it cannot be observed, but of self-directed behavior. The behaviors that require what is usually called logical reasoning are brought forth by conversations with oneself. Staats (1971) said:

> . . . with his various language repertoires, as they come to affect his behavior, the child can think, reason, decide, plan, and so on. These skills of course do not appear overnight. The learning is long term, complex, and subject to great variation depending upon the nature of the child's vastly complex learning experiences and the basic behavioral repertoires that result (p. 257).

All thinking is not verbal; the behaviorists position is that sequences of sensory responses (images) can occur without internal speech. However this is not an important part of the individual's cognition. Language development is, in this view, the determinant of the level and degree of appropriate behavior a person reaches. Furthermore, Staats concluded that "languages of different groups and different individuals vary in terms of their functional value in reasoning, thinking, problem solving, planning and the like" (p. 259). If this can be demonstrated, language change could make a very important difference in a person's potential for cognitive development.

Labelling events is said to be the beginning of the reasoning sequence, rather than as the Piagetian view would suggest, the end of at least a part of it. The solution of a problem would depend on whether or not the individual had learned to label correctly the

concepts involved. If he had not learned the labels, he would not only be unable to communicate, but he would never be able to reason.

Reasoning that is not correct--not logical or "isomorphic to actual events" (p. 264), is caused by incorrect labelling, in Staats' opinion.

Despite the differences in the cognitive and behaviorist view of the relations, and especially of the order of development, of language and thought, both agree that after the initial learning of language, it plays an increasingly important part in guiding behavior. It may be as part of a cybernetic process (Arbib), as a mediator of thought (Vigotsky), or a verbal reasoning sequence silently carried out within the person (Staats).

Both schools of thought agree on the observation that children of 5 or 6 begin to use language as a tool of thought, and that the success of reasoning beyond this age comes to depend increasingly on the development of language. And clearly, in the educational situation confronting most Navajo children, language change must be considered as a potential influence on cognitive development.

Theories of translation. Linguists who have dealt extensively with the subject of translation are Eugene Nida, whose interest is in translation of the Bible, and Paul Garvin working in the machine translation field. Recently, in writings about the place of semantics in linguistic theory, Jerrold Katz has also included translation and criteria of translatability among his concerns.

The consensus of their work can be summed up in a quotation from Katz (1972):

> . . . natural languages are capable of providing a sentence to express any thought a speaker might wish to communicate . . . . For any example in English, a fluent speaker of any language could provide a parallel (p. 12).

Katz saw the real problem of translation to be the question of what properties of sentences must be preserved in translation. The only "proof" of successful translation is empirical evidence that communication of the intended sort has taken place.

Though philosophical arguments may be made for the fact that no morpheme has the same meaning twice, still there must be some abstraction from the variable features of the reference of a term. If there is agreement over a wide range of empirical cases, by fluent speakers, that sentences mean the same, there is a reasonable chance that they do. Katz also pointed out that semantic properties and classifications (such as male-female) do not operate on the same level as syntactic ones such as masculine-feminine-neuter. Different languages choose to label different sets of regions in a conceptual space. The translator must be aware of how the sets correspond and overlap so that he can choose the correct semantic interpretation for a given sentence. Syntactic differences, such as class shifting of morphemes, required gender markings and the like, are surface grammar differences that do not necessarily have to be preserved in a translation.

Garvin (1972) agreed that meaning is the primary subject of interest in translation, and that it is only by assuming a content separate from form of a particular language that one can decide whether a passage in one language is indeed a translation of a passage from another.

The difficulty of translation increases if two languages are very different in form and arrangement, since one-to-one correspondence of meaning at any point is unlikely. The translator must select the appropriate meaning of a form from many possible meanings, as well as put it into proper arrangement (syntax). He must also consider the style level suitable to the intended audience.

Nida (1964), in his detailed discussion of translation methods, concluded that the translator must in a very real sense create a new linguistic form to carry the source language concept. He suggested that no attempt should be made to preserve surface syntactic features of the source language. The original sentences should be decoded into their basic or kernel form (what transformational generative grammarians call "deep structure"), and used as the basis for generation of an entirely new utterance. Nida gave strong support by implication to the notion of the universality of the kernel, and thus to translatability.

All three linguists agreed that the central conceptual meaning of utterances in one language can be translated into another language. The ideal translator is a fully bilingual person translating into his native language (Nida, 1964).

Characteristics of one language or the other that are totally untranslatable often are the syntactic or morphological requirements of the syntax, such as the necessity to specify number or gender in nouns. Another important problem is what Catford (1965) called "collocational untranslatability" (p. 100). By this he meant pragmatic

meaning attached to an item in one language which is not attached to the same item in another. For example, he cites the fact that a "bathrobe" in Japanese is a garment worn on the street, and provided by the hotel to its guests; while it has no such use in English. If such a meaning is central to the concept being translated, then some form of explanation or paraphrase must be used or part of the meaning will be changed or lost in the translation.

Inability to translate formal requirements such as grammatical gender seldom interfere with meaning. However, a collocational problem could develop if items that were members of a class in one language did not fit the class in another. For example, a list of items of food could contain something considered inedible in the target language culture. Such a problem could be solved by changing the item, since the meaning of the sentence would usually be less damaged if the higher level category of "food" remained intact.

It is only in the process of developing a translation from one language to another that one learns what type of knowledge of the language in question is required. And only in experimentation with translation can one verify or disprove the correctness of decisions (Garvin, 1972).

Briére (1973) held that translations of tests could not be successful because of unavoidable cultural content that would be handicapping to the student of another culture. If the results of the test are to be used to judge IQ, or general ability in comparison with different-culture students, this criticism is valid. However,

in educational evaluation and testing of readiness for school, descriptive, absolute information is needed rather than normative ranking (Cronbach, 1972). If test results are used only to measure knowledge of the items tested, and this knowledge is relevant to instructional decisions, translation is worth consideration as a tool of assessment.

It seems equally clear from the discussions of Katz, Garvin, and Nida that the actual translation process must be carefully done and analyzed, and that the analyst must be alert for instances of translation failure from either syntactic, semantic, pragmatic, or cultural causes.

Endnote for Chapter II

[1]The major effort being made at this time to prepare Navajo language materials for young Navajo children is being carried out by the Navajo Reading Study, conducted at the University of New Mexico and supported by the Ford Foundation and the Bureau of Indian Affairs. The following 13 children's books have already been printed, and are available to teachers of Navajo children on request from the Navajo Reading Study, Dr. Bernard Spolsky, Director, University of New Mexico, Albuquerque, New Mexico 87106.

Mósíłgai, by Marlene Atcitty (drawings by C. McHarney). August, 1971.

Pábíí dóó Masí, by Judy Harvey (drawings by C. McHarney) w/posters. March, 1972.

Jasper, by Irene Silentman (drawings by C. McHarney). March, 1972.

Hastóí Táá', by Judy Harvey (drawings by C. McHarney). March, 1972.

Da'iidą́, by Marlene Atcitty (drawings by C. McHarney). April, 1972.

Shiléechąą'í, by Irene Silentman (drawings by C. McHarney). April, 1972.

Chidíłtsooí dóó Gólízhii, by Irene Silentman (drawings by Eddie Begaye).

Dah Díníilghaazh, by Irene Silentman (drawings by C. McHarney). November, 1972.

Hastiin Ch'ahii, by Judy Harvey (drawings by C. McHarney). November, 1972.

Shaaní, by Judy Harvey (drawings by C. McHarney). October, 1972.

Haalą́ Wolyé? by Judy Harvey (drawings by C. McHarney).

Deezbaa', by Marlene Atcitty and Richard Johnsen (drawings by Larry King).

Johnny dóó Willie, by Louise Benally and Rose Fasthorse (drawings by Larry King).

The following 10 publications are reprinted from R. W. Young and W. Morgan, Selections from Navajo history, Navajo Historical Series, Vol. I, II, and III, a part of the original body of Navajo material prepared during the tenure of John Collier as Commissioner of Indian Affairs. These materials had been out of print for some time.

Tł'ohchiníjí Diné Kéédahat'íinii Baa Hane', by Hastiin Biyo' Láni Yęę Biye'.

Tsé Nikání Baa Hóóchi yęę Baa Hane', by Naakaii Dine' Nitł'aaígíí.

Naabeehó 'Ał'aą Dadine'íi, by Chic Sandoval.

'Ał'aą Dadine'é, by Scott Preston.

Ałk'idáá' 'Oozéí 'Ásdiid Jiní, by Scott Preston.

Ba'álílii Wolyéé Nt'éę 'Ólta' Dooda Nílgo Yiniinaa Naazhchxo by The Son of Red House Clansman.

Tádídínii, by Lester Moore.

Łíí' T'áá' Yisił Wolyéii Bikéé' Na'azná, by John Malone.

'Áłchíní 'Ídlíídáá' Hane'ígíí, by John C. Claw.

Łą' T'áá Bita'ígóó Njighází Nt'éego Hahane', by Nancy Woodman.

The Navajo Curriculum Center of the Rough Rock Demonstration School, Chinle, Arizona is also engaged in the preparation of materials especially for the instruction of Navajo children. Though most of their publications are in English, the following Navajo-language stories appeared in their 1970 list of curriculum materials. All except the calendar are absent from the 1974 list, and therefore presumably are out of print.

Awéé' Ch'ídeeldlo'. Describes the traditional celebration for a baby's first laugh. English translation included, 1970.

Akałii Chó'í. A story conceived by students at Rough Rock--a careless little Navajo "Cowboy" gets himself and his sheep in trouble, 1971.

Náhidizídí. A Navajo language calendar for 1971. English translations for holidays included, 1971.

References for Chapter II

Arbib, M. A. Cognition; a cybernetic approach. In P. A. Garvin (Ed.), Cognition: a multiple view. New York: Spartan Books, 1970.

Bach, E. Nouns and noun phrases. In Author and R. T. Harms (Eds.), Universals in linguistic theory. New York: Holt, Rinehart and Winston, 1968.

Black, M. Linguistic relativity: the views of Benjamin Lee Whorf. Philosophical Review, 1959, 68, 228-238.

Brown, R. L. Wilhelm von Humboldt's conception of linguistic relativity. The Hague: Mouton, 1967.

Bruner, J. The process of education. New York: Vintage Books, 1960.

Catford, J. C. A linguistic theory of translation. London: Oxford University Press, 1965.

Chomsky, N. Language and mind. (Enlarged ed.). New York: Harcourt Brace Jovanovich, 1972.

Cronbach, L. J. Judging how well a test measures. In Author and P. J. D. Crench (Eds.), Mental tests and cultural adaptation. The Hague: Mouton, 1972.

Elkind, D. Piagetian and psychometric conceptions of intelligence. Harvard Educational Review, 1969, 39, 319-337.

Erikson, E. H. Identity youth and crisis. New York: Norton, 1968.

Fillmore, C. J. The case for case. In E. Bach and R. T. Harms (Eds.), Universals in linguistic theory. New York: Holt, Rinehart and Winston, 1968.

Fishman, J. A. A systematization of the Whorfian hypothesis. Behavioral Science, 1960, 5, 323-399.

Fishman, J. A. Sociolinguistics; a brief introduction. Rowley, Mass.: Newbury House, 1970.

Furth, H. G. Research with the deaf. Implications for language and cognition. Psychological Bulletin, 1964, 62, 145-164.

Garvin, P. L. On machine translation. The Hague: Mouton, 1972.

Gesell, A. L. & Ilg, F. L. The child from five to ten. New York: Harper, 1946.

Gleason, H. A. An introduction to descriptive linguistics. (Rev. ed.) New York: Holt, Rinehart and Winston, 1961.

Greenberg, J. H. Anthropological linguistics. New York: Random House, 1968.

Greenberg, J. H. Language, culture and communication. Stanford: Stanford University Press, 1971.

Havighurst, R. J. The mental development and school achievement of American Indian children and youth. In Author, Director, National Study of American Indian education research reports, Vol. 1 No. 3 Minneapolis, Minn.: Office of Community Programs, Center for Urban and Regional Affairs, University of Minnesota, 1970.

Holm, W. Some aspects of Navajo orthography. (Doctoral dissertation, University of New Mexico) Ann Arbor, Mich.: University Microfilms, 1972, No. 73-8370.

Kant, I. Critique of pure reason. In R. M. Hutchins (Ed.), Great books of the western world. Chicago: Encyclopedia Britannica, 1952. (Originally published: 1781.)

Kant, I. Critique of judgment. In R. M. Hutchins (Ed.), Great books of the western world. Chicago: Encyclopedia Britannica, 1952. (Originally published: 1790.)

Katz, J. J. Semantic theory. New York: Harper & Row, 1972.

Katz, J. J. & Nagel, R. I. Meaning postulates and semantic theory. Foundations of Language, 1974, 11, 311-340.

Katz, J. J. & Postal, P. M. An integrated theory of linguistic descriptions. Research Monograph 26, Cambridge, Mass.: MIT Press, 1964.

Lakoff, G. Deep and surface grammer. Bloomington: Indiana University Linguistics Club, 1966.

Lakoff, G. The arbitrary basis of transformational grammer. Language, 1972, 48, 76-87.

Longacre, R. E. Review of W. M. Urban, Language and reality and B. L. Whorf, Four articles on metalinguistics. Language, 1956, 32, 298-308.

Nida, E. A. Toward a science of translating. Leiden: E. J. Brill, 1964.

Osgood, C. E. The cross cultural generality of visual-verbal synesthetic tendencies. Behavioral Science, 1960, 5, 146-179.

Osgood, C. E., Suci, G. J., & Tannenbaum, P. J. The measurement of meaning. Urbana: University of Illinois Press, 1958.

Piaget, J. Six psychological studies. New York: Vintage Books, 1967.

Piaget, J. & Inhelder, B. The psychology of the child. New York: Basic Books, 1969.

Sapir, E. Culture, language and personality. Selected essays. D. G. Mandlebaum (Ed.), Berkeley: University of California Press, 1961.

Spolsky, B. Navajo language maintenance II. Six-year-olds in 1970. Navajo Reading Study Progress Report No. 13, University of New Mexico, 1971.

Staats, A. W. Child learning, intelligence, and personality. New York: Harper & Row, 1971.

Suci, G. J. A comparison of semantic structures in Southwest culture groups. Journal of Abnormal and Social Psychology, 1960, 61, 25-30.

Toulmin, S. Reply to Geoffrey Sampson. Synthese, 1972, 23, 487-490.

Vigotsky, L. S. Thought and language. Trans. E. Hanfmann & G. Vakar. Cambridge, Mass.: MIT Press, 1962.

Voyat, G. Sioux children: a study of their cognitive development. Department of Psychology, Yeshiva University, New York City, 1970. Mimeograph.

Voyat, G. Thinking before language? A Symposium. Childhood Education, 1972, 48, 248-251.

Watson, J. B. Psychology from the standpoint of a behaviorist. Philadelphia: Lippincott, 1919.

Werner, O. Cultural knowledge and world view. In P. L. Garvin (Ed.), Cognition: a multiple view. New York: Spartan Books, 1970.

Whorf, B. L. Language, thought and reality: selected writings. Cambridge, Mass.: MIT Press, 1971. (Originally published: 1956.)

CHAPTER III

The Test and the Translation

One major question to be investigated in this study is whether or not a test instrument can be translated so that approximately the same sorts of knowledge are measured in both languages. If the test results indicate a significant difference between responses in one language and the other, reasonable explanations must be sought.

Knowledge of concepts. The research of Piaget and subsequent investigators supported the idea that children who speak different languages develop the basic concepts of space, time, and quantity relations at approximately the same age (Voyat, 1972). The concepts tested by Piaget, such as those of conservation of matter and numerosity of objects, are themselves dependent on knowledge of even more basic concepts, such as "more-ness" and sameness. These may be innate in human perception, but to become useful tools of thought the perceptions must become organized. These basic concepts have in common the fact that they derive meaning from a relation between a syntactic arrangement and a pragmatic reference.

Many concepts can be developed directly from examples of things or events or qualities. We can say a concept has been formed when examples can be distinguished reliably from non-examples, and a language label attached. The concepts with which this project is concerned, however, are not just labels. They form semantic units only when in

syntactic and pragmatic context. There can be no "top" unless it is the top of something; no "more" that is not more than something. The labels have no direct counterpart in the physical world (Mackey, 1969).

Knowledge of words. Ability to use the concept in communication presupposes a knowledge of some language form to express it. Various different instances of the situation referred to as something being "between" other things, or "beside" them or "larger" might have few or no distinguishing characteristics except the relational words or phrases used. Of course, if there is more than one way to express the concept, the speaker or hearer may be familiar with one but not the others.

Some apparently simple concepts are more difficult to grasp than more complex ones (Harré, 1966). If limited examples of the relevant comparative sets have occurred in the child's experience, the concept may be lacking or incompletely defined. These concepts are semantic relations rather than semantic units (Guilford, 1967).

An examination of the requirements for beginning school work shows that there are a number of such basic concepts for which the child must know language forms in order to understand what is expected of him. These words and phrases make up an important part of the child's school language repertoire.

For the purpose of this test translation project, a concept will be assumed to be understood by the child if he reacts appropriately

to a word or short phrase in following verbal instructions. That is, the child's language labels must be attached to the same meaning-complex as the examiner's by a behavioral criterion.

If the child does not answer correctly, it will not be assumed automatically that he does not know the concept, but that he does not know it in that language form. He may not know it at all. Other evidence would be required to establish that.

School tasks always involve communication and require that concepts be appropriately labelled. For the purposes of instruction it is important not only to discover what concepts the child has formed, but also whether he has learned the labels in any form, receptive or productive.

The Test

A study of the basic concepts that appear to be necessary for school tasks was made by Ann Boehm in 1966. From examination of 13 texts and teacher's guides used in kindergarten through the third grade in reading, arithmetic, and science[1] she identified a total of 108 English items--words and short phrases--that were repeatedly used in directions and explanations to the children, but were neither explained nor taught in the actual lesson materials. It was apparently assumed by the writers that English-speaking children would already have mastered these words, their meaning, and the generally agreed-upon contexts of use before they entered school.[2]

The items chosen for the test were those which:

> (a) occurred with considerable frequency; (b) were seldom if ever explicitly identified, or were defined in their simple form but subsequently used in complex forms without adequate transition; and (c) represented relatively abstract basic concepts or ideas (Boehm, 1970, p. 3).

The Boehm Test of Basic Concepts. A test of these concepts was developed in which the child is asked to match the word or phrase with the correct picture in a multiple-choice set. Out of the original 108 items tested, 50 were selected on the basis of their discrimination and difficulty. The items chosen had a point-biserial correlation of .30 or more with the subject's total score, and showed an even rise in percent passing across age levels. They also yielded a roughly normal distribution of percent passing values centered around .50 for kindergarten pupils (Boehm, 1970). This Boehm Test of Basic Concepts (1970) is the instrument that was translated and used in this project.

The 50-item test was administered by Boehm to a representative sample of children from low, middle, and high socioeconomic levels, both in the fall and in the spring, in schools distributed throughout the country. Scores from this sample population of about 10,000 children provided a criterion norm, a basis of expectation for other children of the same age, grade, and socioeconomic levels. Percent passing data on this group is shown in Appendix A, Table 3.

If the concepts of the Boehm test are basic, they should certainly be examples of language universals and be translatable in the sense in which Katz (see page 39) was speaking. Their pragmatic references are common and for the most part culturally neutral. The

translated version of the test should, if successful, allow comparison of the degree of concept understanding reached by children at ages 6 to 8 in the two language groups. The question assumes greater importance if it is true, as Guilford states, that the type of ability measured by the test of basic concepts is an important general language-use ability (Guilford, 1967).

Preserving meaning in translation. Grammatical differences in languages will usually prevent one-to-one correspondence between concept words in one language and another. The more different the two languages, the less likely it is that such correspondences will occur. A careful translation method is required to assure similarity of meaning, assuming that the basic meanings are universal and therefore can be expressed in both languages.

Another important translation problem is that a different degree of syntactic complexity may be necessary to express a similar meaning in the two languages. The Boehm test in English is written in the simplest syntax possible to test knowledge of the concept. Concepts requiring more complex syntax are not often used to give instructions to primary school children. In Navajo, the same meaning may require more or less difficult syntax.

Other things such as sentence length being equal, however, syntactic complexity has been shown to have little effect on comprehension *if* the semantic content of the expression is unambiguous. For example, passive sentences have their true subject after the verb, opposite from the more common order in English, and thus should be

harder to understand. Yet this is not always the case. Sentences of the type: "The cookie was eaten by the dog" are as quickly understood as "The dog ate the cookie"; but "The car was followed by the man" is harder than "The man followed the car." In the first pair, the eater can surely be identified on pragmatic grounds, whatever the syntax. In the second pair, syntax assumes greater importance because either noun could be the subject of the verb (Bever, 1970). In the Boehm test, referential confusion is eliminated as far as possible in the choice of nouns to be pictured. The pictures that were successful for English speakers were not always as successful for the Navajo, however. These problems will be discussed in the following chapter.

Correlation of preschool tests with later school performance has shown that verbal knowledge is the best predictor of school success. If prediction of any sort is to be attempted for Navajo children, they should have the benefit of verbal measures given in their own language. Nonverbal tests rarely predict well (Cronbach, 1970). Also, as a practical matter, a large percent of Navajo children will have to study English in the early grades, and learn most academic subjects mainly or entirely in English from that time on. Thus a measure of how well they understand concepts that frequently occur in English-language texts will be useful.

Summary. The Boehm Test of Basic Concepts was chosen as a vehicle for this study of test translation on the basis of these considerations:

1. The test was developed to test basic concepts required to do school tasks which most Navajo children eventually will have to do through the medium of English.

2. The test has been extensively tested so that a reliable comparison group is available.

3. Test development is a difficult and demanding job. The translation process, if feasible, could save many hours of effort in writing and testing new and untried instruments.

The Translation

Following the advice of Nida (1964), Navajos fully bilingual in Navajo and English were obtained to translate the Boehm Test of Basic Concepts into Navajo. Two Navajo students at the University of New Mexico, Irene Silentman and Marlene Benally, each translated 25 of the 50 items, and then exchanged their halves with each other for a second opinion.

The two translated and double-checked halves were then checked by a third bilingual Navajo graduate student, Agnes Holm, to resolve remaining questions. The work of the three translators was then checked by linguist Dr. Robert Young who was the final arbiter on spelling and grammar.

After the test was approved in written form, the original translators recorded it. Since the written form of Navajo is not well known to many Navajo people, the tape recording was made to guarantee an accurate and fluent presentation of the test sentences.

The Navajo language has dialectic variation between geographical areas. Marlene Benally is a native of the area in which the test school is located, so her dialect corresponded to that of the students. The evidence with regard to the importance of dialect in comprehension is contradictory, and usually based on the comparison of standard English and Black English. Cazden (1970) summarized the position that dialect differences put nonstandard-dialect children at such a disadvantage that they should be instructed in the nonstandard dialect.

On the other hand, a series of studies by Hall & Turner (1974) found no significant differences in comprehension of standard and nonstandard English by children whose natural dialect was nonstandard. They reported that the nonstandard speakers apparently automatically translated standard English into their own dialect.

Since there has been no comparable investigation of the dialect question in Navajo, it would be recommended that in any replication of the test project, the text be read in the local dialect if possible.

During the actual presentation of the test, the tape recording was used for the test sentences. However, Navajo native speakers introduced the test and explained the method of marking answers. In this process it was discovered that the word originally chosen to translate "mark the picture . . ." was slightly ambiguous. Navajo children sometimes understood bikáa'iizoh to mean "mark above the picture" rather than on it. The correct marking procedure, which was to cross over the chosen answer was quickly demonstrated; but in written and future taped texts, the word bik'i'iizoh will be used to indicate a mark made exactly on rather than above the picture.

It is instructive to note that none of the translators foresaw this problem. No translated test could be trusted until after it had been field tested and the results analyzed to find such unpredicted "bugs."

Administration

The test group of Navajo children was made up of 30 kindergarten, 46 beginner (equivalent in age to first grade) and 50 first grade (equivalent in age to second grade) Navajo children. All came from the reservation area around Chinle, Arizona, a region of agricultural and ranching people in the lowest socioeconomic level.

The test was given in March 1972 at the Rock Point Boarding School near Chinle. Intact classes were used, but no further effort was made to randomize the sample, due to the difficulty and inconvenience this would have caused to the school. In the subsequent pages, in order to facilitate comparison of the Navajo and English test groups, the students will be referred to as K, 1, and 2.

The kindergarten students, around 5 to 6 years old, were almost entirely Navajo monolinguals. Oral English as a second language was being introduced, but had not progressed far. The beginners, age 6 to 7 were more advanced in English and were starting to learn English reading and writing. The first graders, age 7 to 8 (with a few older), were receiving more formal English instruction and getting a large part of their other instruction in English.

All classes had Navajo-speaking teachers or aides, and the Navajo language was used freely in class. Few children seemed to be fluent in English.

To insure as far as possible that the results of this test would not be invalidated by student unfamiliarity with the test procedure, a pretest was administered two weeks before the test date. This consisted of six items of the same sort as those on the test. About half the students in the total Navajo group participated in the pretest. They had no special difficulty with the procedures.

The children were tested in their own classes, with the assistance of their own teachers. They were separated from each other as much as possible to minimize "helping." After the first few items, which proved easy for almost everybody, the students seemed to become interested in the game and showed little evidence of either boredom or distraction. They apparently enjoyed taking the test, as did an Albuquerque English-speaking group tested a year later.

Since this testing took place in the second semester of the school year, no students were totally unaccustomed to sitting at a table, listening to a teacher, or marking with a crayon on a paper. All except the kindergarten children had had some previous tests, and none evidenced obvious fear or test anxiety. However, kindergarten students may not have understood the task as well as the older children.

The tape recorder speaking Navajo seemed to be a new experience to most of the group, and sufficiently interesting to keep their attention. They listened more carefully to the recorder than to the

live speaker, apparently realizing that it could not answer questions or repeat.

The Navajo teacher who ran the recorder stopped it at the appropriate places for page-turning, and other monitors made sure that all children were on the right page. This was necessary especially for the younger children, who had had little experience with the normal ordering of pages.

The instructions for presenting the test in English require that each item be read just twice, so that no group will receive unfair advantage from more repetition (Boehm, 1970). Thus the group who took the test from a tape with each sentence read twice did not suffer any disadvantage compared to the Boehm and Albuquerque samples who had a live presentation in English. No explanatory statements or repetitions were provided after the basic process was explained, and the test administrators were satisfied that children understood what they were to do.

The total test required about an hour to administer, with a break of 5 to 10 minutes between the two halves. The kindergarten children appeared to become tired before the end of the last half, but they had also reached a point where few of the concepts were known to them. They were probably suffering as much from the frustration of a too-difficult task in the second part of the test as from fatigue. The low reliability coefficient of their scores, to be discussed below, may reflect this.

Frustration was even more evident at times among the Albuquerque English-speaking group tested in 1973. In some cases, after failing

to understand a couple of items, a child would become visibly agitated, while if he understood the next one (or thought he did) he would quickly regain his composure. That there was actually less of this type of emotional reaction visible among the Navajo children may indicate that they had had, up to that point, fewer unhappy experiences with tests, and did not experience their own failure so negatively. There was probably a lower level of test-awareness among the Navajo children. They had never been tested in a way that they interpreted as a test of their ability to use their own language, while the English-speaking children certainly had.

A few out of both groups of children sought confirmation for their choices from teachers standing nearby, and required some admonishment to prevent oral responses. The problem with these, of course, is that they are most likely to be picked up and copied by students who are insecure. Since the loud child is not always the one who knows most, it was imperative to keep everyone quiet. A few minutes were spent in silence-provoking games such as "see if you can hear this pin drop" whenever oral responses were given more than once at the start of the test.

Analysis

Grading the Boehm test is done by recording correct and incorrect responses of each child, which are then added across the class group. Thus the record includes each child's score on the test, and the class score on each concept. The teacher can then use the results

both to determine which concepts are missed by a large number of students, and which students are missing a significant number of concepts. Both group and individual instructional material can be prepared to supply the missing concepts and reinforce those that are weak.

Of equal interest to the number of students who answer correctly on any item are the answers given by those who do not answer correctly. Since this information was not available for the original Boehm English-speaking group, the test was administered to 3 classes of first grade and 3 classes of second grade students at Griegos Elementary School in Albuquerque in December, 1973. Their average scores proved to be close to the average of the Boehm English-speaking groups (see Table 1, page 68 for comparison), so their tests were used to provide a comparison of Navajo and English wrong responses (Appendix A).

Percent passing scores provide a method of comparison of degree of difficulty of various items for Navajo and English-speaking students. These scores were subjected to chi-square comparison, item by item, assuming the Boehm English-speaking students' average score on each item to be the norm. The items for which the difference in scores proved to be significant ($p < .01$ or less) at all grade levels were chosen for close attention in the following chapter.

Validity. The validity of the Boehm test in English was primarily based upon the relevance of the test content to material in the school curriculum (Boehm, 1970). This same content validity should apply to the Navajo version of the test, since these are the concepts that the child will need when he studies from English materials.

Reliability. Reliability of the Boehm test in English was high, ranging from .82 at grades 1 and 2 to .86 at K. The comparative reliability coefficients obtained for the Navajo and Albuquerque groups were:

	Navajo**	Albuquerque English**	Boehm English*
K	.23 N 30		.86 N 162
1	.75 N 46	.80 N 60	.82 N 276
2	.65 N 50	.69 N 67	.82 N 222

*Split-half coefficient, Spearman-Brown correction

**Kuder-Richardson Formula 20

The low reliability of the K group of Navajo students can be partly explained by the size of the group, of only 30 children. Also, reliability depends on the range of scores gained (Ebel, 1972), and the small group of K students not only made the lowest scores but had a relatively small standard deviation of 4.0. The English K group had the largest standard deviation, 8.1, and the highest reliability.

The lack of variance in Navajo K scores is probably related to the relative social and experiential homogeneity of the group. They were all from farms or ranches in an area of very low population density, and probably had had little preschool exposure to picture books, group directed marking, or any of the other aspects of the test experience.

Some English-speaking children, even in the lowest socioeconomic groups, have play-school or day-care-center experience before they

enter kindergarten. Coloring books are a common plaything, and other forms of graphic material are usual in their lives.

Though the reliability coefficients for grades 1 and 2 for Navajo children were lower than those of the Boehm sample, they were very close to the Albuquerque sample of similar size.

Partly because of the low reliability of the test for kindergarten students, and partly because of the lack of item analysis data for the English K group, it is difficult to interpret the meaning of the test results for these youngest children.

Endnotes for Chapter III

[1]Boehm's selection of basic concepts was made from a study of the following materials:

Hartung, M. L., Van Engen, H., Gible, E., Slenadine, Stochl., J. E., Knowles, L., and Walch, E. Seeing through arithmetic. Book 1, (Teacher's Ed.) Fairlawn, N. J.: Scott Foresman, 1964.

Hartung, M. L., et al. Seeing through arithmetic. Book 2 (Teacher's Ed.) Fairlawn, N. J.: Scott Foresman, 1964.

Educational Research Council, The greater Cleveland mathematics program. Grade 3. (Teacher's Ed.) Chicago: Science Research Associates, 1964.

Upton, C. & Fuller, K. G. American arithmetic. Grade 3. (Teacher's Ed.) New York: American Book Co., 1960.

Brunfield, C. F. & Shanks, M. E. Elementary school mathematics. Book 3 (Teacher's Ed.) Reading, Mass.: Addison Wesley, 1963.

Craig, S. C. & Lembach, M. W. Science everywhere. (Teacher's Ed.) New York: Ginn, 1961.

Craig, S. C. & Daniel, E. Science around you. (Teacher's Ed.) New York: Ginn, 1961.

Lee, B., Jacobson, W. J., & Lawley, C. ABC science series. (Teacher's Ed.) New York: Ginn, 1961.

American Association for the Advancement of Science. Science: a process approach. (Experimental Ed.) 1964.

Robinson, H. M., Monroe, M. & Artley, A. S. Fun with our friends. Fairlawn, N. J.: Scott Foresman, 1962.

Robinson, H. M., et al. Before we read. Fairlawn, N. J.: Scott Foresman, 1962.

Robinson, H. M., et al. We read pictures. Fairlawn, N. J.: Scott Foresman, 1962.

Ousley, O. & Russell, D. Manual for teaching the pre-primer program. New York: Ginn, 1961.

[2]The words tested in the Boehm Test of Basic Concepts are listed, together with the semantic category into which they are considered by Boehm to belong, in Appendix A, Table 4. Below are the words that were in the original 108 but proved to be insufficiently discriminating to be included in the final test. This table appears in Boehm (1970) p. 41.

CLASSIFICATION OF CONCEPTS NOT ON BTBC

	Context Category			
Concept	Space	Quantity	Time	Miscellaneous
Bottom	x			
Under	x			
Beside	x			
In front	x			
Toward--away	x			
Beyond	x			
Up--down	x			
Big--small	x	x		
Tall--short	x	x		
Long--short	x	x	x	
Wide, fat--narrow, thin	x	x		
Round	x			
Flat	x			
Straight	x			
Line	x			
Follow	x		x	
Join	x			
Change				x
Moving--still	x			
Deep--shallow	x			
Fast--slow			x	
Now			x	
Early--late			x	
Past			x	
Start, begin--stop, finish			x	

CLASSIFICATION OF CONCEPTS NOT ON BTBC (continued)

Concept	Context Category			
	Space	Quantity	Time	Miscellaneous
Open--closed				x
Soft--hard				x
Easy--hard				x
Dark--light				x
Loud				x
Light--heavy		x		x
Any		x		
Every--none		x		
Enough		x		
Other				x
With--without				x

References for Chapter III

Bever, T. G. The cognitive basis for linguistic structure. In J. R. Hayes (Ed.) Cognition and the development of language. New York: Wiley, 1970.

Boehm, A. E. The development of comparative concepts in primary school children. (Doctoral dissertation, Columbia University) Ann Arbor, Mich.: University Microfilms, 1966, No. 67-5767.

Boehm, A. E. Boehm test of basic concepts manual. New York: The Psychological Corporation, 1970.

Cazden, C. The situation: a neglected source of social class difference in language use. Journal of Social Classes, 1970, 26, 35-49.

Cronbach, L. J. Essentials of psychological testing. (3rd. ed.) New York: Harper & Row, 1970.

Ebel, R. L. Essentials of educational measurement. Englewood Cliffs, N. J.: Prentice Hall, 1972.

Guilford, J. P. The nature of human intelligence. New York: McGraw Hill, 1967.

Hall, V. C. & Turner, R. R. The validity of the "different language explanation" for poor scholastic performance by black students. Review of Educational Research, 1974, 44, 69-81.

Harré, R. The formal analysis of concepts. In H. J. Klausmeier & C. W. Harris (Eds.), Analyses of concept learning. New York: Academic Press, 1966.

Mackey, W. F. Concept categories as measures of culture distance. Quebec, Canada: International Center for Research on Bilingualism, 1969.

Nida, E. A. Toward a science of translating. Leiden: E. J. Brill, 1964.

Voyat, G. Thinking before language? A symposium. Childhood Education, 1972, 48, 248-251.

Young, R. W. & Morgan, W. The Navajo language. Education Division, Office of Indian Affairs, 1943.

CHAPTER IV

Results of the Study

The results of this study are reported here from two points of view, statistical and linguistic, with cross referencing where necessary. In the linguistic discussion are included problems of semantics, syntax and pragmatics as they appear to be affecting the test results.

Statistical Results

The data from the Navajo test and from the Albuquerque English test were analyzed by the author, using the facilities of the University of New Mexico Computer Center. Statistical data from the Boehm sample were taken from the Boehm Test of Basic Concepts Manual (1970).

The following analyses were made: general statistics, factor analysis, item analysis, Spearman rank-order correlation, and chi-square analysis. Detailed results appear in Appendix A.

General statistics. Navajo children scored below the English speakers on the Boehm test, with the difference reaching significance ($p < .01$, two tailed t test) at K and $p < .001$ at 1 and 2 (Table 1). Compared to the distribution of the scores in the Boehm sample (Table 6, page 123), the Navajo K mean score was at the fortieth percentile of the Boehm group, grade 1 at the fifteenth percentile, and grade 2 at the tenth percentile. Thus, starting relatively close together, the

TABLE 1

General Statistical Analysis

	Kindergarten		First Grade			Second Grade		
	English Boehm	Navajo	English Boehm	English Albq.	Navajo	English Boehm	English Albq.	Navajo
N	162	30	276	60	46	222	67	50
Mean	28.4	25.6	39.2	39.9	31.9	43.5	45.1	38.1
SD	8.1	4.0	5.5	5.3	5.3	5.0	6.1	4.5
r	.86[a]	.23[b]	.82[a]	.80[b]	.75[b]	.82[a]	.64[b]	.65[b]
SE_m	3.0	.73	2.3	.69	.75	2.1	.69	.61

Note.--The reliability of the total Navajo test, as measured by the Kuder-Richardson formula 20 is .83. Total test reliability is not reported for the Boehm sample.

As one means of determining whether the English and Navajo samples were significantly different in their scores on the test, the means of the various groups were compared by means of a t test for samples of different size and non-homogeneous variance (Popham, 1967). The results of this comparison were:

K: English Boehm-Navajo: t 2.9, $p < .01$

1: English Boehm-Navajo: t 8.7, $p < .001$
English Albq.-Navajo: t 8, $p < .001$
English Boehm-English Albq.: t .92, N.S.

2: English-Boehm-Navajo: t 7.5, $p < .001$
English Albq.-Navajo: t 7.1, $p < .001$
English Boehm-English Albq.: t 1.95, N.S.

[a]Split-half coefficient, Spearman-Brown correction.

[b]Kuder-Richardson Formula 20.

two groups moved further apart at each grade. Nonetheless, the Navajo students showed a steady improvement, and the distribution of their scores did not depart radically from a normal curve (see graphs of raw scores, Figures 3, 4, 5, and 6).

This general statistical result suggests that the test may have been harder in Navajo than in English. However, the criteria set in the Boehm manual, that kindergarten students should score around the 50% mark and that there be a steady improvement through the grades, is met. Also, the test apparently measures first and second grade students in a reliable way. Reliability of K will be discussed below.

The question of comparability between English and Navajo groups, and the possible use of the English norms is another matter. In a test with such a large difference between the means, it would be unwise to use English grade level norms. If the test were to be used in its present form, Navajo norms would have to be established through further testing using more stringent sampling procedures. The first conclusion from the statistical analysis must be that the Boehm English and the Boehm Navajo tests are not the same test.

Factor analysis. The semantic categories into which the Boehm test is divided (Table 7, page125) are very general: space, quantity, time, miscellaneous. In order to compare the possible semantic similarity of the two versions of the test in Boehm's terms, a factor analysis was made of the Navajo total data, using the BMD X72 factor analysis program at the University of New Mexico Computer Center.

With a constant of 1.7, the factor analysis yielded 6 factors, which proved essentially uninterpretable. All semantic categories appeared in each factor. The only possible basis of factor separation appeared to be difficulty. The first factor included 13 of the hardest concepts, and factor 4 had most of the rest of the concepts below .50 in difficulty as measured by the item analysis. However, one of these hard concepts appeared in factor 6, and one in factor 2. Since the factor analysis was orthogonally rotated to simple structure, no item appeared in all factors, but no explanation of the factor division is satisfactory. A comparison of the weight in factor and item analysis index of difficulty for each item that had a loading of .30 or more on any factor appears in Table 8, page 127.

The factor analysis data strongly suggests that the Boehm test in Navajo is essentially one factor: comprehension of relational concepts. The differences in the nature of the referents--that is, whether time, space, numerosity, or other semantic categories are involved--does not seem to make a difference in how the test questions are answered. A study currently being carried out by D. Stevenson at The University of New Mexico is tending toward the conclusion that this is the case with many tests that purport to test different facets of verbal knowledge.

Item analysis. The item analysis was performed on the Navajo data and data obtained from the Albuquerque sample of English speakers, for whom actual test papers were available. The evaluation already tentatively reached, that the Navajo test was harder than the English

test, did not indicate whether the Navajo test itself was successful in technical terms. To be a good test for Navajos it must discriminate reliably between students who were more and less able. The item analysis gave this information. The program used was written by Robert Hughes of the University of New Mexico Computer Center. It compared the two halves, higher and lower scores, of each group, and of the combined Navajo 1 and 2 and Albuquerque 1 and 2 groups. Graphs of the raw scores and tables of difficulty and discrimination for each group appear in Appendix A. Graphic representation of the indices of difficulty and discrimination are shown in Figures 1 and 2. The comparison of indices of difficulty reinforces the conclusion that the Navajo version of the test is harder.

Ebel (1972) pointed out that items receiving 25% to 75% correct responses contribute most to test reliability, and that a good test seldom needs to include items that vary widely in difficulty. Table 2 indicates how the test fits this criterion at grades K, 1, and 2 for all groups tested.

At grades 1 and 2, the English version of the test was easy, and results for the two English groups were nearly the same. By Ebel's criterion, only the Boehm K was taking a test of appropriate difficulty.

To be considered a good discriminator, the index of discrimination for a test item must reach .40. Between .30 and .39 the item is reasonably discriminating, between .20 and .29 it is marginal, and at .19 or below, it is poor (Ebel, 1967). In the test as a whole,

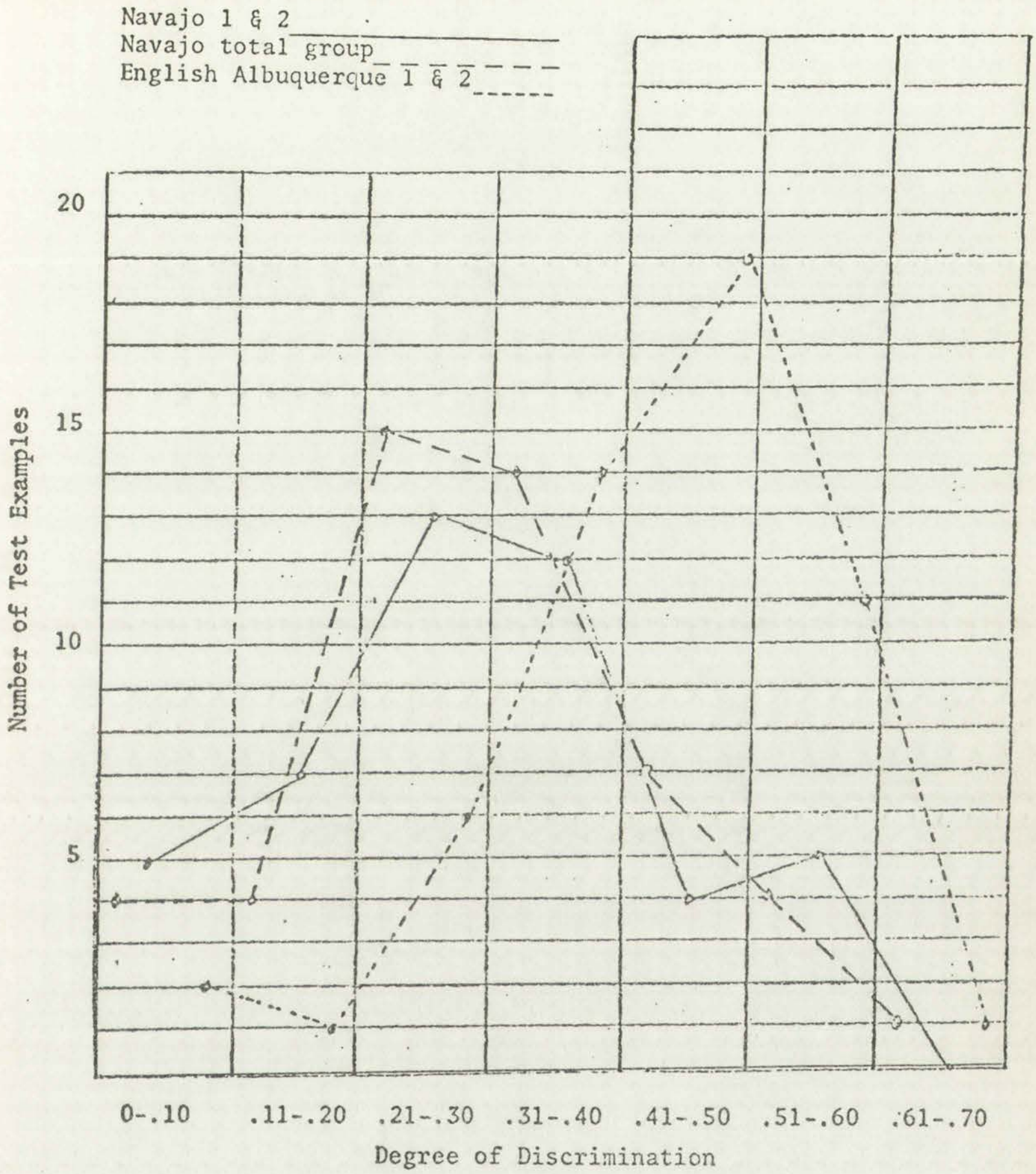


FIGURE 1

Graph of Index of Discrimination

Note.--Navajo total group, N 126; Navajo grade 1 & 2, N 96; English Albuquerque grade 1 & 2, N 127.

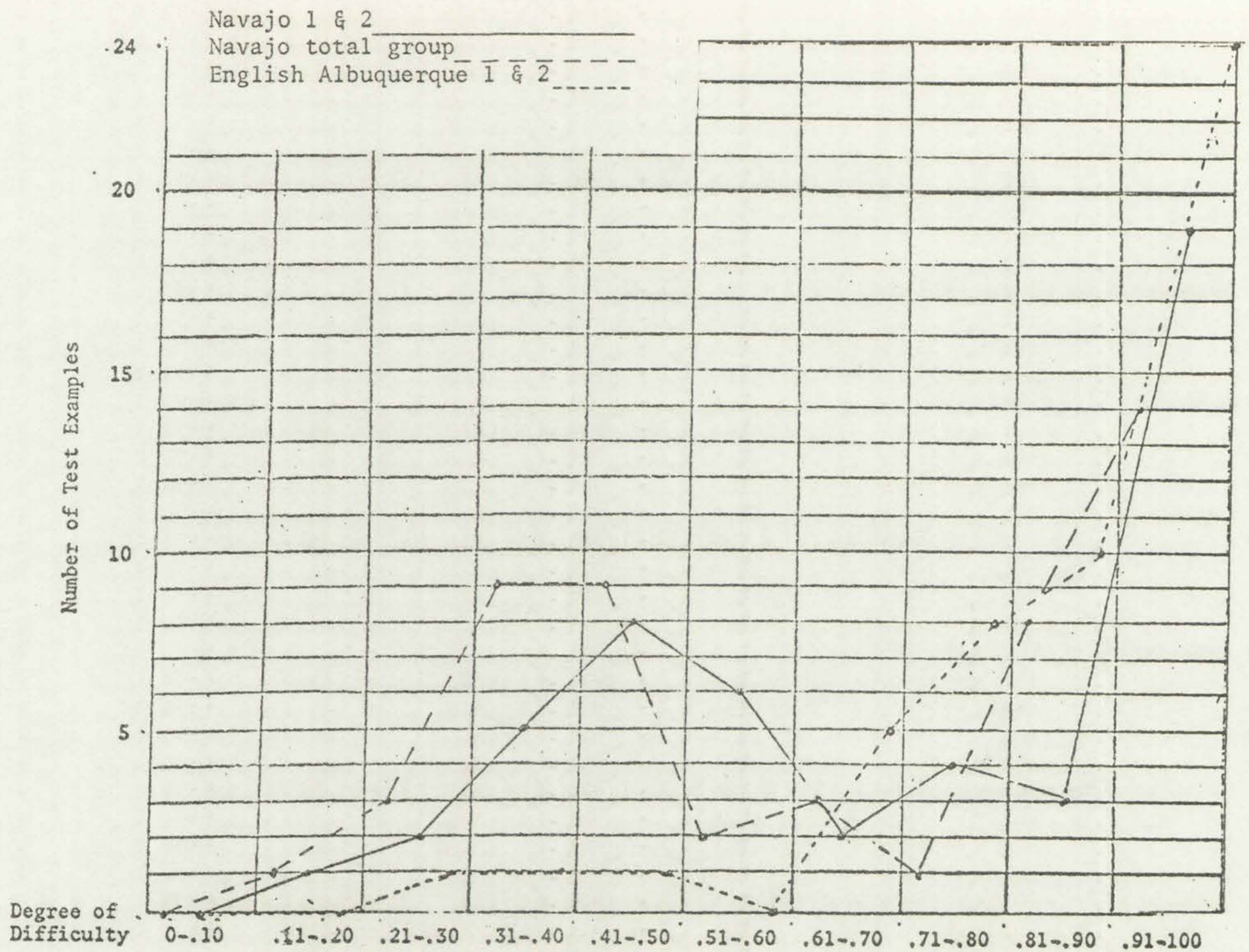


FIGURE 2

Graph of Index of Difficulty

Note.--Navajo total group, N 126; Navajo grade 1 & 2, N 96; English Albuquerque grade 1 & 2, N 127.

7 items were below .19, 8 between .20 and .29, 13 between .30 and .39, and the rest .40 or above. Thus 35, or 70% of the items on the Navajo test were reasonably good or better in discrimination.

TABLE 2

Range of Difficulty of Test Items

Language	Grade	Number of Items Passed by 0-24% of Students	Number of Items Passed by 25%-75% of Students	Number of Items Passed by 76%-100% of Students
Navajo	K	17	16	17
	1	8	18	24
	2	1	21	28
Boehm English	K	4	37	9
	1	0	15	35
	2	0	8	42
Albuquerque English	1	0	16	34
	2	0	7	43

Low discrimination can be the result of items being too easy, too hard, ambiguous, or misunderstood. If items are too hard, they are often answered randomly, and some students who are doing badly on the test as a whole will get them right by accident. If they are too easy, everyone gets them right. The interesting poor discriminators are those items that are apparently misunderstood, because they may illustrate important differences between the two languages.

Out of 15 items on the test that discriminated below .30, 9 were above .80 on the difficulty index, or very easy. One item was hard, .25, and the rest were in the mid range. These interesting "bad" items are: 17 (second), 19 (several), 38 (right), 39 (forward), and 43 (separated). They will be discussed in the linguistic analysis below.

Spearman rank-order analysis. Previous analyses have shown that the Navajo test is significantly more difficult than the English test at all levels. The Spearman rank-order analysis was undertaken to discover the level of correlation between the two tests, considering each item as a "subject" and the two test groups, Navajo and Boehm English, as the two treatments. Although this is a somewhat unusual use of the Spearman formula, its result appeared to fit the other statistical facts. The rho between the Navajo and English total group scores on all items was .46. This means that only 21.2% of the items on the test were answered practically the same by English-speaking and Navajo students, and strongly reinforces the conclusion that this is not the same test in Navajo as it is in English.

Chi-square analysis. In order to find out exactly which items at what grade levels were answered significantly differently in Navajo and English, a chi-square analysis was made between total right and wrong answers to each item, considering the English totals as the norm. A table of the chi-square probabilities appears in Table 17, page 145.

Ranking Navajo items by difficulty shows that the assumptions of Boehm (1970), that the test is organized to become progressively harder from item 1 to 50, is not met in Navajo.

The difference in level of difficulty between the Navajo items and the English items is hardly surprising, since there is no genetic relation or structural similarity between the two languages. Correlation between the scores on any two items in the two languages with respect to length or syntactic complexity would be accidental. The correlation expected was between meanings. If the two languages expressed a similar concept, the test items might be answered similarly. This was the case in only about a fifth of the sentences. It does not prove that the same content is not being presented. It indicates rather that if the semantic content is similar, other factors intervened in the Navajo children's choice of answers.

The test items on which Navajo scores were significantly different from English scores at all grade levels ($p < .001$ by the chi-square test) were 3 (away from), 4 (next to), 14 (between), 18 (corner), 22 (different), 27 (as many . . . as), 30 (other), 31 (alike), 32 (not first or last), and 45 (pair).

In addition, significantly different $p < .01$ were 29 (beginning to), 33 (never), and 41 (above).

Linguistic Results

The Boehm test items were taken from a much longer list of concept words, the most discriminating of which were used. There

was no repetition, although the basic semantic content of a few of the words is very similar. "Middle" and "center" could be interchanged, for example, as could "over" and "above." Nevertheless, these are different words, and were responded to differently.

Repetition. The Navajo test, as translated out of the best linguistic intuition of three native speakers of Navajo and checked by a fourth, proved to have many repetitions of the same morphemes to express various basic concepts. The nature of Navajo grammar is such that a concept is often not a single word, but a stem with affixes, some of which are required by the total sentence syntax. Thus the forms are not exactly the same, though the core meaning is similar, and in most cases the test results were alike in the Navajo group.

In all, 6 concept morphemes accounted for 17 items of the Navajo test. Table 3 shows the repeated morphemes, their intercorrelations, and their percent-right data at each level.

The English student was being tested on his knowledge of different words to express specific variations in concepts that appear in school books. Navajo word variations simply do not match the English variations. Correlation data, however, suggest that these repeated morphemes are not really repetitions, since they do not correlate highly even though they received similar percent-right scores. The fact seems to be that different knowledge is being tested, despite the similarity of the forms.

TABLE 3

Repeated Navajo Forms: Correlation and Percent Right

Item No.	Concept Word: Navajo	Concept Word: English	Correlation: Navajo Total	27	31	35	47	Percent Right: K	1	2
				27	31	35	47			
27	beenéelt'e'	as many . . . as	27		.15	-.02	.60	3	15	54
31	aheełt'é	alike	31			-.02	.26	10	13	14
35	beełt'é	matches	35				.13	30	50	48
47	aheenéelt'e'	equal						20	20	81
				1	11	14				
1	bikáa'gi . . . hódahdi	at the top	1		.08	.22		63	100	100
11	bikáadi	over	11			.09		70	85	96
14	bikáadi	above						27	66	74

TABLE 3 (continued)

Item No.	Concept Word		Correlation	Percent Right		
	Navajo	English	Navajo Total	K	1	2
7	alníi'gi	middle	.16	77	93	94
26	alníi'gi	center		77	94	100
15	t'áá át'é	whole	.17	95	100	98
42	t'áá át'é	every		80	98	98
4	bíighah	next to	.03	3	18	42
46	bíighah góne'	next to		13	22	30
21	alkéé'	behind each other	.19	73	90	100
48	alkéé'	in order		10	48	68

The only items that are closely correlated are 27 (as many . . . as) and 47 (equal). These are highest on the entire test, but even they have only 36% common variance. The other repeated words correlate either at a very low level or negatively.

On the test as a whole, there were just 100 correlations that reached above .20, and two above .50. In addition to 27 and 47, the other correlation above .50 was 16 t'áá ahánígi "nearest" and 11, bikáadi "over." No possible reason for this correlation, either syntactic, semantic, or pragmatic suggests itself. The pictures are not similar, the ideas are not similar, and the percent of right answers was not especially similar.

Repeated concepts that received very different percent-right scores proved to be those with added problems in the item. These are 4 (next to), 46 (skip), 31 (alike), and 48 (in order). The first two are discussed in a later section of this chapter.

There were two reasons why 31 received very poor responses from the Navajo children. One was that it changed the test response set by requiring two marks instead of one. The other was that the sentence does not clearly tell the student this fact. The item reads:

31. Look at the shapes. Mark the shapes that are alike,[2] Aí'aa át'éego nida'asdzooígii níníł'í. Łá' aheelt'é yígíí bik'i'iizoh.

In the English version, two clues to the required plural marking are given: "shapes," and "are." In the Navajo, the only clue is the affix of the reciprocal, ah(i)-, "each other," in aheełt'é, and this does not unambiguously select two shapes. Ah(i)- prefixed to -eełt'é

"they are alike" means "reciprocally the same," hence "alike." Łá' means "one" in a singular context, "some" in a plural context. The sentence could mean "one alike which mark," or "some alike which mark."

The picture for this item (Table 4, page 109) shows five shapes, two of which are circles. The Navajo children almost all marked one or the other circle, but only a few of them marked both, even at the second grade. (See Table 5, page 117, for distribution of answers.) The indication is very strong that the children understood the concept aheełt'é. The low scores on this item unfairly depressed the Navajo mean. The item could be rewritten to emphasize the need for a plural answer: Aheełt'é yígii t'áá alah bik'i'iizoh. "Those that are alike both mark."

Number 48 is:

48. Look at the boxes of circles. Mark the box where the circles are in order from large to small. Tsits'aa' biyi' alhéédá'-idzoígíí níníł'í. Nitsaa dóó áłts'íídíji' ahool'áago ałkéé' nít'i'ígíí bik'i'iizoh.

In English, there are at least four concepts tested here. Three were apparently assumed to be so easy that all children would know them. These are "large," "small," and "from" as the identifier of the starting point for "in order."

In Navajo the same concepts are tested, but the one that is supposedly at issue, "in order," is ambiguous unless the word that expresses the starting point is understood. The literal translation of the Navajo is "Big and small-to extending after each other in a line mark it." The only indication of the starting point is the suffix -ji', which apparently many children missed. Not understanding the direction of the "after each other," they answered poorly. At K

level, 20% left the item blank or marked over the entire picture. Improvement was great at grades 1 and 2. Since this was a hard concept for the English speakers too, the differences were not significant between the groups.

Difficult translations. Another problem that interfered with the technical success of the test was that some of the concepts, as pictured, proved practically untranslatable. Even though one may agree with Katz (1972) that a native speaker who is bilingual can provide a sentence in English for any sentence in his native language, it is clear that this cannot be done simply enough in Navajo for the comprehension of small children. Two sentences of the test had to be expressed in such lengthy phrases that memory is strained, and two apparently illustrate cases in which the semantic range of the Navajo word fails to coincide with English.

Two over-long sentences were:

23. Look at the pictures of a girl. Mark the picture that shows how the girl looked after her hair was cut. At'éód beda'alyaaígíí níníl'í. Díí at'éód táa'go naháaztánígíí t'áá łá' yígíí át'éego át'é. Bitsii' k'égizhgo áádóó bikéédéé anoolníníígíí bik'i'iizoh.:

The two English sentences became three in Navajo because the translators found it necessary to state that the three pictures were of the same girl. It is possible that the middle sentence could be left out, since it really doesn't matter whether it is the same girl or not. The sentence could read, "Mark the picture that shows how a girl looks after . . . etc." Such a small change in the meaning would

still enable one to test the concept "after." In this case, the translation was too accurate.

46. Look at the boxes. One box has an X in it. Skip a box and make another X. Tsits'aa' níníł'í. Tsits'aa' łá' biyi' góne' ałná'ásdzoh bikéé' góne' si'ánígii' bitis dini'íí'. Bitis díni'íí'igii bíighah góne' si'ánígii bik'i'iizoh.

The translators found that in Navajo, no word translated "skip." The circumlocution above is a series of direction for the child, which if followed should get the X in the right box. The trouble is that it is too long to remember. Even at second grade, not even a third of the students were able to solve the puzzle. The approximate literal translation is, "Look at the box(es). The box with an X in it, look over it. The one that you looked over, mark in the one beside it." It would be unlikely that an English-speaking child would mark the right box, given those instructions.

Different ranges of meaning. Two sentences that were ambiguous because the range of meaning of the English word and the Navajo word do not have enough overlap were:

3. Look at the table and the boxes. Mark the box that is away from the table. Bikáá'adání dóó tsits'aa' níníł'í. Tsits'aa' bikáá'adání bits'áádi si'ánígii bik'i'iizoh.

The picture by which this item was tested shows one box on the table, one box under the table, and one box far to the side, on the floor. In English, the concept of "away from" implicitly contrasts here with "near" or "on" when applied to the pictured examples. In

Navajo, the concept bits'áadi includes the box that is under the table, since it too is "away from" the table in a sense.

If the item were rewritten to say "far away" or "by itself," it would then duplicate item 9 (farthest) and 22 (different), discussed below.

18. Look at the glasses on the table. Mark the glass that is at a corner of the table. Tózis bikáá'adání bikáá' naaznilígíí níníł'í. Bikáá'adání dah dik'ánígi tózis sił'ánígíí bik'i'iizoh.

The translators could find no word in Navajo that referred unambiguously to the corner of the flat surface of the table. The word dik'ánígi means a place where a right angle is formed, but any edge of the table would meet that criterion. This item is discussed from another point of view below.

22. Look at the groups of blocks. Mark the group that is different from the others. Tsits'aa' ałk'i dah naazhjaa'ígíí níníł'í. T'áá sahdiı at'éego dah shijaa'ígíí bik'i'iizoh.

The word "different" proved untranslatable, and the word substituted for it means "by itself" or "unique." The picture that tested this item shows three stacks of blocks, one of which has fewer blocks than the other two. This one is unique, but not really by itself.

Despite its being very hard at K level, this item was of moderate difficulty for the total Navajo group, and a reasonably good discriminator. It probably tests the concept of uniqueness cleverly. However, the important semantic content of "different" is that it is the opposite of "same," in the context of the picture. That apparently is not a part of the meaning of t'áá sahdiı

Syntactic problems. The Boehm test was written in simple, direct English sentences appropriate to the youngest children for whom it was intended. The aim of the test was to measure the meaning of certain relational words, and syntactic complexity would have confused the issue.

The general nature of the relational situation, however, often requires that two nominals be mentioned, and this brings the translator into one of the difficult and potentially ambiguous areas of Navajo grammar, the reference of third-person pronominal prefixes.

Despite the fact that all normal children learn to communicate very successfully by the time they reach school age (McNeill, 1971), it has been shown that they do not control the more difficult nuances of their grammar. C. Chomsky (1969) speculated, on the basis of her research, that there is a critical period in which the acquisition of difficult constructions may depend on the degree of linguistic elaboration in the child's environment, his intelligence, and his rate of general cognitive development. If during this critical period he is not in his own language environment, the nuances may not be well learned.

Many Navajo relational sentences take the form of noun-noun-postposition-verb. The postposition requires a pronominal prefix that indicates the person of the noun to which it is related. The verb also has a prefix that cross references the subject-object relation in the sentence. If the subject and object are in different persons, there is no problem. If they are both in the third person, as is the case in the sentences of this test, then a potential ambiguity

exists. Sapir and Hoijer (1967) recognized the problem, and pointed out that is is solved by using the pronominal prefix yi- when the first noun is the subject in a noun-noun-postposition-verb group, and bi- when the first noun is the object.

The sentences of this test, however, as translated by native speakers using their native-speaker intuition, did not always work out this way because of the rank order of nouns. In some sentences the first noun was the subject and in some it was the object, but yi- occurred only when the subject noun was an animate being. If it was a thing, which was the case in almost every example, bi- was used no matter which noun was subject and which object.

Examples are:

16. Look at the boys going to school. Mark the boy who is nearest the door. Ashiiké ółta'góó yikahígíí níníł'ı. Ashkii dáádílkał t'áá' áhánígi yich'ı' yigáłígíí bik'i'iizoh.

Here "boy" is the subject and "door" the object of the postposition. In both the verb and the postposition, the form yi- occurs, indicating that the animate noun, which here is first, is the subject.

20. Look at the sofa and the toys. Mark the toy that is behind the sofa. Bik'idahasdáhí nteelígíí dóó daane'é níníł'ı. Daane'é bik'idahasdáhí nteelígíí bine'dęę si'ánígíí bik'i'iizoh.

Literally, the second sentence is "toy sofa it-behind located mark it." It would seem that the relation is very like "boy near the door," yet here the prefix bi- is used, and yi- would not be correct. The referent of bi- is bik'idahasdahi nteelígíí, "sofa," object of the postposition bine'dęę, "behind."

6. Look at the boxes and marbles. Mark the box that has some but not many marbles. Tsits'aa' dóó máazo nínil'í. Tsits'aa' máazo łá' biyi'ígíí bik'i'iizoh. T'óó ahayoi biyi'ígíí éí dooda.

Here, the marbles are in the box, so the referent of bi- in biyi', "it-in," is the first noun, tsits'aa'.

Clearly, one cannot predict from the prefix alone which of the two nouns it refers to. In fact, there was no apparent trouble from this as long as the nature of the relation did not allow semantic confusion. That is, since a box could not be in the marbles, the sentence was not misunderstood. But the toy could be behind the sofa or the sofa behind the toy--the picture included a toy in front of the sofa as well as one behind it. A few children marked the sofa itself, probably from this kind of misunderstanding.

This syntactic difficulty may have contributed to the low scores on item 18, mentioned above. The first sentence of the item, Tózis bikáá'adání bikáá' naaznilígíí nínil'í, is literally "glasses table it-on located look at." This should have no possible ambiguity. But the second half is Bikáá'adání dah dik'ánígi tózis siánígíí bik'i'iizoh, "table up at a right angle glass located-which mark it." The only pronominal reference is bi- in bik'i'iizoh. In the majority of these sentences, the bi- of bik'i'iizoh refers to the whole preceding clause, which is relativized by the enclitic -ígíí, "the very one," here glossed as "which." The clause is most often composed of the first noun in the sentence with the relation following. The student is accustomed to hearing immediately the class of thing he is to mark--

and in this sentence, he hears bikáá'adání, "table." Many students may have interpreted the sentence to mean "table which has a glass on the edge of it mark it." Ambiguous markings on the test, which were interpreted to be marks on the middle glass (see Table 5, page 117), could have been intended as marks on the whole table.

The matter of the selection of pronominal referent forms for sentences including two third-person references deserves further study. It may prove to be one of the difficult constructions of Navajo, which children do not learn thoroughly before age 7 or 8.

Understood pronouns. The lack of an overt pronominal reference in some sentences may be another instance of true syntactic difficulty. Since all Navajo verb forms are inflected for person, and number is usually apparent, the reference is usually there,but children seemed to have difficulty with such sentences. Some examples are:

36. Look at the dog, the book, and the ear. Mark the one a child always has. Łééchąą'í dóó naaltsoos dóó ajaa' beda'alyaaígíí níníł'í. Áłchíní t'áá álahájí' bee hółóo łehígíí bik'i'iizoh.

There is no free form in the second sentence to correspond to "the one" in English. The postposition and verb bee hółóo mean "with him it exists," and the cross-referencing pronoun affix in bik'i'iizoh means "it-mark." The suffix -ígíí on łeh- means "the one," but apparently was not clearly understood. The child is faced with the need to decide what category of object is being referred to. Navajo answers to this item were apparently almost randomly chosen at K and 1.

Another item in which the noun to be marked is given no overt pronominal expression is:

17. Look at the animals walking in a line. Mark the second animal. Naałdlooshii ałkéé' naazíigo beda'alyaaígíí níníł'í. Naaki góne' akéé' sizínígíí bik'i'iizoh.

The second sentence is literally "two in-the-space something-after located-which it-mark."

This item was average in difficulty, but low in discrimination. First-grade children got it wrong more often than K, and the scores at 2 were the same as K.

Aside from the lack of an overt pronominal reference, there was probably another serious problem in this sentence. The concept intended to be tested was "second," naaki góne'. But implicitly tested also was the concept "in a line," requiring the student to know that when things are in a line pointing in some direction, he starts counting from that direction. Apparently English-speaking students know this by first grade, but the Navajo sentence gives no clue except the word akéé', "after something." The postposition -kéé' occurs in other sentences of the test (see items 21 and 48), and its meaning is "in a line," but it apparently does not include the English directional implication.

Superlatives. A number of the concepts in the English test were superlative forms of adjectives: 9 (farthest), 12 (widest), 13 (most), 50 (least). Since the comparison of adjectives is important in English grammar, it is useful to find out whether children understand the dimensions of the sets such as far-farther-farthest or little-more-most. These are clearly concepts that can be established only

after experience with many different examples of the relations, in situations where the relation itself (rather than the objects involved) is brought to the child's conscious attention.

In Navajo, however, these concepts are not expressed in comparative sets. In some cases they apparently cannot be expressed unambiguously at all. If the comparative items such as "farther" or "more" had been included in the test, it would have been even more difficult to translate into Navajo because there is no clear way to say these things. Young (1971) reported that equality comparisons are made in Navajo, but inequality comparisons are not.

The superlative can sometimes be overtly indicated by the addition of alááh, meaning "beyond anything," to the neuter verb form that supplies the adjectival concept. Examples:

12. Look at the doors. Mark the door that is widest. Dáádílkał níníł'í. Dáádílkał alááh ánílteelígíí bik'i'iizoh. The second sentence is literally "door beyond anything it is relatively wide mark it."

13. Look at the boxes of eggs. Mark the box that has the most eggs. Tsits'aa' ayeezhii biyi'ígíí níníł'í. Tsits'aa' ayeezhii alááh ánéeláá' biyi'ígíí bik'i'iizoh.

The literal translation is "Box eggs beyond anything relatively much in it which mark it."

Navajo children made high scores on these items, both of which tested, in part, the word alááh, "beyond anything."

The type of superlative that could not be translated at all occurred twice. The two examples were 9 (farthest) and 16 (nearest).

The test items were successful only because the pictures did not actually require superlatives. In the picture illustrating "farthest," there were three sailboats, one of which was very large, one moderately large, and one very small. The test sentence was:

9. Mark the boat that is farthest from the shore. Tsinaa'eeł ńléí nízaadi naa'eeł yígíí bik'i'iizoh.

Literally, "boat over there at a far place floating which mark it." Only one boat in the picture was far away--so it would have been selected if the English sentence had read, "Mark the boat that is far away," just as the Navajo sentence did. Number 16, "nearest," showed the backs of three boys and a school steps and door. One boy was very large, at the bottom of the steps; one was medium sized, and in the middle of the steps. One was small and close to the door. The test sentence was:

16. Mark the boy who is nearest the door. Ashkii dáádilkał t'áá' áhánígi yich'ı' yigáłígíí bik'i'iizoh.

Literally, "Boy door just nearby it-toward he walks-which mark it." If the English sentence had read "Mark the boy who is near the door," the correct answer would have been selected.

One more superlative occurs on the test. It is "least," the opposite in English of "most." This created a special problem in Navajo. The sentence is:

50. Look at the groups of stars. Mark the group that has the least stars. Sǫ' dah naazhjaa'go beda'alyaaígíí níníł'ı. Sǫ' áłch'íídígo naashch'aa'igíí bik'i'iizoh.

Literally, this sentence is "Star(s) up there clustered in groups pictured-which look at. Star(s) being-few drawn-which mark it." The problem is that the verb naazhjaa', "they are clustered in groups," is in plural form, and Navajo has a dual as well as plural. Thus the picture with two stars in it, the correct answer, is syntactically excluded from the reference of naazhjaa'.

This item was hard for all students, though by second grade Navajo scores had reached 66% correct, better than either English group. It is interesting to note that the majority of Navajo K and 1 students marked the group of stars that was syntactically correct, the smallest plural number, 3. English-speaking children showed the confusion between "most" and "least" that might be expected with these sets of opposites. No Navajo child beyond K level marked the large group, indicating that the concept of fewness was understood.

School words. The hardest words on the test for English speakers were those that are usually not learned until after starting school. They were 40 (zero) and 47 (equal). In Navajo, however, the translations of these words had no special school-related significance. "Zero" was translated by ádin, "empty," or "all gone." "Equal" was translated by aheenéelt'e', "the same in number.

Since both of these words occur in other items, they were redundant. They do not measure what the Boehm examples were meant to measure.

One more word occurred on the test that was easier for Navajo that for English students. This was 45 (pair), the only one for which

the difference was significant ($p < .001$) at all levels, with Navajo means higher than English means. The item reads:

45. Look at the pictures of candles. Mark the picture that shows a pair of candles. Ak'ahkǫ' beda'alyaaígíí níníł'í. Ak'ahkǫ' naakiígíí bik'i'iizoh.

In English, "pair" is one of many different ways to say "two." In Navajo there is only one way, naaki. The literal translation of the Navajo sentence is, "candles two-which mark." It is hardly surprising that nearly everybody got it right. What is more surprising is that the English speakers did so badly--only 27% right at K, 36% at 1 and 43% at 2. Albuquerque students scored almost the same at 1 and 2. Despite the prevalence of pairs of things in children's early years, apparently the "twoness" of "pair" was not fully comprehended.

Poor discriminators. Low discriminators that were neither too hard nor too easy were items that showed little improvement throughout the grades, or showed a decrement at one of the higher grades. Examples were 17 (second), 19 (several), 38 (right), 39 (forward), and 43 (separated). No Albuquerque English score showed such a decrement.

Of these items, 17 has been discussed above (page 89). It is probable that older children, as they achieved some realization of the dilemma of deciding where to start counting when they wanted to mark the "second" animal, showed their confusion in lower scores. Numbers 19 and 39 are:

19. Look at the groups of animals. Mark the group that has several rabbits. Gah dóó mósi doo ch'éeh dighahii beda'alyaaígíí níníł'í. Gah t'áá łą shijée'go be'alyaaígíí bik'i'iizoh.

The plurality of t'áá łą́ "just a lot," apparently was not clear. The plural morpheme -da- occurred in the first sentence, beda'alyaa "they are pictured," referring to the multiple pictures of animals. There were several animals of one sort or another in each picture.

In the second sentence, the same verb occurs without the plural and means that the child is to mark the (one) picture in which several rabbits are seen. So many children marked the single rabbit--27% at K, 39% at 1, and 34% at 2--that one suspects the children may not have realized that the reference of the verb be'alyaaígíí, "picture (the one) which" was the (one) picture, but thought it was to the (one) rabbit.

Another possibility that occurs to a non-Navajo speaker, listening to the sounds of spoken Navajo, is that the word łą́ sounds much like łą́', a common form with multiple meanings which include "one." This latter word occurred in item 30, "Mark the other dessert," which also received very low scores. There it meant "other," but students marked the desserts so randomly that it could easily have been interpreted to mean "mark one (dessert)."

The same possibility occurs to the non-native listener with regard to the words for "left" and "right," nishtł'a and nish'náá. Children often have difficulty distinguishing these two concepts, and the fact that they begin with the same syllable may make it harder.

Number 39 as well as 29 (beginning to . . .), which was moderately discriminating, were apparently poor translations in the sense that they did not clearly select the correct answers. They are:

39. Look at the boys. Mark the boy who is bending forward. Ashiiké níníł'í. Ashkii náasii' yaago hót'éhígíí bik'i'iizoh.

The literal translation of the test sentence is "Boy forward he is bending-which mark it." For some undeterminable reason, the majority of Navajo students at all grades chose to interpret the bending as backward--K, 67%; 1, 72%; 2, 54%.

29. Look at the trees and squirrels. Mark the squirrel that is beginning to climb a tree. T'iis dóó tsindit'iní níníł'í. T'iis yaah haa'néehgo yaa ńdiidáhígíí bik'i'iizoh.

This item caused more discussion among the translators than any other on the test. It was clear that it was very difficult to express in Navajo the concept of "beginning to climb" with the picture supplied by the test. In some Navajo verbs, the inception of action is shown by a prefix. The verb used here, haa'néeh, does not accept such a prefix. The words in the sentence that clearly indicate "beginning to . . . ." are yaa ńdiidáh, "he is starting." The imperfective verb form used suggests action in progress, "climbing up" suggests that the squirrel is already on the tree, and at grades K and 1, more than half the Navajo students marked the "correct" tree--the one on which the squirrel was in the act of climbing.

Later discussion with Navajo informant Ben Hale brought out still another fact about this translation. The verb form used, haa'néeh,

is not usually applied to the kind of climbing squirrels do. This seems to be a case in which the English word misled the translators, who made too literal a translation.

One final item among the low discriminators is perhaps another example of syntactic difficulty. It is:

43. Look at the beads. Mark the beads that are separated.

Yoo' níníł'í. Yoo' ałts'ádahaas'nilígii bik'i'iizoh.

This provides an example of the multiple affixing of Navajo verb stems to vary the meaning. The stem -nil means "to handle plural objects." Adverbial prefixes are added to indicate reciprocalness, al-, separation, ts'a, plural, da, and seriative haa' (a morphophonemic variant of hi) as well as required paradigmatic prefixes of person, mode, aspect, and verb class. The result is a word including more specific information than the English adjectival past participle "separated."

The concept is carried in the form ałts'á, "separated from each other," but the whole complex may have been too hard for young children to understand.

Summary. The linguistic analysis of the Boehm Test of Basic Concepts in Navajo explains to a large degree the statistical result that only 21.2% of the items are measuring in about the same way. Even for those, we cannot say with certainty that they are testing exactly the same concept, only that the students answered similarly. This is not an impressive percent of commonality.

Several categories of problems were identified. An important one is that many different concept words in English are expressed by few in Navajo. Navajo uses other means than discrete words to vary the meaning of sentences. Though other concepts may be differentially measured in these duplicate-word sentences, the ones the Boehm test expected to measure may not be.

Another problem is that some words are either untranslatable or can be translated only by such complicated circumlocutions that a young child could not be expected to follow them. The concepts may indeed prove to be lacking in the Navajo child's thinking, and teachers may need to teach them when English concepts become necessary. But a test sentence that fails because of length and complexity is not valid. In fact, if the sentence is so difficult to translate, that in itself probably shows that it will be too hard for a child.

Concepts that have different ranges of meaning pose a similar problem. Pictures designed to pin-point the English meaning are slightly or entirely ambiguous when the differently-organized Navajo concept is applied to them.

Differences in level of syntactic complexity and vocabulary difficulty also compounded the translation problem. In particular, Navajo does not have the special school-oriented words of English. School words are translated in Navajo with basic words, resulting in duplication of items.

On the other hand, some of the Navajo concepts required the use of more difficult syntax than English. While the degree to which

the Navajo child controls these aspects of syntax, third person reference and multiple affixing, is important information for the teacher of Navajo, it is not what is being tested. The child may know where "behind" is, but answer the item wrong because he does not understand what is supposed to be behind what.

This syntactic problem would not occur in English, and presumably would not interfere with learning the English concept word later on.

Still another confounding element in translation is that some of the concept words proved to be near-homophones in Navajo. Though perception of the difference is an important language-development skill in Navajo, it confuses the issue of whether the child understands the concept.

Finally, despite great care in making the translation, some items do not test the meaning intended. A fully bilingual translator may unconsciously add some of his second language semantic content to his translation and assume the resulting Navajo sentence to come closer to the exact meaning than it does.

Endnotes for Chapter IV

[1]Two explanations of Navajo syntax and morphology are Sapir, E. & Hoijer, H. The phonology and morphology of the Navajo language. Berkeley: University of California Press, 1967; and Landar, H. J. Navajo syntax. Language, 1963, 39 (3, part 2). Supplement, language dissertation no. 57. Neither is exhaustive, and new things are being discovered about Navajo by native speakers who have become students of linguistics. More definitive Navajo grammars should soon be available.

[2]This and all succeeding English test items are taken from the Boehm Test of Basic Concepts. New York: The Psychological Corporation, 1970. They are quoted here with permission of the publisher.

References for Chapter IV

Boehm, A. E. Boehm test of basic concepts manual. New York: The Psychological Corporation, 1970.

Chomsky, C. The acquisition of syntax in children from 5 to 10. Cambridge, Mass.: MIT Press, 1969.

Ebel, R. L. The relation of item discrimination to test reliability. Journal of Educational Measurement, 1967, 4, 125-128.

Katz, J. J. Semantic theory. New York: Harper & Row, 1972.

McNeill, D. The capacity for the ontogenisis of grammar. In D. I. Slobin (Ed.), The ontogenesis of grammar: a theoretical symposium. New York: Academic Press, 1971.

Popham, J. W. Educational statistics: use and interpretation. New York: Harper & Row, 1967.

Sapir, E. & Hoijer, H. The phonology and morphology of the Navajo language. Berkeley: University of California Press, 1967.

Young, Rodney W. Semantics as a determiner of linguistic comprehension across language and cultural boundaries. (Doctoral dissertation, The University of New Mexico) Ann Arbor, Mich.: University Microfilms, 1971, No. 72-8378.

CHAPTER V

Conclusions

The working hypotheses on which this study was undertaken were:

1. Theories of universals in language are sufficiently convincing so that a reasonably accurate transfer of meaning can be accomplished between any two human natural languages.

2. The similarity of children's rates of development and ability to communicate adequately in any language native to them strongly suggests that basic relational concepts will be a part of each child's linguistic repertoire.

3. A translation of a test of these basic relational concepts could tap this similar meaning stratum in the two languages, and enable cross-language comparison of concept development.

A practical consideration related to these assumptions was the fact that such a test could be useful to teachers of Navajo children. At the very least, concepts soon to be needed in English and apparently lacking in the Navajo children's language could be taught directly.

The major effort in the study was to examine closely the feasibility of translating a test from English to Navajo. Secondarily, I have looked for possible inferences that can be drawn about child language development in Navajo.

Positive results. Only the first assumption of this project was reasonably supported. Native speakers of Navajo who were fully

bilingual in English proved to be able to translate all the test items to their own satisfaction. In only two cases, 39 (forward) and 29 (beginning to . . .) did linguistic intuition apparently fail them.

Successful translation of the test, however, depended not only upon translating the exact meaning of the English concept but on doing it so that a child looking at the test pictures would identify the correct answer if he knew the word and the concept it labelled. Conversely, a wrong answer should indicate that he did not know the meaning of the word or lacked the concept. The language of the translation thus had to be at the appropriate level of syntactic knowledge and memory span.

Negative results. By the criteria of syntactic level and length, many of the items failed. This failure is related to the basic difference between the way English and Navajo express differences in meaning. The concepts of the English test were, in the majority of cases, single words with specific identifiable pragmatic reference. One of the test's good features is that the pictures clearly illustrate the concept words.

The Navajo language does not use different words to express all the different concepts, but rather employs stems with core meaning of a very general nature, which become specific by the addition of affixes of location, direction, benefaction, and the like. In a sense, the Navajo child has fewer basic concept forms to learn, but more complex ways of assembling them.

The problem of syntactic complexity could not be overcome in Navajo by paraphrase of the complex sentences. This supported the conclusion of Rodney Young (1971) that syntactic variety is lacking in Navajo. Young reported that no informant was able to produce a syntactic variation of a given Navajo sentence, and that all Navajo sentences within the same semantic category followed the same pattern. Thus, when any one of the concepts of the Boehm test happened to require a difficult syntactic form in Navajo, the test unavoidably became harder for Navajo children than for English children.

Translatability of this specific test for a specific age group of Navajo children must be considered low. The fact that children of all language groups learn to speak at about the same age, and meet their communication needs very adequately (C. Chomsky, 1969; McNeill, 1971), suggests that there _are_ simple sentences in Navajo and there _are_ important basic concepts expressed in them which children learn to understand and use at an early age. However, these simple expressions of basic concepts were not found by translating this English test of basic concepts. Perhaps they can be found by studying large samples of natural, unedited speech of Navajo children, and subjecting such a corpus to careful linguistic analysis.

Usefulness of the test. I have concluded that the Navajo version of the Boehm test is not the same test as the English version, and thus cannot be used to compare English-speaking and Navajo children. The assumption that the test might prove useful to teachers remains to be considered.

It was originally suggested that the test be utilized to identify concepts that children did not know, and devise ways to teach them. Test results indicate that this could be done, since reliability of the whole test was reasonably good, and many items fell within desirable ranges of discrimination. No harm would result if teachers taught a concept and discovered that in fact the concept was already known, but the test item had been bad. Only a little time would be lost, and the teacher could go on to another concept. With the benefit of the analysis reported here, many items of this test could be changed to express slightly different and less ambiguous versions of the concepts. Others could be improved by drawing pictures that better matched the semantic range of Navajo. The syntactic problem of subject-object third person pronoun reference could be solved pragmatically, by insuring that none of the third-person nouns could be related reversibly.

An unanswered question. One final question remains for consideration. That is, why, since at K level the Navajo test was only 10% harder than the English test, did the Navajo scores improve so slowly? By grade 2 they were 40% below the English scores.

It is possible that K scores included a great deal of random accidental correct choice. If the actual language content is much harder in Navajo than in English, the fact that Navajo students improved more slowly would be explained.

However, there is another possible explanation. This may be an example of the phenomenon described by John (1971) and C. Chomsky (1969). The Navajo child's normal development in his own language

is interfered with at a crucial stage. He has learned the basic language that all children apparently learn by age 5 or 6, but the more difficult syntax, the subtler nuances of meaning, are not yet established. As Vigotsky (1962) said, he may be using words for concepts that are not yet fully known. Or, he may have the concept but not yet have learned how to express it in Navajo.

What happens to him linguistically at ages 5-10 may importantly determine whether he ever reaches the higher levels of Navajo language development. One cannot, on the basis of this test result, discount the possibility that the amount of English instruction and English-language experience that is being given to these Navajo children at grades 1 and 2 is slowing their growth in the Navajo language.

Since a steady growth is revealed, the students probably would have mastered the concepts of this test by grade 3 or 4. Perhaps the slowdown in Navajo is not important, or at least is offset by the value of learning a second language. No value judgment is offered here.

Summary. Despite the failure of the translated test as a measure of comparison between concept development of English and Navajo children, the test could be used as a comparative measure of Navajo children's Navajo language knowledge. It produced a reasonable distribution of answers, though correlating only moderately with the English version. If it were to be used as a Navajo language test, the less discriminating items could be omitted and the test standardized

for Navajo children alone. Correlations could be developed with other measures of achievement, and predictive validity established.

My final conclusion is that it is not highly feasible to employ the translation method for producing test instruments in Navajo. Any translated test should be studied with great care and administered with caution. Syntactic differences and the different organization of semantic categories in the two languages are almost certain to change the test beyond recognition.

References for Chapter V

Chomsky, C. The acquisition of syntax in children from 5 to 10. Cambridge, Mass.: MIT Press, 1969.

John, V. P. & Horner, V. M. Early childhood bilingual education. New York: Modern Language Association, 1971.

McNeill, D. The capacity for the ontogenesis of grammer. In D. I. Slobin (Ed.), The ontogenesis of grammer: a theoretical symposium. New York: Academic Press, 1971.

Vigotsky, L. S. Thought and language. (Trans. E. Hanfmann & G. Vakar) Cambridge, Mass.: MIT Press, 1962.

Young, Rodney W. Semantics as a determiner of linguistic comprehension across language and cultural boundaries. (Doctoral dissertation, University of New Mexico) Ann Arbor, Mich.: University Microfilms, 1971, No. 72-8378.

APPENDIX A

Statistical Data

TABLE 4

Concept Words, Pictures, and Percent Right: English Boehm, English Albuquerque, and Navajo[a]

CONTEXT CATEGORIES:
S = Space (location, direction, orientation, dimensions)
Q = Quantity (and number)
T = Time
M = Miscellaneous

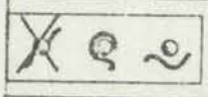
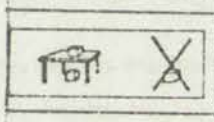
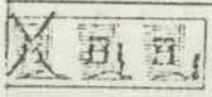
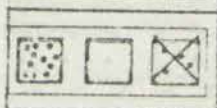
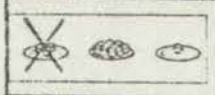
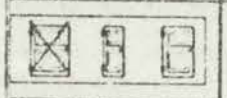
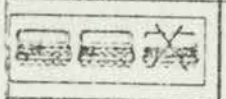
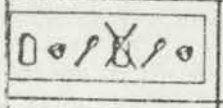
	CONCEPT	KEY	CONTEXT CATEGORY	K English Boehm N 162	K Navajo N 30		1 English Boehm N 276	1 English Albq. N 60	1 Navajo N 46		2 English Boehm N 222	2 English Albq. N 67	2 Navajo N 50
BOOKLET 1 1. Top	bikáa'gi...hódahdi		S	62	63		99	100	96		98	98	100
2. Through	binikáanit'i'		S	86	90		99	98	98		100	100	100
3. Away from	bits'ąądi		S	59	20		96	97	37		99	97	54
4. Next to	biighahgóó		S	73	3		98	100	18		98	100	42
5. Inside	yii'		S	82	77		99	100	98		100	100	100
6. Some, not many	ła'...tóó ahayoi		Q	84	87		98	95	96		99	95	100
7. Middle	ałnii'gi		S	80	77		96	98	93		95	100	94
8. Few	t'áá díkwíihí		Q	60	73		87	95	87		90	96	89
9. Farthest	nléí nízaadi		S	71	93		92	97	98		96	98	100
10. Around	binaagóó		S	83	90		100	100	97		100	100	100
11. Over	bikáadi		S	72	70		86	100	85		96	100	96
12. Widest	alááh ánílteel		Q	70	80		92	92	93		95	98	100
13. Most	alááh ánéel		Q	85	97		96	95	100		99	98	100
14. Between	bita' góne'		S	68	27		90	78	66		91	100	74
15. Whole	t'áá át'é		Q	65	95		84	88	100		94	96	98
16. Nearest	t'áá áhánígi		S	93	90		99	100	96		97	100	98

TABLE 4 (continued)

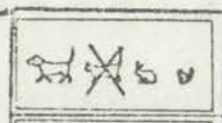
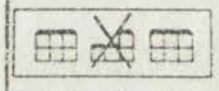
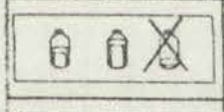
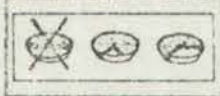
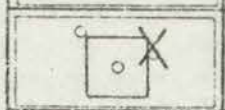
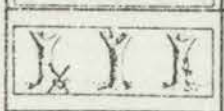
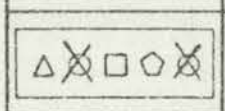
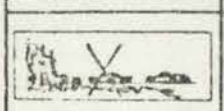
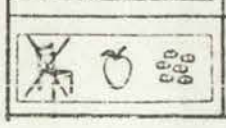
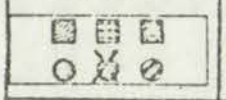
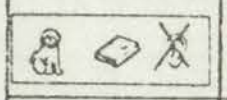
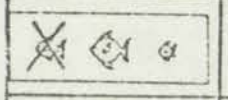
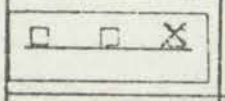
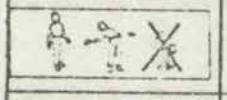
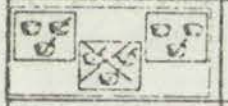
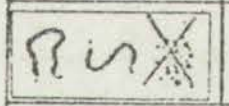
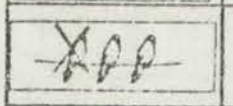
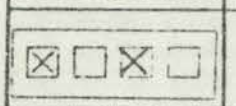
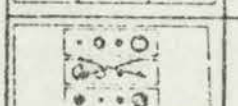
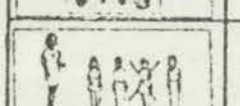
				K			1				2		
				English Boehm N 162	Navajo N 30		English Boehm N 276	English Albq. N 60	Navajo N 46		English Boehm N 222	English Albq. N 67	Navajo N 50
17. Second	naaki góne' akéé'		Q	52	44		87	88	30		98	100	45
18. Corner	dah dik'ánígí		S	71	6		91	84	33		97	100	60
19. Several	t'áá łą		Q	81	70		85	90	54		89	98	66
20. Behind	bine'dęę́		S	74	83		92	67	80		98	93	92
21. Row	k'éhézdongo ałkéé'		S	59	73		92	90	90		95	100	100
22. Different	t'áá sahdi		M	69	34		94	94	54		97	100	60
23. After	bikéé'dęę́'		T	72	63		85	92	85		91	97	72
24. Almost	k'adęę́...ádiih		Q	75	80		84	83	85		86	93	98
25. Half	ałníí'dóó ádin		Q	74	57		87	92	59		92	96	84
BOOKLET 2 26. Center	ałníí'gi		S	1 64	2 77	3	4 76	5 72	6 94	7	8 75	9 78	10 100
27. As many	beenéelt'e'		Q	34	3		81	92	15		89	98	54
28. Side	bibąąhgi		S	48	47		75	72	67		82	83	81
29. Beginning	yąąh haa'née		T	59	30		77	83	26		90	95	54
30. Other	ła'		M	58	20		84	80	24		91	93	54
31. Alike	aheełt'é		M	60	10		80	83	13		91	93	14
32. Not first or last	doo áłtsé... doo akéédęę́		Q	49	13		79	83	29		93	100	60
33. Never	ts'ídá doo		T	38	13		75	82	34		92	96	68

TABLE 4 (continued)

				K			1				2		
				English Boehm N 162	Navajo N 30		English Boehm N 276	English Albq. N 60	Navajo N 46		English Boehm N 222	English Albq. N 67	Navajo N 50
34. Below	biyaadi		S	51	77		87	78	82		88	87	96
35. Matches	beełt'ée		M	46	30		61	80	50		69	95	48
36. Always	t'áá áłahaji'		T	34	33		68	72	37		84	89	64
37. Medium-sized	t'áá ata' áníłtsoo		Q	20	13		41	65	17		56	87	50
38. Right	nish'náá		S	45	43		67	63	43		82	76	60
39. Forward	náasii' yaago hot'éh		S	45	30		51	67	29		75	76	46
40. Zero	ádin		Q	24	87		83	88	100		96	98	100
41. Above	bikáadi		S	55	97		70	74	98		86	98	100
42. Every	t'áá át'é		Q	71	80		83	83	98		93	98	98
43. Separated	ałts'adahaasnil		S	49	60		63	67	85		75	81	76
44. Left	nishtł'a		S	43	23		61	63	46		78	78	60
45. Pair	naaki		Q	26	93		36	25	99		43	46	100
46. Skip	bitis		M	27	13		70	60	22		85	84	30
47. Equal	aheenéełt'e'		Q	10	20		34	20	20		63	43	81
48. In order	ałkéé'		S	26	10		42	45	48		71	88	68
49. Third	táá' góne'		Q	21	17		47	46	48		68	85	46
50. Least	áłch'íidí		Q	18	20		29	35	33		44	49	66

[a]Translated and reproduced by permission for research purposes only. See Appendix B for full translation of all items.

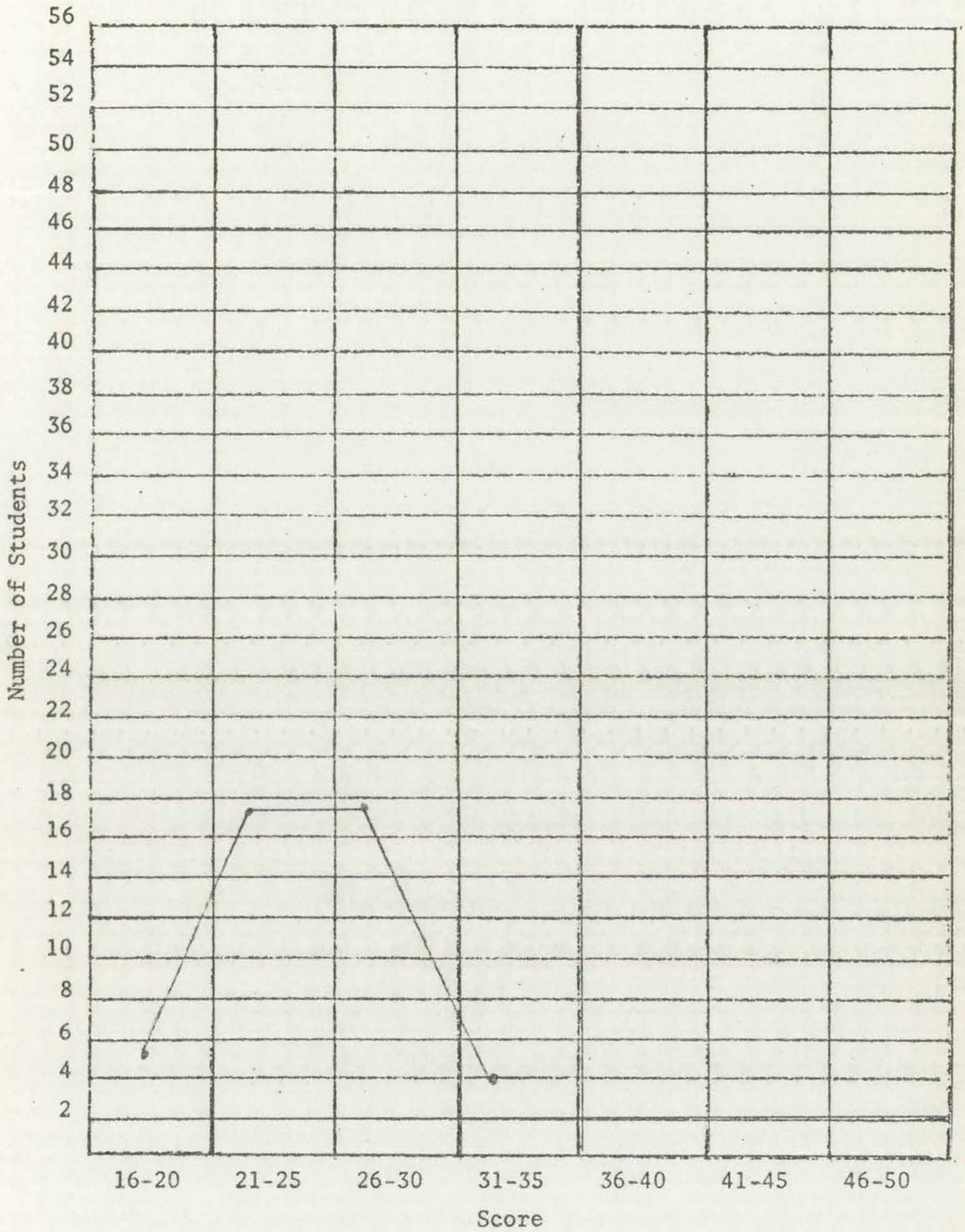


FIGURE 3

Raw Score Distribution: Navajo K

Note.--Navajo _____ N 30

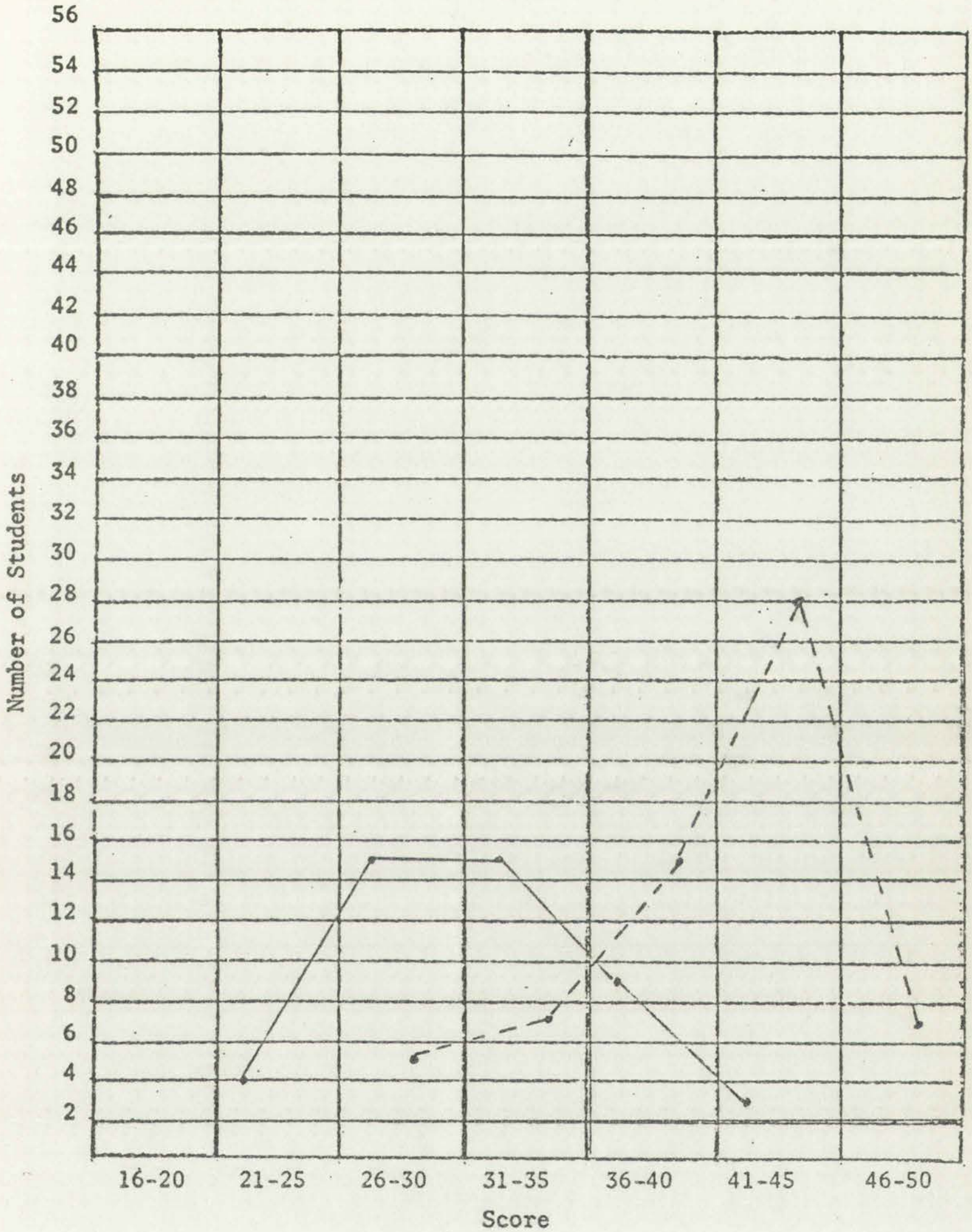


FIGURE 4

Raw Score Distribution: Navajo 1 and English Albuquerque 1

Note.--Navajo ——— N 46
English ---- N 60

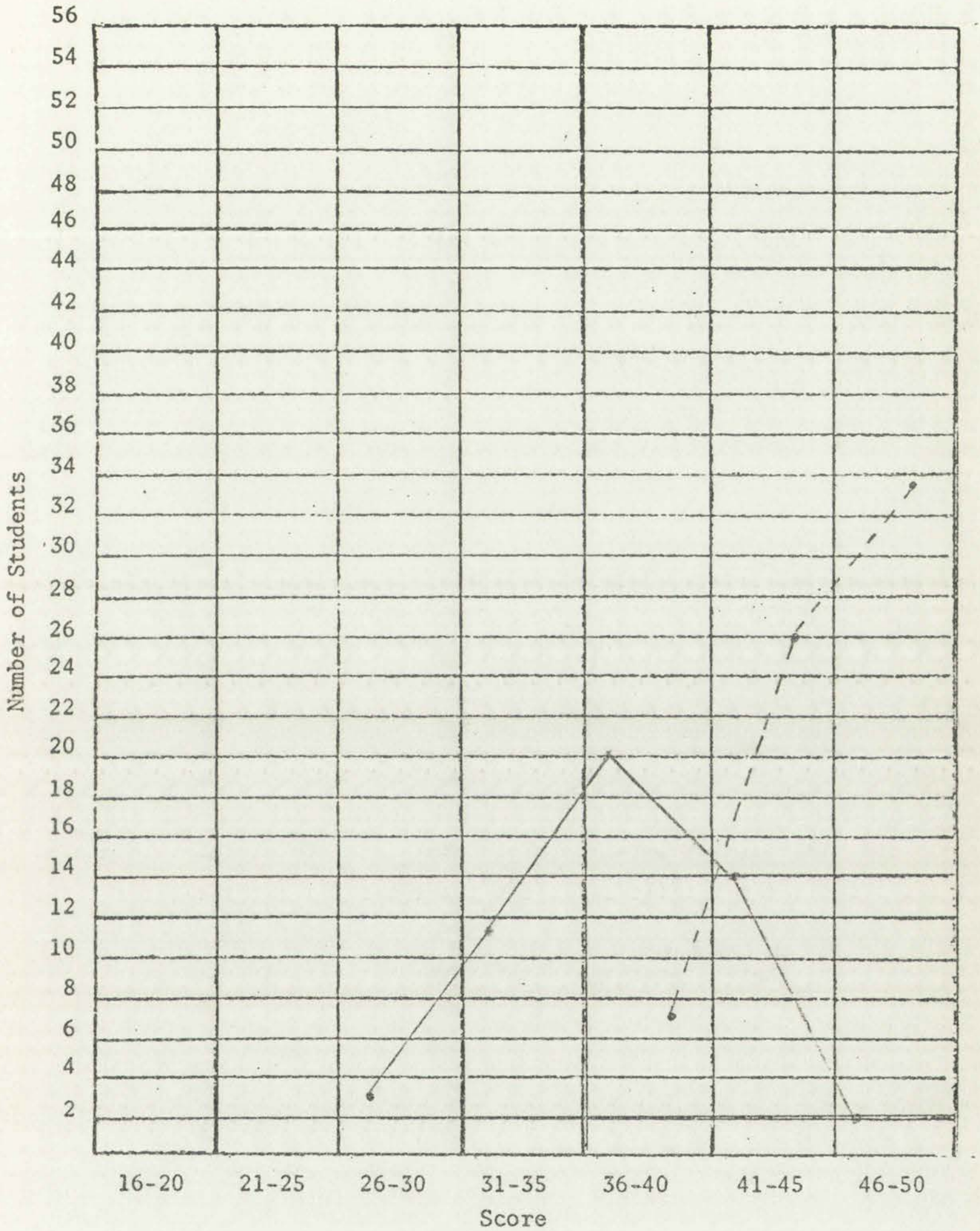


FIGURE 5

Raw Score Distribution: Navajo 2 and English Albuquerque 2

Note.--Navajo ——— N 50
English ---- N 67

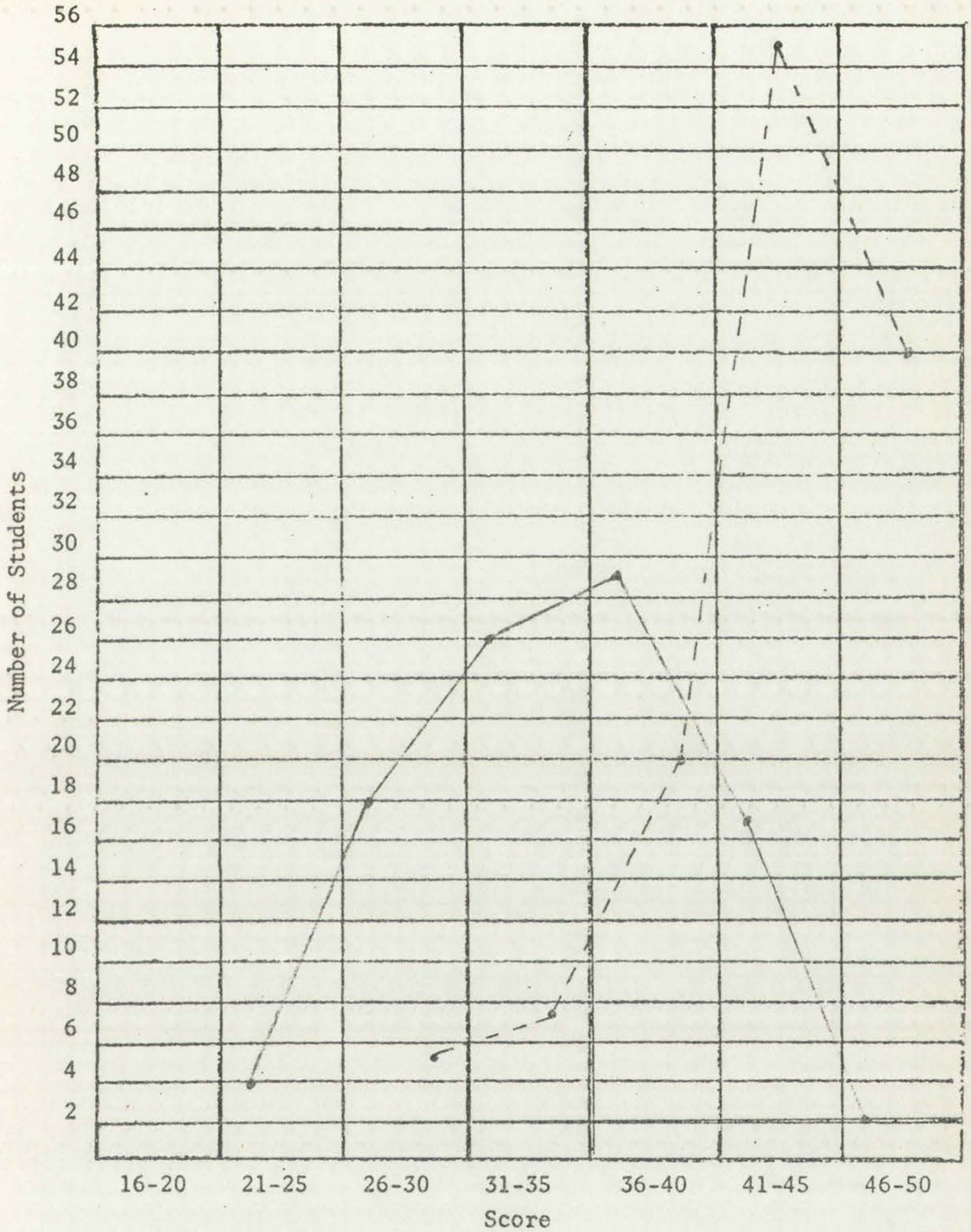


FIGURE 6

Raw Score Distribution: Navajo 1 and 2 Combined;
English Albuquerque 1 and 2 Combined

Note.--Navajo —— N 96
English ---- N 127

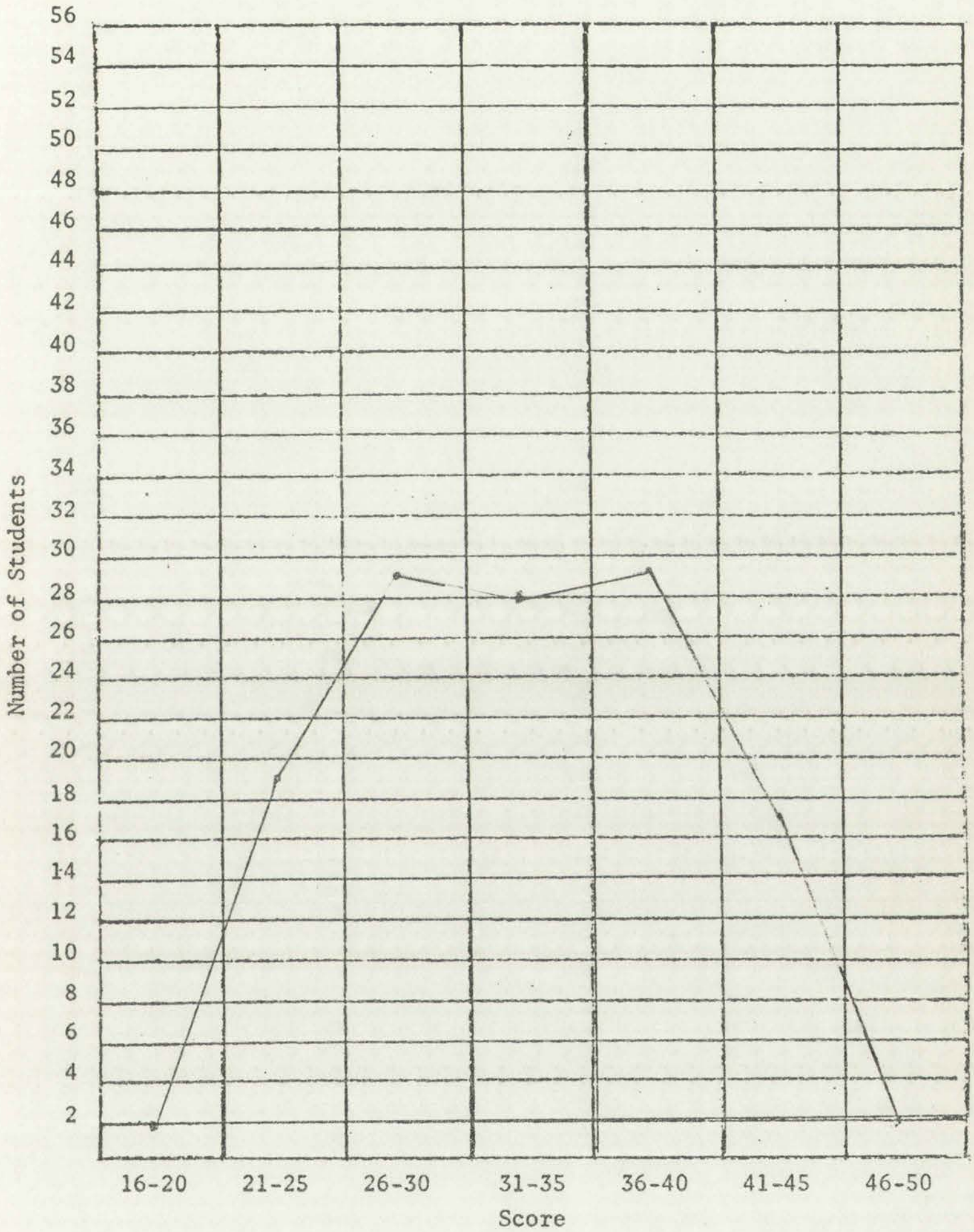


FIGURE 7

Raw Score Distribution: Navajo K, 1 and 2

Note.--Navajo ——— N 126

TABLE 5

Percent Choosing Each Answer: English
Albuquerque and Navajo[a]

Item	Grade	Percent Choosing Each Answer[b]													
		1		2		3		4		5		6		Ambiguous	
		E	N	E	N	E	N	E	N	E	N	E	N	E	N
	K	-	17	-	10	-	63							-	10
1	1	0	2	0	0	100	96							0	2
	2	0	0	2	0	98	100							0	0
	K	-	90	-	0	-	0							-	10
2	1	100	98	0	0	0	2							0	0
	2	100	100	0	0	0	0							0	0
	K	-	20	-	13	-	20							-	47
3	1	0	19	0	22	97	37							3	22
	2	2	6	0	26	97	54							0	14
	K	-	80	-	3	-	7	-	0					0	10
4	1	0	78	100	18	0	2	0	0					0	2
	2	0	58	100	42	0	0	0	0					0	0
	K	-	77	-	13	-	3							0	7
5	1	100	98	0	0	0	2							0	0
	2	100	100	0	0	0	0							0	0

Note.--Navajo K N 30 English Albuquerque 1 N 60
1 N 46 2 N 67
2 N 50

[a]Navajo students are called "beginners" in the first school year, and "first grade" in the second year. For convenience, grades 1 and 2 have been used here to refer to both Navajo and English students of the same age and years in school.

[b]Most items on the Boehm Test of Basic Concepts have three choices. A few have more. The category "ambiguous" includes double markings and blanks. The percent of students answering each item correctly is underlined.

TABLE 5 (continued)

Item	Grade	Percent Choosing Each Answer													
		1		2		3		4		5		6		Ambiguous	
		E	N	E	N	E	N	E	N	E	N	E	N	E	N
	K	-	3	-	0	-	87							-	10
6	1	3	4	0	0	95	96							2	0
	2	3	0	0	0	95	100							2	0
	K	-	17	-	0	-	77	-	0	-	3			-	3
7	1	0	0	0	0	98	93	0	0	1	2			1	5
	2	0	3	0	0	100	94	0	0	0	3			0	0
	K	-	73	-	10	-	10							-	7
8	1	95	87	0	0	5	13							0	0
	2	96	89	0	2	4	8							0	1
	K	-	0	-	93	-	7							-	0
9	1	1	2	97	98	1	0							1	0
	2	1	0	98	100	1	0							0	0
	K	-	90	-	0	-	0							-	10
10	1	100	97	0	3	0	0							0	0
	2	100	100	0	0	0	0							0	0
	K	-	0	-	70	-	0							-	30
11	1	0	0	100	85	0	0							0	15
	2	0	0	100	96	0	0							0	4
	K	-	80	-	10	-	10							0	0
12	1	92	93	7	3	1	4							0	0
	2	98	100	1	0	0	0							1	0
	K	-	3	-	0	-	97							-	0
13	1	0	0	3	0	95	100							2	0
	2	0	0	2	0	98	100							0	0
	K	-	3	-	0	-	50	-	27	-	17	-	0	-	3
14	1	0	0	0	4	0	26	78	66	0	2	1	2	10	0
	2	0	0	0	4	0	16	100	74	0	6	0	0	0	0

TABLE 5 (continued)

Item	Grade	Percent Choosing Each Answer													
		1		2		3		4		5		6		Ambiguous	
		E	N	E	N	E	N	E	N	E	N	E	N	E	N
	K	-	3	-	94	-	3							-	0
15	1	8	0	88	100	4	0							0	0
	2	2	2	96	98	2	0							0	0
	K	-	0	-	0	-	90							-	10
16	1	0	0	0	4	100	96							0	0
	2	0	0	0	2	100	98							0	0
	K	-	13	-	44	-	20	-	10					-	13
17	1	4	13	88	30	2	37	6	20					0	0
	2	0	4	100	45	0	35	0	12					0	2
	K	-	6	-	60	-	6							-	27
18	1	84	33	6	56	8	4							2	9
	2	100	60	0	30	0	8							0	2
	K	-	27	-	0	-	70							-	3
19	1	6	39	2	4	90	54							2	3
	2	2	34	0	0	98	66							0	3
	K	-	83	-	0	-	14	-	0					-	3
20	1	67	80	26	0	0	13	5	2					2	4
	2	93	92	6	2	0	4	0	2					1	0
	K	-	10	-	73	-	6							-	10
21	1	5	5	90	90	3	5							2	0
	2	0	0	100	100	0	0							0	0
	K	-	34	-	34	-	16							-	16
22	1	2	35	94	54	2	9							2	0
	2	0	20	100	60	0	18							0	2
	K	-	63	-	7	-	23							-	7
23	1	92	85	4	6	2	9							2	0
	2	97	72	1	20	2	8							0	0

TABLE 5 (continued)

Item	Grade	Percent Choosing Each Answer													
		1		2		3		4		5		6		Ambiguous	
		E	N	E	N	E	N	E	N	E	N	E	N	E	N
	K	-	17	-	3	-	80							-	0
24	1	17	15	0	0	83	85							0	0
	2	6	2	0	0	93	98							2	0
	K	-	57	-	30	-	10							-	0
25	1	92	59	3	41	3	0							2	0
	2	96	84	4	14	0	2							0	0
	K	-	0	-	0	-	77	-	3					-	20
26	1	2	0	17	0	72	94	7	0					2	6
	2	0	0	9	0	78	100	9	0					4	0
	K	-	87	-	0	-	0	-	3					-	10
27	1	7	80	0	0	0	0	92	15					2	0
	2	2	46	0	0	0	0	98	54					0	0
	K	-	7	-	33	-	47							-	13
28	1	18	11	7	15	72	67							3	7
	2	16	18	0	0	83	81							3	0
	K	-	30	-	10	-	57							0	3
29	1	83	26	0	15	15	59							0	0
	2	95	54	0	6	6	38							0	3
	K	-	37	-	20	-	23							-	20
30	1	3	34	80	24	15	34							1	7
	2	4	14	93	54	3	28							0	4
	K	-	0	-	33	-	17	-	0	-	57	-	10	-	30
31[c]	1	0	4	5	54	2	9	0	0	2	37	83	13	7	4
	2	0	2	2	50	0	2	0	2	3	66	93	14	3	0
	K	-	10	-	13	-	57							-	20
32	1	0	13	83	29	13	57							2	2
	2	0	14	100	60	0	16							0	10

[c]This item required two marks; answer 6 is the correct answer, requiring that answer 2 and 5 both be marked.

TABLE 5 (continued)

Item	Grade	Percent Choosing Each Answer													
		1		2		3		4		5		6		Ambiguous	
		E	N	E	N	E	N	E	N	E	N	E	N	E	N
	K	-	13	-	60	-	27							-	0
33	1	82	34	8	30	7	34							2	0
	2	96	68	2	12	2	20							0	0
	K	-	7	-	10	-	77	-	7					-	0
34	1	15	2	0	7	78	82	7	9					0	0
	2	8	0	3	2	87	96	2	2					0	0
	K	-	13	-	23	-	7	-	30	-	20	-	7	-	0
35	1	0	7	7	20	2	2	80	50	2	17	0	4	10	0
	2	0	4	3	4	0	0	95	48	2	38	0	2	2	4
	K	-	20	-	37	-	33							-	10
36	1	10	26	15	34	72	37							3	0
	2	6	12	2	22	89	64							3	0
	K	-	13	-	67	-	20							-	0
37	1	65	17	20	54	10	22							5	4
	2	87	50	9	26	2	22							2	2
	K	-	37	-	10	-	43							-	10
38	1	23	57	7	0	63	43							7	0
	2	18	38	3	0	76	60							3	0
	K	-	0	-	67	-	30							-	3
39	1	0	0	33	72	67	29							0	0
	2	0	0	15	54	76	46							7	0
	K	-	87	-	7	-	3							-	0
40	1	88	100	7	0	3	0							2	0
	2	98	100	0	0	2	0							0	0
	K	-	97	-	0	-	3							-	0
41	1	74	98	20	2	3	0							3	0
	2	98	100	0	0	2	0							0	0

TABLE 5 (continued)

Item	Grade	Percent Choosing Each Answer													
		1		2		3		4		5		6		Ambiguous	
		E	N	E	N	E	N	E	N	E	N	E	N	E	N
	K	-	7	-	80	-	10							-	3
42	1	5	2	83	98	3	0							7	0
	2	0	2	98	98	0	0							2	0
	K	-	10	-	23	-	60							-	7
43	1	23	4	7	11	67	85							3	0
	2	16	10	3	14	81	76							2	0
	K	-	23	-	3	-	70							-	3
44	1	63	46	2	0	28	54							7	0
	2	78	60	0	2	22	38							0	0
	K	-	0	-	3	-	93							-	3
45	1	68	2	5	0	25	99							2	0
	2	54	0	0	0	46	100							0	0
	K	-	13	-	61	-	13	-	10					-	3
46	1	0	9	22	63	60	22	5	4					13	2
	2	0	6	9	50	84	30	0	12					3	2
	K	-	23	-	57	-	20	-	20					-	7
47[d]	1	47	37	22	30	30	50	20	20					8	2
	2	13	93	30	3	10	91	43	81					0	2
	K	-	23	-	10	-	7							-	20
48	1	38	37	45	48	7	7							10	7
	2	7	24	88	68	3	4							2	4
	K	-	7	-	50	-	17	-	17	-	0			-	10
49	1	0	2	23	22	15	15	46	48	12	0			3	13
	2	0	0	12	6	0	26	85	46	2	16			2	6
	K	-	20	-	77	-	0							-	3
50	1	35	33	15	67	37	0							6	0
	2	49	66	12	34	36	0							3	0

[d]This item required two marks; answer 4 is correct, requiring that answers 1 and 3 both be marked.

TABLE 6

Percent Passing Each Item, by Grade and Socioeconomic Level[a]

Item	Kindergarten N 162	Grade 1 N 276	Grade 2 N 222
	Socioeconomic Level: Low	Socioeconomic Level: Low	Socioeconomic Level: Low
Booklet 1			
1	62	99	98
2	86	99	100
3	59	96	99
4	73	98	98
5	82	99	100
6	84	98	99
7	80	96	95
8	60	87	90
9	71	92	96
10	83	100	100
11	72	86	98
12	70	92	95
13	85	96	99
14	68	90	91
15	65	84	94
16	93	99	97
17	52	87	98
18	71	91	97
19	81	85	89
20	74	92	98
21	59	92	95
22	69	94	97
23	72	85	91
24	75	84	86
25	74	87	92

[a]Boehm, A. E. Boehm Test of Basic Concepts Manual. New York: Psychological Corporation, 1970, p. 19.

TABLE 6 (continued)

Item	Kindergarten N 162	Grade 1 N 276	Grade 2 N 222
	Socioeconomic Level: Low	Socioeconomic Level: Low	Socioeconomic Level: Low
Booklet 2			
26	64	76	75
27	34	81	89
28	48	75	82
29	59	77	90
30	58	84	91
31	60	80	91
32	49	79	93
33	38	75	92
34	51	87	88
35	46	61	69
36	34	68	84
37	20	41	56
38	45	67	82
39	45	51	75
40	24	83	96
41	55	70	86
42	71	83	93
43	49	63	75
44	43	61	78
45	26	36	43
46	27	70	85
47	10	34	63
48	26	42	71
49	21	47	68
50	18	29	44

TABLE 7

Semantic Classification of Boehm Concepts[a]

	Concept	Context Category			
		Space	Quantity	Time	Miscellaneous
1	Top	x			
2	Through	x			
3	Away from	x			
4	Next to	x		x	
5	Inside	x			
6	Some, not many		x		
7	Middle	x		x	
8	Few		x		
9	Farthest	x		x	
10	Around	x			
11	Over	x			
12	Widest		x		
13	Most		x		
14	Between	x		x	
15	Whole		x		
16	Nearest	x		x	
17	Second	x	x	x	
18	Corner	x			
19	Several		x		
20	Behind	x			
21	Row	x			
22	Different				x
23	After	x		x	
24	Almost		x		
25	Half		x		
26	Center	x			
27	As many		x		
28	Side	x			
29	Beginning	x		x	
30	Other				x

[a]Boehm, A. E. Boehm Test of Basic Concepts Manual. New York: Psychological Corporation, 1970, p. 12.

TABLE 7 (continued)

	Concept	Context Category			
		Space	Quantity	Time	Miscellaneous
31	Alike				x
32	Not first or last	x	x	x	
33	Never			x	
34	Below	x			
35	Matches				x
36	Always			x	
37	Medium-sized		x		
38	Right	x			
39	Forward	x			
40	Zero		x		
41	Above	x			
42	Every		x		
43	Separated	x		x	
44	Left	x			
45	Pair		x		
46	Skip				x
47	Equal		x		
48	In order	x			
49	Third	x	x	x	
50	Least		x		

TABLE 8

Navajo

Factor Analysis Weight in Factor and
Item Analysis Index of Difficulty

Item	Index of Difficulty	Weight in Factor
	Factor 1	
3	.412	.413
4	.238	.405
18	.365	.308
22	.515	.368
27	.277	.679
31	.142	.379
32	.373	.582
33	.484	.549
36	.476	.559
37	.309	.450
44	.476	.546
47	.404	.710
48	.452	.526
50	.428	.421
	Factor 2	
5	.928	.366
7	.896	.423
14	.587	.316

TABLE 8 (continued)

Item	Index of Difficulty	Weight in Factor
19	.642	.311
26	.904	.593
28	.690	.432
39	.428	.368
40	.968	.533
42	.936	.363
43	.746	.521
45	.944	.406
Factor 3		
1	.901	.511
2	.968	.648
5	.928	.483
8	.841	.436
9	.968	.639
12	.928	.447
Factor 4		
14	.587	.370
18	.365	.487
34	.825	.529

TABLE 8 (continued)

Item	Index of Difficulty	Weight in Factor
35	.412	.557
37	.309	.337
38	.500	.389
49	.373	.470
	Factor 5	
1	.904	.413
6	.936	.368
13	.992	.601
20	.857	.338
21	.881	.513
42	.936	.595
	Factor 6	
10	.960	.416
11	.896	.765
15	.976	.370
16	.952	.680
17	.365	.379
20	.857	.602
21	.881	.343
40	.968	.451

TABLE 9

General Statistics: Item Analysis

Grade	Navajo							English Albuquerque						
	N	High	Low	Mean	SD	SE_m	r^a	N	High	Low	Mean	SD	SE_m	r^a
1	46	42	21	32	5.11	.75	.75	60	48	27	40	5.32	.69	.80
2	50	47	27	38	4.29	.61	.65	67	50	36	45	3.06	.37	.64
1 & 2	96	47	21	37	5.56	.57	.77	127	50	27	42	6.08	.54	.87
K, 1 & 2	126	47	16	32	6.63	.59	.83	-	-	-	-	-	-	-

[a]KR 20

TABLE 10

Index of Difficulty and Discrimination
Navajo Grade 1
N 46

Difficulty				Discrimination[a]			
By Item		By Difficulty		By Item		By Discrimination	
1	0.9783	31	0.1087	1	0.2934	19	-0.1505
2	0.9783	4	0.1739	2	-0.0272	24	-0.1129
3	0.3696	27	0.1739	3	0.4042	6	-0.0390
4	0.1739	37	0.2174	4	0.3867	38	-0.0283
5	0.9783	17	0.2391	5	0.3226	2	-0.0272
6	0.9565	30	0.2391	6	-0.0390	43	0.0291
7	0.9348	46	0.2391	7	0.1067	23	0.0409
8	0.8696	47	0.2391	8	0.0933	8	0.0933
9	0.9783	29	0.2609	9	0.2934	25	0.0973
10	0.9783	32	0.2609	10	0.1477	17	0.1025
11	0.8913	18	0.3043	11	0.4142	7	0.1067
12	0.9348	50	0.3261	12	0.3305	36	0.1400
13	1.0000	3	0.3696	14	0.4021	10	0.1477
14	0.6522	36	0.3696	16	0.3988	30	0.1523
15	1.0000	38	0.4348	17	0.1025	41	0.2351
16	0.9565	49	0.4348	18	0.4535	44	0.2529
17	0.2391	35	0.4565	19	-0.1505	29	0.2732
18	0.3043	44	0.4565	20	0.4028	26	0.2737
19	0.5435	48	0.4565	21	0.3079	1	0.2934
20	0.8043	33	0.5000	22	0.3531	9	0.2934
21	0.8696	39	0.5000	23	0.0409	21	0.3079
22	0.5435	19	0.5435	24	-0.1129	28	0.3226
23	0.8478	22	0.5435	25	0.0973	5	0.3226
24	0.8478	25	0.6087	26	0.2737	42	0.3226
25	0.6087	14	0.6522	27	0.4428	12	0.3305
26	0.9565	28	0.6957	28	0.3226	22	0.3531
27	0.1739	34	0.7609	29	0.2732	45	0.3649
28	0.6957	20	0.8043	30	0.1523	49	0.3661
29	0.2609	23	0.8478	31	0.4599	37	0.3849
30	0.2391	24	0.8478	32	0.5249	4	0.3867

[a]Items which all students answered correctly are nondiscriminating and so do not appear on this table.

TABLE 10 (continued)

Difficulty				Discrimination			
By Item		By Difficulty		By Item		By Discrimination	
31	0.1087	43	0.8478	33	0.4974	16	0.3988
32	0.2609	8	0.8696	34	0.5354	50	0.3992
33	0.5000	21	0.8696	35	0.5345	14	0.4021
34	0.7609	11	0.8913	36	0.1400	20	0.4028
35	0.4565	7	0.9348	37	0.3849	3	0.4042
36	0.3696	12	0.9348	38	-0.0283	11	0.4142
37	0.2174	45	0.9348	39	0.4294	46	0.4214
38	0.4348	6	0.9565	41	0.2351	39	0.4294
39	0.5000	16	0.9565	42	0.3226	27	0.4428
40	1.0000	26	0.9565	43	0.0291	18	0.4535
41	0.9783	1	0.9783	44	0.2529	31	0.4599
42	0.9783	2	0.9783	45	0.3649	33	0.4974
43	0.8478	5	0.9783	46	0.4214	48	0.5089
44	0.4565	9	0.9783	47	0.5609	32	0.5249
45	0.9348	10	0.9783	48	0.5089	35	0.5345
46	0.2391	41	0.9783	49	0.3661	34	0.5354
47	0.2391	42	0.9783	50	0.3992	47	0.5609
48	0.4565	13	1.0000				
49	0.4348	15	1.0000				
50	0.3261	40	1.0000				

TABLE 11

Index of Difficulty and Discrimination
English Albuquerque Grade 1
N 60

Difficulty				Discrimination[a]			
By Item		By Difficulty		By Item		By Discrimination	
1	1.0000	47	0.1333	3	0.3629	24	-0.1344
2	1.0000	45	0.2000	6	0.2112	26	0.0507
3	0.9667	50	0.3333	7	0.0837	8	0.0675
4	1.0000	48	0.4667	8	0.0675	7	0.0837
5	1.0000	49	0.4833	9	0.2408	13	0.0963
6	0.9500	38	0.6167	12	0.3003	36	0.0994
7	0.9667	44	0.6333	13	0.0963	42	0.1149
8	0.9500	46	0.6333	14	0.3895	23	0.2084
9	0.9667	37	0.6500	15	0.3335	6	0.2112
10	1.0000	43	0.6500	17	0.3904	25	0.2129
11	1.0000	20	0.6667	18	0.6467	9	0.2408
12	0.9167	39	0.6833	19	0.2663	46	0.2521
13	0.9500	28	0.7000	20	0.5049	47	0.2561
14	0.7667	26	0.7167	21	0.3278	19	0.2663
15	0.8667	36	0.7167	22	0.4555	32	0.2956
16	1.0000	41	0.7333	23	0.2084	12	0.3003
17	0.9000	14	0.7667	24	-0.1344	27	0.3116
18	0.8667	34	0.7667	25	0.2129	30	0.3116
19	0.8833	35	0.7833	26	0.0507	50	0.3122
20	0.6667	30	0.8000	27	0.3116	45	0.3147
21	0.9000	33	0.8167	28	0.4592	33	0.3148
22	0.9500	24	0.8333	29	0.5622	40	0.3248
23	0.9333	29	0.8500	30	0.3116	21	0.3278
24	0.8333	42	0.8500	31	0.3427	15	0.3335
25	0.9000	15	0.8667	32	0.2956	31	0.3427
26	0.7167	18	0.8667	33	0.3148	3	0.3629
27	0.9167	31	0.8667	34	0.5079	44	0.3756
28	0.7000	19	0.8833	35	0.5070	43	0.3802
29	0.8500	32	0.8833	36	0.0994	14	0.3895
30	0.8000	40	0.8833	37	0.5771	17	0.3904

[a]Items which all students answered correctly are nondiscriminating and so do not appear on this table.

TABLE 11 (continued)

Difficulty				Discrimination			
By Item		By Difficulty		By Item		By Discrimination	
31	0.8667	17	0.9000	38	0.4940	41	0.4277
32	0.8833	21	0.9000	39	0.5325	49	0.4318
33	0.8167	25	0.9000	40	0.3248	22	0.4555
34	0.7667	12	0.9167	41	0.4277	48	0.4570
35	0.7833	27	0.9167	42	0.1149	28	0.4592
36	0.7167	23	0.9333	43	0.3802	38	0.4940
37	0.6500	6	0.9500	44	0.3756	20	0.5049
38	0.6167	8	0.9500	45	0.3147	35	0.5070
39	0.6833	13	0.9500	46	0.2521	34	0.5079
40	0.8833	22	0.9500	47	0.2561	39	0.5325
41	0.7333	3	0.9667	48	0.4570	29	0.5622
42	0.8500	7	0.9667	49	0.4318	37	0.5771
43	0.6500	9	0.9667	50	0.3122	18	0.6467
44	0.6333	1	1.0000				
45	0.2000	2	1.0000				
46	0.6333	4	1.0000				
47	0.1333	5	1.0000				
48	0.4667	10	1.0000				
49	0.4833	11	1.0000				
50	0.3333	16	1.0000				

TABLE 12

Index of Difficulty and Discrimination
Navajo Grade 2
N 50

Difficulty				Discrimination[a]			
By Item		By Difficulty		By Item		By Discrimination	
1	1.0000	31	0.2400	3	0.2391	42	-0.1659
2	1.0000	46	0.3200	4	0.2134	24	-0.0327
3	0.5600	4	0.4200	6	0.1006	17	-0.0043
4	0.4200	35	0.4400	7	0.2958	38	0.0133
5	1.0000	39	0.4400	8	0.3463	23	0.0453
6	0.9800	17	0.4600	10	0.3672	31	0.0957
7	0.9400	49	0.4600	11	0.3580	6	0.1006
8	0.8800	37	0.5200	14	0.3963	26	0.1006
9	1.0000	27	0.5400	15	0.3672	45	0.1006
10	0.9800	29	0.5400	16	0.3672	43	0.1118
11	0.9600	30	0.5400	17	-0.0043	35	0.1556
12	1.0000	3	0.5600	18	0.1657	25	0.1632
13	1.0000	18	0.6000	19	0.2732	18	0.1657
14	0.7400	22	0.6000	20	0.2937	46	0.1768
15	0.9800	38	0.6000	21	0.3672	22	0.1847
16	0.9800	32	0.6200	22	0.1847	50	0.2102
17	0.4600	44	0.6200	23	0.0453	4	0.2134
18	0.6000	36	0.6600	24	-0.0327	39	0.2308
19	0.6800	48	0.6600	25	0.1632	49	0.2391
20	0.9200	50	0.6600	26	0.1006	3	0.2391
21	0.9800	19	0.6800	27	0.4442	19	0.2732
22	0.6000	33	0.6800	28	0.3300	20	0.2937
23	0.7400	14	0.7400	29	0.3694	7	0.2958
24	0.9800	23	0.7400	30	0.4349	47	0.3056
25	0.8600	43	0.7600	31	0.0957	28	0.3300
26	0.9800	47	0.8000	32	0.3785	8	0.3463
27	0.5400	28	0.8200	33	0.5632	11	0.3580
28	0.8200	25	0.8600	34	0.5000	10	0.3672
29	0.5400	8	0.8800	35	0.1556	15	0.3672
30	0.5400	20	0.9200	36	0.5942	16	0.3672

[a]Items which all students answered correctly are nondiscriminating and so do not appear on this table.

TABLE 12 (continued)

Difficulty				Discrimination			
By Item		By Difficulty		By Item		By Discrimination	
31	0.2400	34	0.9200	37	0.3873	21	0.3672
32	0.6200	7	0.9400	38	0.0133	29	0.3694
33	0.6800	11	0.9600	39	0.2308	32	0.3785
34	0.9200	6	0.9800	42	-0.1659	37	0.3873
35	0.4400	10	0.9800	43	0.1118	14	0.3963
36	0.6600	15	0.9800	44	0.4746	30	0.4349
37	0.5200	16	0.9800	45	0.1006	27	0.4442
38	0.6000	21	0.9800	46	0.1768	48	0.4564
39	0.4400	24	0.9800	47	0.3056	44	0.4746
40	1.0000	26	0.9800	48	0.4564	34	0.5000
41	1.0000	42	0.9800	49	0.2391	33	0.5632
42	0.9800	45	0.9800	50	0.2102	36	0.5942
43	0.7600	1	1.0000				
44	0.6200	2	1.0000				
45	0.9800	5	1.0000				
46	0.3200	9	1.0000				
47	0.8000	12	1.0000				
48	0.6600	13	1.0000				
49	0.4600	40	1.0000				
50	0.6600	41	1.0000				

TABLE 13

Index of Difficulty and Discrimination
English Albuquerque Grade 2
N 67

Difficulty				Discrimination[a]			
By Item		By Difficulty		By Item		By Discrimination	
1	1.0000	45	0.4179	3	0.3192	33	-0.0816
2	1.0000	47	0.4179	6	-0.0372	6	-0.0372
3	0.9701	50	0.5224	7	0.2039	30	-0.0094
4	1.0000	43	0.7313	8	0.2409	42	0.0267
5	1.0000	38	0.7463	9	0.0834	9	0.0834
6	0.9851	44	0.7463	12	0.3647	13	0.0834
7	0.9851	39	0.7612	13	0.0834	50	0.0916
8	0.9552	26	0.7761	15	0.1702	38	0.1598
9	0.9851	28	0.8060	19	0.2039	15	0.1702
10	1.0000	41	0.8060	20	0.3963	35	0.1738
11	1.0000	46	0.8209	23	0.3192	7	0.2039
12	0.9851	49	0.8507	24	0.2109	19	0.2039
13	0.9851	37	0.8806	25	0.3116	24	0.2109
14	1.0000	36	0.8955	26	0.4105	29	0.2294
15	0.9552	48	0.8955	27	0.2409	36	0.2313
16	1.0000	30	0.9104	28	0.2584	8	0.2409
17	1.0000	31	0.9104	29	0.2294	27	0.2409
18	1.0000	34	0.9104	30	-0.0094	28	0.2584
19	0.9851	20	0.9254	31	0.2636	31	0.2636
20	0.9254	24	0.9254	32	0.3647	25	0.3116
21	1.0000	29	0.9254	33	-0.0816	3	0.3192
22	1.0000	35	0.9254	34	0.4001	23	0.3192
23	0.9701	42	0.9403	35	0.1738	44	0.3277
24	0.9254	8	0.9552	36	0.2313	49	0.3521
25	0.9552	15	0.9552	37	0.3696	39	0.3565
26	0.7761	25	0.9552	38	0.1598	12	0.3647
27	0.9552	27	0.9552	39	0.3565	32	0.3647
28	0.8060	3	0.9701	41	0.4186	37	0.3696
29	0.9254	23	0.9701	42	0.0267	46	0.3799
30	0.9104	33	0.9701	43	0.4875	48	0.3906

[a]Items which all students answered correctly are nondiscriminating and so do not appear on this table.

TABLE 13 (continued)

Difficulty				Discrimination			
By Item		By Difficulty		By Item		By Discrimination	
31	0.9104	6	0.9851	44	0.3277	20	0.3963
32	0.9851	7	0.9851	45	0.4536	34	0.4001
33	0.9701	9	0.9851	46	0.3799	26	0.4105
34	0.9104	12	0.9851	47	0.5820	41	0.4186
35	0.9254	13	0.9851	48	0.3906	45	0.4536
36	0.8955	19	0.9851	49	0.3521	43	0.4875
37	0.8806	32	0.9851	50	0.0916	47	0.5820
38	0.7463	1	1.0000				
39	0.7612	2	1.0000				
40	1.0000	4	1.0000				
41	0.8060	5	1.0000				
42	0.9403	10	1.0000				
43	0.7313	11	1.0000				
44	0.7463	14	1.0000				
45	0.4179	16	1.0000				
46	0.8209	17	1.0000				
47	0.4179	18	1.0000				
48	0.8955	21	1.0000				
49	0.8507	22	1.0000				
50	0.5224	40	1.0000				

TABLE 14

Index of Difficulty and Discrimination
Navajo Grades 1 and 2 Combined
N 96

Difficulty				Discrimination[a]			
By Item		By Difficulty		By Item		By Discrimination	
1	0.9896	31	0.1771	1	0.2428	23	-0.0353
2	0.9896	46	0.2813	2	0.0400	43	0.0008
3	0.4688	4	0.3021	3	0.3696	2	0.0400
4	0.3021	17	0.3542	4	0.3758	6	0.0484
5	0.9896	27	0.3646	5	0.2613	24	0.0564
6	0.9688	37	0.3750	6	0.0484	38	0.0812
7	0.9375	30	0.3958	7	0.1702	42	0.0830
8	0.8750	29	0.4063	8	0.1868	19	0.1122
9	0.9896	32	0.4479	9	0.2428	15	0.1506
10	0.9792	35	0.4479	10	0.2141	17	0.1618
11	0.9271	49	0.4479	11	0.3973	7	0.1702
12	0.9688	18	0.4583	12	0.3067	8	0.1868
13	1.0000	3	0.4688	14	0.3867	41	0.2059
14	0.6979	39	0.4688	15	0.1506	26	0.2098
15	0.9896	50	0.5000	16	0.3605	10	0.2141
16	0.9688	36	0.5208	17	0.1618	1	0.2428
17	0.3542	38	0.5208	18	0.4083	9	0.2428
18	0.4583	47	0.5313	19	0.1122	39	0.2495
19	0.6146	44	0.5417	20	0.3894	25	0.2524
20	0.8646	48	0.5625	21	0.3685	22	0.2605
21	0.9271	22	0.5729	22	0.2605	5	0.2613
22	0.5729	33	0.5938	23	-0.0353	49	0.2705
23	0.7917	19	0.6146	24	0.0564	45	0.2873
24	0.9167	14	0.6979	25	0.2524	35	0.2893
25	0.7396	25	0.7396	26	0.2098	46	0.2977
26	0.9688	28	0.7604	27	0.5414	31	0.3000
27	0.3646	23	0.7917	28	0.3502	12	0.3067
28	0.7604	43	0.8021	29	0.4098	28	0.3502
29	0.4063	34	0.8438	30	0.4007	16	0.3605
30	0.3958	20	0.8646	31	0.3000	21	0.3685

[a]Items which all students answered correctly are nondiscriminating and so do not appear on this table.

TABLE 14 (continued)

Difficulty				Discrimination			
By Item		By Difficulty		By Item		By Discrimination	
31	0.1771	8	0.8750	32	0.5453	3	0.3696
32	0.4479	24	0.9167	33	0.5356	4	0.3758
33	0.5938	11	0.9271	34	0.5440	44	0.3845
34	0.8438	21	0.9271	35	0.2893	14	0.3867
35	0.4479	7	0.9375	36	0.4410	20	0.3894
36	0.5208	45	0.9583	37	0.4718	11	0.3973
37	0.3750	6	0.9688	38	0.0812	30	0.4007
38	0.5208	12	0.9688	39	0.2495	18	0.4083
39	0.4688	16	0.9688	41	0.2059	29	0.4098
40	1.0000	26	0.9688	42	0.0830	50	0.4231
41	0.9896	10	0.9792	43	0.0008	36	0.4410
42	0.9792	42	0.9792	44	0.3845	37	0.4718
43	0.8021	1	0.9896	45	0.2873	48	0.5095
44	0.5417	2	0.9896	46	0.2977	33	0.5356
45	0.9583	5	0.9896	47	0.6097	27	0.5414
46	0.2813	9	0.9896	48	0.5095	34	0.5440
47	0.5313	15	0.9896	49	0.2705	32	0.5453
48	0.5625	41	0.9896	50	0.4231	47	0.6097
49	0.4479	13	1.0000				
50	0.5000	40	1.0000				

TABLE 15

Index of Difficulty and Discrimination
English Albuquerque Grades
1 and 2 Combined
N 127

Difficulty				Discrimination[a]			
By Item		By Difficulty		By Item		By Discrimination	
1	0.9922	47	0.2813	1	0.5737	24	0.1753
2	1.0000	45	0.3125	3	0.2310	3	0.2310
3	0.9688	50	0.4297	5	0.5737	26	0.2396
4	1.0000	49	0.6719	6	0.3819	42	0.2654
5	0.9922	38	0.6797	7	0.3786	50	0.2709
6	0.9609	43	0.6875	8	0.3008	36	0.2917
7	0.9688	44	0.6875	9	0.4229	8	0.3008
8	0.9453	48	0.6875	10	0.5737	30	0.3291
9	0.9688	39	0.7188	11	0.5737	13	0.3488
10	0.9922	46	0.7266	12	0.4760	44	0.3681
11	0.9922	26	0.7422	13	0.3488	46	0.3695
12	0.9453	28	0.7500	14	0.5025	45	0.3719
13	0.9609	37	0.7656	15	0.4136	7	0.3786
14	0.8828	41	0.7656	16	0.5737	31	0.3786
15	0.9063	20	0.7969	17	0.5155	25	0.3791
16	0.9922	36	0.8047	18	0.6476	6	0.3819
17	0.9453	34	0.8359	19	0.4315	38	0.3831
18	0.9297	30	0.8516	20	0.5471	43	0.3958
19	0.9297	35	0.8516	21	0.4816	33	0.3971
20	0.7969	24	0.8750	22	0.5780	28	0.4013
21	0.9453	14	0.8828	23	0.4025	23	0.4025
22	0.9688	29	0.8828	24	0.1753	27	0.4064
23	0.9453	31	0.8828	25	0.3791	47	0.4128
24	0.8750	33	0.8906	26	0.2396	15	0.4136
25	0.9219	42	0.8906	27	0.4064	41	0.4143
26	0.7422	15	0.9063	28	0.4013	9	0.4229
27	0.9297	25	0.9219	29	0.4945	19	0.4315
28	0.7500	18	0.9297	30	0.3291	39	0.4330
29	0.8828	19	0.9297	31	0.3786	32	0.4667
30	0.8516	27	0.9297	32	0.4667	40	0.4753

[a]Items which all students answered correctly are nondiscriminating and so do not appear on this table.

TABLE 15 (continued)

Difficulty				Discrimination			
By Item		By Difficulty		By Item		By Discrimination	
31	0.8828	32	0.9297	33	0.3971	12	0.4760
32	0.9297	40	0.9375	34	0.5159	35	0.4809
33	0.8906	8	0.9453	35	0.4809	21	0.4816
34	0.8359	12	0.9453	36	0.2917	29	0.4945
35	0.8516	17	0.9453	37	0.5477	49	0.4965
36	0.8047	21	0.9453	38	0.3831	14	0.5025
37	0.7656	23	0.9453	39	0.4330	17	0.5155
38	0.6797	6	0.9609	40	0.4753	34	0.5159
39	0.7188	13	0.9609	41	0.4143	48	0.5399
40	0.9375	3	0.9688	42	0.2654	20	0.5471
41	0.7656	7	0.9688	43	0.3958	37	0.5477
42	0.8906	9	0.9688	44	0.3681	1	0.5737
43	0.6875	22	0.9688	45	0.3719	5	0.5737
44	0.6875	1	0.9922	46	0.3695	10	0.5737
45	0.3125	5	0.9922	47	0.4128	11	0.5737
46	0.7266	10	0.9922	48	0.5399	16	0.5737
47	0.2813	11	0.9922	49	0.4965	22	0.5780
48	0.6875	16	0.9922	50	0.2709	18	0.6476
49	0.6719	2	1.0000				
50	0.4297	4	1.0000				

TABLE 16

Index of Difficulty and Discrimination
Navajo Grades K, 1 and 2 Combined
N 126

Difficulty				Discrimination			
By Item		By Difficulty		By Item		By Discrimination	
1	0.9048	31	0.1429	1	0.4679	19	-0.0275
2	0.9683	4	0.2381	2	0.2771	17	0.0774
3	0.4127	46	0.2460	3	0.3961	23	0.1031
4	0.2381	27	0.2778	4	0.4256	24	0.1046
5	0.9286	37	0.3095	5	0.4047	41	0.1129
6	0.9365	30	0.3571	6	0.1921	13	0.1200
7	0.8968	17	0.3651	7	0.3054	38	0.1509
8	0.8413	18	0.3651	8	0.2550	6	0.1921
9	0.9683	32	0.3730	9	0.2703	43	0.2131
10	0.9603	49	0.3730	10	0.2789	15	0.2252
11	0.8968	29	0.3810	11	0.3527	8	0.2550
12	0.9286	47	0.4048	12	0.3209	45	0.2679
13	0.9921	3	0.4127	13	0.1200	9	0.2703
14	0.5873	35	0.4127	14	0.5261	2	0.2771
15	0.9762	39	0.4286	15	0.2252	10	0.2789
16	0.9524	50	0.4286	16	0.3619	46	0.2822
17	0.3651	48	0.4524	17	0.0774	20	0.2841
18	0.3651	36	0.4762	18	0.4805	39	0.2881
19	0.6429	44	0.4762	19	-0.0275	35	0.2939
20	0.8571	33	0.4841	20	0.2841	42	0.2953
21	0.8810	38	0.5000	21	0.4155	40	0.2976
22	0.5159	22	0.5159	22	0.3169	31	0.2978
23	0.7619	14	0.5873	23	0.1031	7	0.3054
24	0.8968	19	0.6429	24	0.1046	25	0.3153
25	0.6905	25	0.6905	25	0.3153	22	0.3169
26	0.9048	28	0.6905	26	0.3741	12	0.3209
27	0.2778	43	0.7460	27	0.5854	11	0.3527
28	0.6905	23	0.7619	28	0.4630	16	0.3619
29	0.3810	34	0.8254	29	0.3634	29	0.3634
30	0.3571	8	0.8413	30	0.3900	49	0.3647
31	0.1429	20	0.8571	31	0.2978	26	0.3741
32	0.3730	21	0.8810	32	0.5480	44	0.3830
33	0.4841	7	0.8968	33	0.6011	30	0.3900
34	0.8254	11	0.8968	34	0.3994	3	0.3961
35	0.4127	24	0.8968	35	0.2939	34	0.3994

TABLE 16 (continued)

Difficulty				Discrimination			
By Item		By Difficulty		By Item		By Discrimination	
36	0.4762	1	0.9048	36	0.4046	36	0.4046
37	0.3095	26	0.9048	37	0.4595	5	0.4047
38	0.5000	5	0.9286	38	0.1509	21	0.4155
39	0.4286	12	0.9286	39	0.2881	4	0.4256
40	0.9683	6	0.9365	40	0.2976	37	0.4595
41	0.9841	42	0.9365	41	0.1129	28	0.4630
42	0.9365	45	0.9444	42	0.2953	1	0.4679
43	0.7460	16	0.9524	43	0.2131	50	0.4745
44	0.4762	10	0.9603	44	0.3830	18	0.4805
45	0.9444	2	0.9683	45	0.2679	14	0.5261
46	0.2460	9	0.9683	46	0.2822	32	0.5480
47	0.4048	40	0.9683	47	0.6801	48	0.5736
48	0.4524	15	0.9762	48	0.5736	27	0.5854
49	0.3730	41	0.9841	49	0.3647	33	0.6011
50	0.4286	13	0.9921	50	0.4745	47	0.6801

TABLE 17

Results of Chi-square Analysis Between
Boehm English and Navajo Test Scores

Concept		Difference Probability		
Item	English Word	K	1	2
1	top	ns	ns	ns
2	through	ns	ns	ns
3	away from	.001	.001	.001
4	next to	.001	.001	.001
5	inside	ns	ns	ns
6	some, not many	ns	ns	ns
7	middle	ns	ns	ns
8	few	ns	ns	ns
9	farthest	.05	ns	ns
10	around	ns	ns	ns
11	over	ns	ns	ns
12	widest	ns	ns	ns
13	most	ns	ns	ns
14	between	.001	.001	.001
15	whole	.01	.01	ns
16	nearest	ns	ns	ns
17	second	ns	.001	.001
18	corner	.001	.001	.001
19	several	ns	.001	.001
20	behind	ns	.05	.05
21	row	ns	ns	ns
22	different	.001	.001	.001
23	after	ns	.001	.001
24	almost	ns	ns	.05
25	half	.05	.001	ns
26	center	ns	.001	.001 N[a]
27	as many . . . as	.001	.001	.001
28	side	ns	ns	ns
29	beginning to . . .	.01	.001	.001
30	other	.001	.001	.001
31	alike	.001	.001	.001
32	not first or last	.001	.001	.001
33	never	.02	.001	.001
34	below	.05	ns	ns N
35	matches (V)	ns	ns	.01

[a]N = item on which Navajo scores were higher than English scores.

TABLE 17 (continued)

Concept		Difference Probability		
Item	English Word	K	1	2
36	always	ns	.001	.05
37	medium sized	ns	.02	ns
38	right	ns	ns	.001
39	forward	ns	ns	.001
40	zero	.001	.01	ns N
41	above	.001	.001	.01 N
42	every	ns	ns	ns
43	separated	ns	ns	ns
44	left	.01	ns	.05
45	pair	.001	.001	.001 N
46	skip	ns	.001	.05
47	equal	ns	ns	.05
48	in order	ns	ns	ns
49	third from	ns	ns	.05
50	least	ns	ns	.05

APPENDIX B

English and Navajo Test Items

ENGLISH AND NAVAJO TEST ITEMS*

1. Look at the pictures of writing paper with stars. Mark the paper with the star at the top.

Naaltsoos/ sǫ' bikáa'go/ beda'alyaaígíí/ nínílʼí. // Paper/ star(s) it-upon-with/ pictured-which/ look at it.
Naaltsoos/ bikáa'gi/ sǫ' hódahdi dah/ si'anígíí/ bik'i'iizoh. // Paper/ it-upon-at/ star(s) up there up/ located-which/ mark on it.

The words nínílʼí, "look at it," and bik'i'iizoh, "mark on it," will be glossed "look at" and "mark" in the following pages. Navajo verbs include subject and object cross-referencing forms, which are unnecessary in English. The literal translation given here will assist the reader to understand how Navajo organizes concepts into syntactic arrangements, but it will not be made more confusing than necessary.

This test sentence is typical of many others to follow, both in English and Navajo. The underlying two sentences, the second of which is imbedded in the first in both languages, are: "Mark the paper," and "The paper has a star at the top." In English the subordinating "with" has been used rather than a clause "which has," but the meaning is the same.

In the Navajo example, both sentences contain the relative enclitic -ígíí, "the very one" suffixed to the verb.

The introductory sentence also shows the subordinating enclitic -go suffixed to bikáa' to indicate the adjectival function of the phrase sǫ' bikáa', "the starred-upon paper." The prefix bi-, "it," refers to naaltsoos, "paper," object of the postposition -káa', "on top of." These affixes also occur in most of the following sentences.

2. Look at the beads and strings. Mark the bead that has a string through it.

Yoo'/ dóó/ tłʼóółʼ/ nínílʼí. // Bead(s)/ and/ string/ look at.
Yoo'/ tłʼóółʼ binikánit'i/ yígíí/ bik'i'iizoh. // Bead/ string it-through-extending/ which/ mark.

The "through" concept is reinforced in Navajo by the verb, which includes a string-like extension in its meaning as well as a postpositional prefix (biníká-) meaning "through penetrating it."

---

*Boehm Test of Basic Concepts. New York: Psychological Corporation. Navajo items are translated and reproduced by permission for research purposes only.

This item shows no evidence of student difficulty with the reference of the pronominal prefix bi- even though two third-person objects are involved. There would be no pragmatic possibility of a "string with a bead through it." The combination of picture, words, and real possibilities prevents confusion even if the syntactic structure would allow it. The problem of -bi is discussed in the text on pages 85 - 88.

3. Look at the table and the boxes. Mark the box that is away from the table.

Bikáá'adání/ dóó/ tsits'aa'/ nínił'í. // Table/ and/ box/ look at.
Tsits'aa'/ bikáá'adání/ bits'áádi/ sí'ánígíí/ bik'i'iizoh. // Box/ table/ it-away-at/ located-which/ mark.

This item was one of ten that proved significantly different ($p < .001$) between Navajo and English at all grade levels. It is discussed in detail on page 83.

4. Look at the toys. Mark the toy that is next to the truck.

Daane'é/ nínił'í. // Toy(s)/ look at.
Daane'é/ chidítsoh yázhí/ bíighahgóó/ sí'ánígíí/ bik'i'iizoh. // Toy/ truck small/ it-beside-along/ located-which/ mark.

This item was the second most difficult on the test for Navajo children. It is an example of a sentence in which bi- could be misunderstood, since "toy beside the truck," and "truck beside the toy" are equally likely.

5. Look at the pictures of the house and the boy. Mark the house with the boy inside it.

Kin/ dóó/ ashkii/ be'elyaaígíí/ nínił'í. // House/ and/ boy/ pictured-which/ mark.
Ashkii/ kin yii'/ sizínígíí/ bik'i'iizoh. // Boy/ house it-in/ located-which/ mark.

Ashkii, "boy," is the object of bik'i'iizoh, "mark on it," in this sentence. The alternative third-person pronominal prefix yi- was used on the postposition -ii', "in" to indicate that the subject was the first noun. This was an easy item for all children, but it does not have the possibility of ambiguous interpretation. There could never be a "boy with a house in it." However, it actually asks the student to "mark the boy . . ." rather than "mark the house" as does the English.

6. Look at the boxes and marbles. Mark the box that has some but not many marbles.

Tsits'aa'/ dóó/ máazo/ níníł'í. // Box(es)/ and/ marble(s)/ look at.
Tsits'aa'/ máazo łá' biyi'ígíí/ bik'i'iizoh. // Box/ marbles some it-in-which/ mark.
T'óó ahayoi/ biyi'ígíí/ éí/ dooda. // A lot/ it-in-which/ that one/ not.

This item tests three concepts, combined into one sentence in English and two in Navajo. No excluding "but" is available in Navajo to conjoin the concepts "some" and "not many."

The burden on memory created by the longer Navajo form is probably offset by the difficulty in English of comprehending the three concepts together.

The Navajo word łá' has apparently created some ambiguity in sentences of this test in which it could mean "one" or "some." In this item, since the third choice was a completely empty box, no ambiguity was possible and students answered well.

7. Look at the flowers. Mark the flower that is in the middle.

Ch'ilá'tah hózhóón/ níníł'í. // Flower(s) look at.
Ch'ilá'tah hózhóónii/ ałníí'gi/ íí'áhígíí/ bik'i'iizoh. // Flower/ middle-at/ sticking up-which/ mark.

This item is an example of the Navajo phrasal noun for concepts that require only one word in English. Apparently the long form of the word "flower" created no difficulty for Navajo children.

8. Look at the plates of cupcakes. Mark the plate that has a few cupcakes.

Báah łikaní yázhí/ naazkánígíí/ níníł'í. // Cupcake(s)/ distributed about in groups (on a plate)-which/ look at.
T'áá díkwíhí/ báah łikaní yázhí sikánígíí/ bik'i'iizoh. // Just a few/ cupcakes located-which/ mark.

It has been suggested that cupcakes may not be in the experience of Navajo children. However, the descriptive phrasal noun baah łikaní yázhí means "little sweet bread," and would thus be explained if not experienced.

The concept word here is díkwíhí, "few." Children who missed the item may not have understood the range of fewness, since wrong answers were usually the single cupcake. English wrong answers tended toward the same mistake, although more correct answers were given by the English students.

9. Look at the boats. Mark the boat that is farthest from the shore.

Tsinaa'eeł/ níníł'í. // Boat(s) look at.
Tsinaa'eeł/ nlei nizaadi/ naa'eeł yígíí/ bik'i'iizoh. // Boat/ over there at a far place/ floating which/ mark.

This item is one in which the English concept is not tested in the Navajo sentence. There is no Navajo superlative form, and the correct boat is marked only because no other boat is far from shore. See page 91 for discussion of this problem.

10. Look at the boxes and circles. Mark the box that has circles around it.

Tsits'aa'/ dóó/ názbasgo ahéeda'idzoígíí/ níníł'í. // Box(es)/ and/ circles they are drawn circularly-which/ look at.
Tsits'aa'/ binaagóó/ názbasgo ahená'eezhígíí/ bik'i'iizoh. // Box/ it-around-along/ in a circle circularly arranged-which/ mark.

There is no noun "circle" in Navajo, but the verb-adverb combination used to express the circular movement of circularly drawn lines apparently got the idea across.

This item has a bi- pronominal affix, but it follows directly the nominal to which bi- refers (box) and there is no possible ambiguity in the picture. This is one of the few sentences in which the postposition separated two related things. It was a result of the nonexistence of a noun form of "circle," but apparently made the item easier.

11. Look at the balloons and the tree. Mark the balloon that is over the tree.

T'iis/ dóó/ bii'ná'álzołí/ níníł'í. // Tree(s)/ and/ balloon(s)/ look at.
T'iis/ bikáadi dah/ si'ánígíí/ bik'i'iizoh. // Tree/ it-over-at up there/ located-which/ mark.

This item contains bikáa, a concept word in Navajo that covers the meaning of several different English words. See page 77 for discussion of repeated Navajo forms.

12. Look at the doors. Mark the door that is widest.

Dáádilkał/ níníł'í. // Door(s)/ look at.
Dáádilkał/ alaah/ ánílteelígíí/ bik'i'iizoh. // Door/ anything-beyond/ relatively wide-which/ mark.

This is an example of the Navajo way of expressing superlative degree of an adjectival concept. There are no comparative and superlative forms of the adjectival verbs.

English speaking children who missed this item confused the polar pairs "widest" and "narrowest." The existence of many such polar pairs in English probably makes them a likely source of semantic confusion in early years. Navajo children make fewer mistakes of this nature.

13. Look at the boxes of eggs. Mark the box that has the most eggs.

Tsits'aa'/ ayęęzhii biyi'ígíí/ níníł'í. // Box(es)/ egg(s)/ it-in-which/ look at.
Tsits'aa'/ ayęęzhii/ alááh áneelaá'/ biyi'ígíí/ bik'i'iizoh. // Box/ egg(s)/ anything-beyond relatively much/ it-in-which/ mark.

This was the easiest item on the test for Navajo students, yet it has the bi- prefix on the postposition -yi' following the two nominals to be related, and referring back to the first one. This is the same structure as the hardest items on the test (see 3 and 4), indicating that syntax is not the major problem children are encountering when they miss such test questions. Only when ambiguous pronoun reference is easily possible, as in the "toy beside the truck" or the "truck beside the toy," does the bi- problem occur.

Few Navajo children at any grade missed this item, reinforcing the conclusion that the phrasal superlative is somewhat easier than the inflected adjective of the English form. English-speaking children's errors were mostly in choosing the box with the least eggs, a confusion of polar adjectives.

14. Look at the jars, cups, and spoons. Mark the thing that is between the spoons.

Tózis/ dóó/ baah'íízhahí/ dóó/ béésh'adee'/ níníł'í. // Jar(s)/ and/ cup(s)/ and/ spoon(s)/ look at.
T'áádoo le'é/ béésh'adee' bita' góne'/ si'ánígíí/ bik'i'iizoh. // Thing/ spoon(s) it-between in-the-space/ located-which/ mark.

Navajo students who missed this could have misunderstood the reference of -bi prefixed to -ta', "between." The nominal t'áádoo le'é, "thing," is general enough to include any of the objects in the picture, and "The spoon between the thing(s)" is a reasonable idea. Few students marked the end items in the picture, indicating that the concept "between" was understood but the nominal and pronominal

references necessary to pin the meaning down were missed. This is an example in which the concept was not really tested because of interference from a different source in the Navajo sentence.

15. Look at the cakes. Mark the cake that is whole.

Báah łikáni/ níníł'í. // Cake(s)/ look at.
Báah łikáni/ t'ah t'áá át'é/ si'ánígii/ bik'i'iizoh. // Cake/ still just existing/ located-which/ mark.

The phrase t'áá át'é expresses wholeness in the sense of "entirety" or "undamaged."

English-speaking students made more mistakes than Navajo students on this item. It is probably an example of a hard vocabulary word rather than an unknown concept. In a study conducted by L. Wendell Rivers and Robert L. Williams (1974), a change in the wording to "Mark the cake that is all there" resulted in improved scores. However, "whole" is not always interchangeable with "all there" in English, whereas t'áá át'é does cover both meanings.

16. Look at the boys going to school. Mark the boy who is nearest the door.

Ashiiké/ ółta'góó/ yikahígii/ níníł'í. // Boy(s)/ school-toward/ walking-which/ look at.
Ashkii/ dáádílkał/ t'áá áhánígi/ yich'i'/ yigáłígii/ bik'i'iizoh. // Boy/ door/ just nearby/ it-toward/ he walks-which/ mark.

This is another case in which a superlative was used in English, but the picture required no overt superlative. The semantic content of the adverbial "near," t'áá áhání, excludes the other examples in the picture without expressing a superlative degree. In fact, in English "near" would also have elicited the same choice as "nearest," based upon the picture. The implied concept "nearest of the three" cannot be stated in Navajo, according to Navajo informants.

17. Look at the animals standing in a line. Mark the second animal.

Naałdlooshii/ ałkéé'/ naazíígo/ beda'alyaaígii/ níníł'í. // Animal(s)/ each other-after/ grouped/ pictured-which/ look at.
Naaki góne'/ akéé'/ sizínígii/ bik'i'iizoh. // Two in-the-space/ thing-after/ located-which/ mark.

This is a test of the ordinal number "second" in English. In Navajo it includes the number "two," naaki, and therefore should be easier. However, the students apparently did not understand which

end of the line to start from. Thus in the Navajo sentence the important concept word here is ałkee', "after each other." See pages 81 and 89 for discussion of this word.

18. Look at the glasses on the table. Mark the glass that is at a corner of the table.

Tózis/ bikáa'adání/ bikáa'/ naaznilígíí/ níníł'í. // Glass(es)/ table/ it-upon/ distributed about-which/ look at.
Bikáa'adání/ dah dik'ánigí/ tózis si'ánígíí/ bik'i'iizoh. // Table/ up there at a right angle place/ glass located-at/ mark.

This item has at least two possible sources of misunderstanding for Navajo students, and proved to be one of the most difficult. It is discussed in detail on pages 84 and 87. Both the vocabulary item for "corner," dik'áni, and the pronoun reference of bi- in bik'i'iizoh could have caused confusion.

19. Look at the groups of animals. Mark the group that has several rabbits.

Gah/ dóó/ mósi/ dóó/ ch'éeh dighahii/ beda'alyaaígii/ níníł'í. // Rabbit(s)/ and/ cat(s)/ and/ turtle(s)/ pictured/ look at.
Gah/ t'áá łą/ shijée'go/ be'alyaaígíí'/ bik'i'iizoh. // Rabbit(s)/ just a lot being/ it is/ pictured-which/ mark.

The concept of "rabbit" was understood in this item, but not that of "several." This may be related to similarity between the word for "several," łą, and that for "one" or "some," łą'. See page 94 for discussion of this problem.

English speakers had little trouble with this sentence, since the plurality of "several" is reinforced by the plural ending on "rabbits." Navajo does not usually have a plural marker in the nominal expression, but only in the verb of which it is subject. In this test sentence, the verb be'alyaa does not have a plural affix because the subject is not "rabbits" but "it," referring to one of the three pictures.

20. Look at the sofa and the toys. Mark the toy that is behind the sofa.

Bik'idah'asdáhí nteelígíí/ dóó/ daane'é/ níníł'í. // Sofa/ and/ toy(s)/ look at.
Daane'é/ bik'idah'asdáhí nteelígíí/ bine'dęę/ si'ánígíí/ bik'i'iizoh.
Toy/ sofa/ it-behind-from/ located-which/ mark.

This is an item in which the nouns could be reversed, to be "sofa behind the toy," and some Navajo students apparently misunderstood it in this way. However, about a fourth of the English speakers chose the doll beside the sofa at grade 1. Apparently "behind" is either a difficult concept, or not clearly illustrated here. It is possible that the two words "beside" and "behind" sound enough alike in English to be difficult for young children.

21. Look at the groups of trees. Mark the group where all the trees are in a row.

T'iis/ ał'áá/ dah/ naazhjaa'ígíí/ níníł'í. // Tree(s)/ separate/ clustered in groups-which/ look at.
T'iis/ k'éhézdongo/ ałkéé'/ nt'i' yígíí/ bik'i'iizoh. // Tree(s)/ straight/ each other-after/ strung out which/ mark.

This item repeats the concept word ałkéé' that occurred in 17, "naa'dlooshii ałkéé', "animals after each other." However, here there is no directionality required and the word k'éhézdongo, "straight," selects the correct group.

22. Look at the groups of blocks. Mark the group that is different from the others.

Tsits'aa'/ ałk'i'/ dah/ naazhjaa'ígíí/ níníł'í. // Box(es)/ each other-on/ in groups/ superimposed on one another-which/ look at.
T'áá sahdii/ át'éego/ dah/ shijaa'ígíí/ bik'i'iizoh. // Just apart-a being/ grouped-which/ mark.

The concept of "different" is not uniquely expressed in Navajo. The different picture is the one t'áá sahdii, "just apart," yet here it is not apart but in the middle of the others. See page 84 for discussion of this problem item.

23. Look at the pictures of a girl. Mark the picture that shows how the girl looked after her hair was cut.

At'éed/ beda'alyaaígíí/ níníł'í. // Girl(s) pictured-which/ look at.
Díí at'éed/ táá'go/ nahaaztánígíí/ t'áá łá'í yígíí/ át'eego/ át'é. // This girl/ three/ distributed about-which/ just the same which/ being/ are.
Bitsii'/ k'égizhgo/ áádóó bikéedee'/ ánoolníníígíí/ bik'i'iizoh. // Her hair/ having been cut/ then it-after-from/ she looks like-which/ mark.

This sentence is a double imbedding in English: "The picture shows a girl," "The girls looks after that," "The girl's hair was cut."

It was difficult at K, probably because of its length. In Navajo, it is even longer because an extra sentence was added to indicate that the pictures were of the same girl. See page 82 for further comments on this item.

24. Look at the bottles. Mark the one that is almost empty.

Tózis/ nínił'í. // Bottle(s)/ look at.
T'áadoo le'é/ k'adéé/ bii'/ adiihígii/ bik'i'iizoh. // Thing/ almost/ it-in/ it is in the act of dwindling away-which/ mark.

There is no word in this Navajo example that corresponds exactly to "empty." The concept is conveyed by the adverbial k'adéé, "almost," modifying the imperfective active verb "to be in the act of dwindling away." Though there is no clear reference for the bi- "it" of bik'i'iizoh, "mark it," it makes no pragmatic difference whether the student thinks he is marking the bottle or the "thing." In English, a correct answer requires knowledge of both "empty" and "almost." Some students apparently did not know how empty a bottle had to be to be considered "almost" empty. Though both Navajo and English-speaking students found this item about equally difficult in the early grades, by second grade the Navajo children had made a greater improvement than the English speakers.

25. Look at the pies. Mark the pie that is half gone.

Báah łikaní bii'aztłe'é/ nínił'í. // Pie(s)/ look at.
Báah łikaní bii'aztłe'é/ áłnii'doo adinígii/ bik'i'iizoh. // Pie/ middle-from empty-which/ mark.

The concept "half" is expressed by a word that has already occurred in 7, ch'ilátah hózhóonii áłnii'gi, "blossom in the middle."

Many Navajo students marked the pie from which only one piece was gone, suggesting that "empty from the middle" is not an unambiguous way to say "half."

This is an example of a school-oriented word that is expressed in Navajo by a combination of ordinary words.

26. Look at the circle and the boxes. Mark the box that is at the center of the circle.

Ahée'ídzooígii/ doó/ tsits'aa'/ nínił'í. // Something drawn in a circle/ and/ box(es)/ look at.
Tsits'aa'/ ahée'ídzoh/ áłnii'gi/ si'ánígii/ bik'i'iizoh. // Box/ circle/ center-at/ located-which/ mark.

The word for "circle" is a passive verbal nominalized by the enclitic -igii, "the very one." The concept is the same as 7, ałnii'gi, "at the middle." In English, "center" was harder than "middle," which is a less specific word that would be interchangeable here but not in every context.

27. Look at the box of marbles and the groups of marbles. Mark the group that has as many marbles as the box.

Máazo/ tsits'aa'/ bii'/ shijaa'ígíí/ dóó/ máazo/ dah naazhjaa'ígíí/ ninił'í. // Marble(s)/ box/ it-in/ located-which/ and/ marbles/ clustered-which/ look at.
Máazo/ tsits'aa' bii' shijaa'/ beenéelt'e'ígíí/ bik'i'iizoh. // Marble(s) box it-in located/ it is the same number-which/ mark.

This item is one of four that include the basic concept of alikeness. It was fourth hardest of the test for Navajo students, and tenth hardest for English speakers. In the earliest grades, it is probable that neither group of children could count fast enough and precisely enough to make the necessary number comparison.

In the Navajo test sentence, the reference of the pronominal affix of the verb beenéelt'e' and the second verb bik'i'iizoh is not overtly mentioned. It is referred to only by the exclusion of the "marbles in the box." Many students apparently misunderstood this to mean "mark the marbles that are in the box," disregarding or failing to understand the concept word beenéelt'e', "same in number."

28. Look at the box and the circles. Mark the circle that is at a side of the box.

Tsits'aa'/ dóó/ názbasgo aheéda'idzooígíí níníł'í. // Box(es)/ and/ circularly it is drawn-which/ look at.
Łá'/ názbąsgo ahee'ídzooígíí/ tsits'aa' bibąąhgi/ si'ánígíí/ bik'i'iizoh. // The one/ circularly it is drawn-which/ its-side-at/ located which/ mark.

The problem concept word in this item is bibąąhgi, "at its side." Another weak item for Navajo students was 4, biighah, "beside" or "next to it." This may indicate a concept that is not firmly fixed in early years. Relational locations such as "beside" must have comparative boundaries set through experience, which young children probably have not had.

29. Look at the trees and squirrels. Mark the squirrel that is beginning to climb a tree.

T'iis/ dóó/ tsindit'iní/ níníł'í. // Tree(s)/ and/ squirrel(s)/ look at.
T'iis/ yaah/ haa'néehgo/ yaa/ ndiidáhígíí/ bik'i'iizoh. // Tree/ it alongside/ climbing/ around/ doing-which/ mark.

There is no word in this sentence that excludes the squirrel who is already half up in the tree, and the imperfective form of the verb haa'néeh actually suggests action in progress. This item is discussed on page 95. It is one that should be rewritten or redrawn if it is to be useful in Navajo.

30. Look at the desserts. One is an ice cream cone, and one is a piece of pie. Mark the other dessert.

Ch'iyáán/ daalkaníígíí/ níníł'í. // Food/ sweet-which/ look at.
Łá'/ abe'yistiní át'é/ łá' éí/ bii'aztłe'é át'é'. // One/ ice cream is/ one that one/ pie is.
Łá'ígíí/ bik'i'iizoh. // Other one-which/ mark.

The concepts "the one" and "the other" are expressed by the same word, łá', in Navajo. It is little wonder that answers to this item were almost random at the earliest level. The English problem was to understand the relation between the two words. The Navajo problem was to learn two meanings for one form.

31. Look at the shapes. Mark the shapes that are alike.

Ałt'aa/ át'éego/ nida'asdzooígíí/ níníł'í. // Different/ being/ shapes-which/ look at.
Łá'/ aheełt'é yígíí/ bik'i'iizoh. // The one(s)/ reciprocally the same which/ mark.

This was the hardest item on the test for Navajo children, if correct answers are counted. However, most of the mistakes were caused by a misunderstanding of the instruction to mark two pictures. There is no overt plurality in the instruction, which could mean "mark the one that is alike" as well as "mark the ones that are alike." Since most of the students chose one of the two shapes that were alike (the circles), it appears likely that the concept of "alike" was understood, and what was misunderstood was the plural reference implicit in the reciprocal affix ah(i)-. English speakers had the advantage of multiple overt plural markers, with both the verb "are" and the plural ending on "shapes."

32. Look at the cars going into the tunnel. Mark the car that is not the first or the last.

Chidí/ dził bighá'/ ígeed góne'/ dayílyeedígíí/ níníł'í. // Car(s) tunnel/ inside/ running along which/ look at.
Chidí/ doo áłtsé yilwołígíí/ dóó/ doo akéédee yilwolígíí/ bik'i'iizoh. // Car/ not first running/ and/ not after running/ mark.

The task set in this item is similar to that of 30, "mark the other dessert." The student is given the description of the nonanswers, and the correct answer is the excluded item. Conceptually this is harder than identifying a described item, which was the task up through item 29.

33. Look at the chair, the apple and the cookies. Mark what a child should never eat.

Bik'idah'asdáhí/ dóó/ bilasáana/ dóó/ báah da'áka'í łikanígíí/ níníł'í. // Chair/ and/ apple/ and cookie(s)/ look at.
T'áadoo le'é/ áłchíní/ ts'idá/ doo yidooyiiłígíí/ bik'i'iizoh. // Something/ a child/ surely/ not he eat it-which/ mark.

There is no precise translation for "never," though in this context the words used, ts'ída doo, "surely not" are sufficient to indicate the correct answer. This item, like 9 "farthest" and 16 "nearest," does not test exactly the concept of English even though the correct answer is chosen.

34. Look at the table. Make an X below the table.

Bikáá'adání/ níníł'í. // Table/ look at.
Bikáá'adani sí'ánígíí/ biyaadi/ ałná'ásdzohgo/ ánileeh. // Table located-which/ it-under-at/ lines in cross form/ make it.

The Navajo postposition -yaa "under" serves for three English words: "under," "beneath," and "below." It is probable that English-speaking students would have answered correctly more often if the more common English form "under" had been used in this sentence, which was easier at all levels for Navajo students. In this case the Navajo child is benefiting from not having to learn several words for the same concept.

35. Look at the boxes and the balls. Mark the ball that matches one of the boxes.

Tsits'aa'/ dóó/ jooł/ naaznilígíí/ níníł'í. // Box(es)/ and/ ball(s) clustered-which/ look at.
Jooł łá'/ tsits'aa'/ t'áá beełt'éego/ naashch'aa'ígíí/ bik'i'iizoh. // Ball the one/ box/ just the same/ drawn-which/ mark.

The concept word here is the same stem -łt'é', a neuter verb meaning "to be the same," that has already occurred in 27 and 31, translating "as many as" and "alike." This item, like the other two, proved difficult for Navajo students. Errors made were mainly in marking the box that was decorated like the ball, again indicating that reference of the object pronoun prefix be- "it," on beelt'éego may be ambiguous. Balls and boxes are reversible in reference, and there is no pragmatic clue in the sentence or picture to clarify which noun was the subject of the imbedded sentence to which the object prefix bi-, "it," in bik'i'iizoh, "mark on it," refers.

Since the idea of matching or being alike in design is the concept being tested, it is probable that students who marked either or both of the matching items understood the concept. They were unable to understand the directions for choosing which of the matching items to mark. This is an example of difficult Navajo syntax rather than lack of the concept.

36. Look at the dog, the book, and the ear. Mark the one a child always has.

Łeechaa'í/ dóó/ naaltsoos/ dóó/ ajaa'/ beda'alyaaígíí/ nínił'í. //
Dog/ and/ book/ and/ ear/ pictured-which/ look at.
Áłchíní/ t'áá áłáhají'/ bee hólóo/ łehígíí/ bik'i'iizoh. // Child/
just always/ him-with it exists/ usually-which/ mark.

At K level, this item proved so difficult for Navajo children that answers seemed to be random. The concept bee hólóo, "it exists with him (instrumentally)" does not necessarily refer to inalienable possession, and could apply to any of the things mentioned. T'áá áłáhají', "always," and łeh, "usually" are redundant but still not strong enough to exclude possessions such as dogs and books.

This is an item in which no overt pronoun reference in Navajo corresponds to "the one" in English. Another problem may be that a picture of a detached ear may not immediately call to mind an attached ear. Since the ear is out of proportion to the other items in the picture, possibly K level students did not get the idea that it was meant to suggest an ear growing on a child's head. Few children have a detached ear in their possession, so they might well choose a book or dog.

In English, this sentence tests "always" as an opposite of "never," which was tested in 33. This pair of opposites does not exist in Navajo, though "always" can be translated.

37. Look at the fish. Mark the fish that is medium-sized.

Łoó'/ t'áá alaa/ ádaníł tsogo/ beda'alyaaígíí/ níníł'í. // Fish/ just different/ relatively large/ pictured-which/ look at.
Łoó'/ t'áá áta'/ aníłtsooígíí/ bik'i'iizoh. // Fish/ just between/ relatively large-which/ mark.

The large number of K errors in marking the middle fish suggests that ata' "between" may have been applied to the array of pictures rather than to the word it modifies, aníłtso, "relatively large." The prefix determines the word to which the postposition -ta' is related. In this sentence the impersonal a- "something" is used since the reference is the concept aníłtso, "relatively large," that follows. The spatial -ta', which occurred in 14, bita' "between (the spoons)" may be more familiar to young children, though many errors were made on this item also.

This is the first size or number comparison in the test for which the correct answer was not a polar one--largest, widest, most. It requires a thinking process like that of 32, "not first or last," except that here the poles are not overtly named. Navajo students found this item exactly as hard as 32, while English speakers found it harder.

38. Look at the boxes and the line. Mark the box that is over the right end of the line.

Tsits'aa'/ naaznil/ dóó/ ídzooígíí/ níníł'í. // Box(es)/ sitting grouped/ and line-which/ look at.
Tsits'aa'/ nish'náájígo/ si'ánígíí/ bik'i'iizoh. // Box/ right-at/ located-which/ mark.

Almost all mistakes above K level on this item were to mark the left box--a confusion of the polar pair. Left-right is a relatively complex concept, particularly since it depends on point of view. It is probably one that is often not thoroughly learned in the preschool years, especially by children who are not securely right- or left-handed. Another problem for the Navajo child is that the words for "right" and "left" begin alike. See page 94 for discussion of this matter.

39. Look at the boys. Mark the boy who is bending forward.

Ashiiké/ níníł'í. // Boys/ look at.
Ashkii/ náasii'/ yaago/ hót'éhígíí/ bik'i'iizoh. // Boy/ forward/ down/ he is bending-which/ mark.

Neither Navajo nor English-speaking children had any difficulty with the concept of "bending." However, the Navajo students showed much confusion about the direction, over half preferring the boy who was bending backward.

English speakers also had difficulty with the direction represented by the word "forward," reaching only 75% correct responses at second grade.

40. Look at the boxes and candies. Mark the box that has zero candies.

Tsits'aa'/ dóó/ alk'ésdisí/ nínił'í. // Box(es)/ and/ candy/ look at.
Tsits'aa'/ alk'ésdisí/ bii' ádinígii/ bik'i'iizoh. // Box/ candy/ it-in nothing-which/ mark.

This item in Navajo uses the word ádin, "nonexistent" which also occurred in 25, "empty from the middle." The "none-ness" of the picture of candies is clearer and there is no second concept, "from the middle," to interfere with it, so this item proved easier than 25.

The English-speaking children had much more difficulty with "zero," which is a school word. The sentences phrased as "mark the box with nothing in it" would surely have proved much easier, though the basic concept would be the same.

In this example the Navajo students benefited from having fewer words to learn for the concept, as they apparently did in the case of -yaa, "under" and "below," and -káá', "over," "above," and "upon."

41. Look at the cloud and the airplanes. Mark the airplane that is above the cloud.

K'os/ dóó/ chidí naat'a'í/ nínił'í. // Cloud/ and/ airplane/ look at.
K'os/ bikáa'di/ yit'ahígii/ bik'i'iizoh. // Cloud/ it-above-at/ it is flying-which/ mark.

This test sentence contains no form of the nominal to be marked. Chidí naat'a'í appears in the second sentence only as the reference of bi- in bik'i'iizoh. However, this caused no apparent misunderstanding, probably because the verb yit'ah, "it is flying," could not be used to refer to the action of a cloud.

English speakers again evidenced confusion in the above-below polar comparison. Wrong answers up to first grade were almost entirely the plane below the cloud.

42. Look at the pictures of bowls and spoons. Mark the picture that shows a spoon in every bowl.

łeets'aa' nímazí/ dóó/ beesh'adee'/ dah naazhjaa'go/ beda'alyaaígii/ nínił'í. // Bowl(s)/ and/ spoon(s)/ up there clustered/ pictured-which/ look at.

Łá' łeets'aa'/ dah shijaa'/ béésh'adee'/ t'áá át'é/ bii' daaz'áhígíí/ bik'i'iizoh. // Some bowls/ up there located/ spoon/ everyone/ they are sticking out-which/ mark.

This is a long sentence with a potentially confusing picture. It was hard for English-speaking students, easier for Navajos. Apparently the concept of a "complete" bowl and spoon set is clearly expressed though not by means of a direct translation of "every."

The same concept of completeness was tested in 15, "whole," using the same words, t'áá át'é.

Some English-speaking students marked every bowl with a spoon in it, showing that they knew the concept "every" but failed to understand the sentence structure.

43. Look at the beads. Mark the beads that are separated.

Yoo'/ níníł'í. // Bead(s)/ look at.
Yoo'/ áłts' ádahaas'niligíí/ bik'i'iizoh. // Bead(s)/ from each other separately strewn about-which/ mark.

This sentence provides a good instance of complex affixing to express meaning in Navajo. It is discussed in the text on page 96. Neither Navajo nor English-speaking students made especially high scores, indicating that the concept is hard, and not much used before school age.

44. Look at the birds. Mark the bird on the left.

Tsidii/ beda'alyaaígíí/ níníł'í. // Bird(s)/ pictured-which/ look at.
Tsidii/ nishtl'aaji/ sidahígíí/ bik'i'iizoh. // Bird/ left-at/ located-which/ mark.

This item, like 38, "right," tests a concept that is seldom well controlled before school age. Both Navajo and English speakers scored about the same and their wrong answers were also the same--opposite to the correct answer. The similarity in the first syllables of nish'naá and nishtl'a may make the two concepts harder to separate, and account for slower improvement in the Navajo scores.

45. Look at the pictures of candles. Mark the picture that shows a pair of candles.

Ak'ahkǫ'/ beda'alyaaígíí/ níníł'í. // Candle(s)/ pictured/ look at.
Ak'ahkǫ'/ naakiigíí/ bik'i'iizoh. // Candle(s) two-which/ mark.

This is the only item on which English speakers scored significantly lower than Navajos at all grade levels. It is somewhat surprising because preschool children encounter many things in pairs: shoes, pants, scissors. They may have failed to separate the words, and understood them as "pairashoes" or "pairapants," unaware of the locus of the twoness in the concept. Navajo children simply had to count the candles.

46. Look at the boxes. One box has an X in it. Skip a box and make another X.

Tsits'aa'/ nínił'í. // Box(es)/ look at.
Tsits'aa'/ łá'/ biyi' góne'/ ałná'ásdzoh/ bikéé' góne'/ si'ánígíí/ bitis/ díní'íí'. // Box/ the one/ it-on in-the-space/ cross/ it-on in-the space/ located-which/ it-over/ look.
Bitis díní'íí'ígíí/ bíighah góne'/ si'ánígíí/ bik'i'iizoh. // It-over you look-which/ it-beside in-the-space/ located-which/ mark.

This concept proved to be impossible to express except in a roundabout way that must have proved hard to follow. It is discussed in the text on page 83.

The meaning of "skip" as it is used here is one that is frequently used in giving classroom instructions. Otherwise it is not one of the important relational concepts of English.

The scores of Navajo students were depressed by this difficult item, which does not really test the concept "skip" but rather the child's ability to follow a complex series of instructions.

47. Look at the pictures of lollipops. Mark the pictures that have equal numbers of lollipops.

Ałk'ésdisí/ beda'alyaaígíí/ nínił'í. // Candy/ pictured-which/ look at.
Be'elyaa/ ałk'ésdisí/ t'áá aheenéelt'e' ígíí/ bik'i'iizoh. // Picture/ candy/ just same-in-number-which/ mark.

The concept of the same number is also tested in Navajo in 27, "as many marbles as." In English, the word "equal" is harder than "as many as." Since the same stem is used in Navajo for the two concepts, differences in Navajo difficulty are related to other parts of the sentence context. Both sentences were hard at K and 1, but 47, "equal" was easier at grade 2. Perhaps the picture of lollipops was easier to count than the marbles.

This picture, like 31, "alike," required plural marking and had no clear indication of that fact. Most of the Navajo students above K level chose either one or the other of the "same number" pictures, showing that they might have understood the concept but not the instruction.

48. Look at the boxes of circles. Mark the box where the circles are in order from large to small.

Tsits'aa'/ biyi'/ ałheeda'idzoigii/ ninił'i. // Box(es)/ it-in/ lines drawn in circles-which/ look at.
Nitsaa/ dóó/ ałts'iisiji'/ ahool'áago/ ałkee'/ nit'i'igii/ bik'i'iizoh. // Big/ and/ small-to/ extending/ each-other-after/ in a string-which/ mark.

The word ałkee, "after," appears here for the fourth time in the test. Comprehension of the required order would depend upon correctly interpreting the "big to small" phrase as requiring directional order. Ordering of this kind is probably a school-learned concept, and the item was difficult for all students.

49. Look at the teacher and the children. Mark the third child from the teacher.

Bá'ólta'í/ dóó/ áłchíní/ beda'alyaaígii/ nínił'í. // Teacher/ and/ children/ pictured-which/ look at.
Bá'ólta'í/ biighahdóó/ áłchíní/ táá' góne'/ sizínígii/ bik'i'iizoh. // Teacher/ her-beside-from/ child/ three in-the-space/ located-which/ mark.

This item is intended to measure the "third from" concept, the child's ability to identify a starting point and go a stated number of units from there.

The requirement to comprehend two noun phrases, bá'ólta'í biighahdóó "from beside the teacher," and áłchíní táá' góne', "third child," seems to have been very difficult. Some children attended to the first phrase and marked the child beside the teacher; others to the second, and marked the third person in the line of people.

It is possible that a child may understand "beside," "from," and "third," but not be able to put them together as they are given here. To determine whether one or more of the concepts is lacking, the teacher would need to separate them and test them individually. This item, like 46, "skip," may be a useful test of level of language development in Navajo. The child who can handle several concepts together in a sentence shows a higher level of language skill than the child who must attend to each one separately.

50. Look at the groups of stars. Mark the group that has the least stars.

So'/ dah/ naazhjaa'go/ beda'alyaaígii/ nínił'í. // Star(s) clustered in groups/ pictured-which/ look at.
So'/ áłch'íídígo/ naashch'aa'ígii/ bik'i'iizoh. // Star(s)/ being few/ drawn-which/ mark.

The fault in this item for Navajo students is discussed in the test on page 91. Since a plural verb must refer to more than two units in Navajo, the initial sentence verb beda'alyaa excludes the choice that is correct in the English test. To correct the item, at least three stars would have to be drawn in the group with the "least."

English speakers had difficulty with the negative pole of the polar pair "most" and "least." Thirty-seven percent at first grade and 36% at second grade marked the picture with the most stars.

Another difficulty in the Navajo sentence is that áłch'íídí, "they are few," is not a superlative and cannot be made overtly so. If any other group of stars in the picture also falls within the range of "few," an unambiguous test item would be impossible.

CURRICULUM VITAE

The author of this dissertation, Annabelle R. Scoon, was born in Kirksville, Missouri in 1922. She received her B.A. degree from the University of Oklahoma in Letters in 1941, and her M.A. in Linguistics from The American University, Washington, D.C. in 1963. Her Ph.D. in Education was awarded by the University of New Mexico in 1974.

In 1970, she was a participant in an NDEA Summer Institute on Asian History at Brooklyn College, New York.

During the period between 1951 and 1960, while living abroad, Ms. Scoon taught English as a Foreign Language in Bangkok, Thailand, Bad Godesberg, Germany, and Rangoon, Burma. Further professional experience included service as Vietnamese linguist for the Foreign Service Institute, Washington, D.C. in 1965, supervisor of foreign language instruction at the Institute of Modern Languages in Washington, D.C. in 1966, and Vietnamese language research coordinator for the Defense Languages Institute in 1967. She also taught English as a Foreign Language teaching methods in the off-campus program of The American University, and was a writer for the Voice of America and instructor in training programs for binational center personnel of the United States Information Agency.

From 1968 until 1974, Ms. Scoon was Education Specialist for the Bureau of Indian Affairs at the Albuquerque Indian School, as director of the reading laboratory and other special projects concerned with the education of American Indian children.

Ms. Scoon is the author of a number of articles on the educational status of American Indian students. Her recent Bibliography of Indian Education and Innovative Practices appears in ERIC documents.