ABSTRACT

Native children do not achieve well in Western schools, in spite of recent developments in the area of Native education. A review of the psychological literature suggests that Native children are stronger in spatial abilities than in verbal, and may even have a different "style" of problem-solving. Specific findings are examined and implications for the classroom teacher are discussed.

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Teaching Native Children: Lessons From Cognitive Psychology

SCHOOL DROPOUT RATE AMONG INDIAN RANGES TO 90% — NIB SEEKS CONTROL OF EDUCATION[1] warns a headline in a prominent southern Alberta Native newspaper. Six months later the same newspaper is asking *WHY DO STUDENTS RAN SO LOW IN EDUCATION SYSTEM?*[2] and, again the 90% dropout rate is of central concern. Articles such as these are typical as Native people demonstrate a growing awareness of, and concern for, the failures in Native education.[3]

According to the Canadian Association in Support of the Native Peoples, there are nearly 300,000 Status Indians and Inuit people in Canada and a further 750,000 Metis and Non-status Indians.[4] These 1,000,000 Canadians are not, as is so commonly thought, homogeneous in cultural and linguistic background. There are eleven different language families spoken by Native people with each family including many different languages and dialects[5] In addition to the differences in traditional cultures that existed, the time of first contact with Europeans varied nearly 150 years from the mid 17th Century in Eastern Canada to the early 19th Century on the Plains. Moreover, even today the degree of contact with Whites varies from the more densely populated and urban southern corridor to the isolated rural northern regions.

In spite of the cultural and linguistic diversity within Native peoples, there are many commonalities, particularly when their living conditions are compared to those of non-Natives. The Canadian Association in Support of the Native Peoples considers the Native population to be the most economically disadvantaged of any group in Canada. The Association reports that the average per capita earned income on reserves is less than $2,000 per year with 41% of all Indian families living on welfare (as compared to 3.7% for the total Canadian population). Moreover,

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[1] *Kainai News,* October 15, 1976, p. 5.

[2] *Kainai News,* April 22, 1977, p. 9.

[3] Reviews of the scholastic achievement of Indian children can be found in H. B. Hawthorne, ed., *A Survey of the Contemporary Indians of Canada,* (Ottawa: Queen's Printer, 1966), and W. T. Stanbury, *Success and Failure: Indians in Urban Society,* (Vancouver: University of British Columbia Press, 1975).

[4] Canadian Association in Support of the Native Peoples, *And What About Canada's Native Peoples?* (Ottawa: The Association, 1976),p. 1-4.

[5] B. Burnaby, "Language in Native Education," *Yearbook of the Canadian Society for Studies in Education,* Vol. 3, (1976), p. 62-85.

unemployment averages 55% with seasonal variations rising to 95% on some reserves. The average age death is 41.5 years for males and 43.3 for females with violent deaths occurring three to six times more frequently than in non-Native groups. Further, the rate of suicide is 28.4% and rising, and the mortality rate for infants is three to four times that of the national average.[6]

Education is frequently seen as the key to breaking the "cycle of poverty"; however, here too the comparison is invidious. Figures provided by the Department of Indian Affairs indicate that the rates of retention for Natives from grades 1 to 12 from 1958-59 to 1969-70 varied from 7.7% in Quebec to a high of 18.4% in Ontario. The comparable rates for the non-Native population ranged from a low of 46.2% in Nova Scotia to 88.4% in Alberta.[7] Usually, one-half of the Native children beginning grade one dropout before grade eight or nine.[8] Correspondingly, the level of educational attainment is equally depressing. Stanbury, who provides a very detailed account of Indian educational attainment in British Columbia, reports that according to the 1971 census, 79.6% of all people whose first language was an Indian or an Inuit language and who were over 20 years of age had no more than an elementary school education (as compared to 36.8% for all Canadians). Only 5.5% had any university training as compared with 27.3% for the country as a whole.[9] Furthermore, studies of in-school achievement commonly show that Native pupils "lag behind" their White classmates and fall further behind with increasing years in school. Comparisons of the performance of Native and non-Native children on standardized achievement tests usually show that Native children score below White norms. Although many standardized tests are "biased" against the Indian child, such findings have appeared so consistently that a former Commissioner of the Bureau of Indian Affairs in the United States remarked that these studies "have yielded a familiar and by now dreary, statistic."[10]

On the brighter side, during the last decade considerable resources have been devoted to Native education, resulting in developments in three major areas. First, in response to the Federal Government's attempt in 1969 to turn Native education over to provincial governments, the National Indian Brotherhood and other Native organizations pressed for Indian control of Native education. This policy, which has now been accepted by the Government, has many advantages as no group is more interested in, and affected by, the successes and failures in Native education than the Native people themselves. The second thrust has been in the development of curricula to make classroom lessons more relevant to the Native child. Again, this is a progressive step, for the motivation of the intended learner is often related to the relevancy of the curriculum. The third major development has been in training Native people to be classroom teachers. There are now nearly a dozen post-secondary programs in Canada dedicated to this task. This, too, is a desirable development as Indian control of schools and the development of relevant curricula, particularly in the area of native language teaching, are dependent upon the availability of professionally trained teachers of Native ancestry.

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[6]And What About Canada's Native Peoples?

[7]Quoted in W. T. Stanbury, p. 108.

[8]W. T. Stanbury, p. 108.

[9]Ibid., p. 112.

[10]Quoted in B. Berry, *The Education of the American Indians: A Survey of the Literature* (Columbus: Ohio State University, 1968), p. 27.

In spite of these promising developments, the tide of failures has not yet been reversed.[12] The purpose of this paper is to argue that one reason for the continuing lack of success is the inadequate attention paid to the cognitive functioning of the Native child. Local control is, in part, only meaningful if the school is reorganized to reflect the learning behaviors of the pupils. Curriculum development should, likewise, not be concerned only with content, but rather should reflect the psychology of the learner. Similarly, Native classroom teachers will be of limited additional effectiveness if they, as result of their training, teach Native pupils the way non-Native teachers teach. Yet one might ask, are there differences in cognitive functioning between the Native and the non-Native children? A review of the studies of intellectual functioning will reveal that there are differences and, moreover, differences which are educationally significant. Of course, to say that there are differences between two groups is not to infer that one group is inferior or superior to the other. Also, as with any other group, one would expect to find a wide range of individual differences. Nevertheless, there are some common features or, at least, characteristic patterns which would apply to many Native children.

Comparisons between the intellectual abilities of Indians and those of Europeans have fascinated Europeans for about two hundred years. In 1784, Benjamin Franklin published a pamphlet in England which attempted to convince people that Indians were just as competent in intellectual functioning as they, but rather placed more emphasis on physical prowess and survival skills than on "school learning."[13] Of course scientific studies of intellectual functioning are much more recent; however, in 1914, only nine years after Binet and Simon published their test, it was being administered to two hundred and sixty-eight Indian children.[14]

The first such study with Canadian Indians was conducted in 1928 by a doctoral student in Ontario who was himself an Indian.[15] By 1931, 29 studies of mental abilities had been conducted with 6,857 Indians in the United States and this figure does not include the studies of personality, sensory perception, aesthetics, resistance to fatigue, association of ideas and musical ability which were conducted in the 1920s.[16] Interest in the topic continued throughout the 1930s; however, the advent of World War II directed research into other areas. Even in the aftermath, little attention was paid to the educational problems of Native children.

Indeed, during the 1950s only one study was published, and this a Master's thesis into the scholastic aptitude of a group of Indian children in Ontario.[17] The

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[11]For a review of the developments in Native education in Canada, particularly the language aspects, see B. Burnaby. For a comprehensive review of developments in the United States, see M. Szasz, *Education and the American Indian: The Road to Self-Determinination,* 1928-1973 (Albuquerque: University of New Mexico Press, 1974).

[12]For suggestions as to why work in curriculum development has not achieved much success, see J. Barrington, "Curriculum Innovation and Ethnicity," *The Journal of Educational Thought 11 (April, 1977): 77-81.*

[13]*B. Franklin, "Remarks Concerning the Savages of North America," Michigan Archeologist* (1957): 21-22. Reprint of a pamphlet published in England in 1784.

[14]E. C. Rowe, "Five Hundred Forty-Seven White and Two Hundred Sixty-Eight Indian Children Tested by the Binet-Simon Tests," *Journal of Genetic Psychology* 21 (1914): 454-468.

[15]E. Jamieson, "The Mental Capacity of Southern Ontario Indians." (Ph.D. diss., University of Toronto, 1928).

[16]T. Garth, *Race Psychology* (New York: McGraw-Hill, 1931).

[17]D. J. Penfold, "The Scholastic Aptitude of the Indian Children of the Caradoc Reserve" (MA thesis, University of Western Ontario, 1951).

results were reminiscent of the pre-war studies; namely, that age for age, and as a group, Indian children demonstrated a lower scholastic aptitude than White children. Nevertheless, abilities covered the same range and capable Indians were found to surpass average Whites. The authors concluded that these differences were not due to race, but rather to environmental circumstances such as being schooled in a second language, lacking confidence in their abilities, lacking a tradition of schooling, poor attendance at school and low motivation to perform the tests, coming from communities of low socio-economic status and attending schools which were not equipped to handle the unique educational needs of Native children.[18]

A change in the purpose of such studies came in the 1960s with the work of Russell MacArthur and his students at the University of Alberta. Initially, MacArthur was interested in the problems of identifying and measuring the intellectual potential of Native pupils and doing it in a manner which would be valid, practical and economical.[19] This assessment is necessary, MacArthur claimed, if the schools are to further the development of Native children.

> Contemporary philosophies of education expect that instruction will be adaped to the intellectual potential of the pupil. However, in order to adjust teaching treatments to pupil potential, a fair estimate of that potential is required. Many studies in recent years indicate that conventional measures of verbal intelligence tend to discriminate against children who are not members of urban middle-class culture. Teachers and counsellors frequently require a less biased estimate of the potential of a pupil who is the product of a rather different culture. Hence the search for measures of intelligence which are relatively independent of specific environmental experiences becomes especially important. [20]

Later, a supplementary question was added to determine to what extent particular environmental conditions affect the development of particular abilities.[21] Hence, this research was motivated by an educational problem, namely, that of adaptive teaching.

The first studies were concerned with comparing several tests of scholastic aptitude ranging from conventional verbal tests such as the Detroit Beginners First Grade Intelligence Test[22] to less culturally-specific non-verbal tests such as Raven's Progressive Matrices.[23] The tests were normed on a sample of 780 White pupils in grades 1,3,6, and 7 in Edmonton and Calgary. Then they were administered to 147 Metis in Faust, Alberta and 155 Indians and Metis in Ft. Simpson, N.W.T.[24]

Overall, the results were consistent with earlier findings, showing that Indians and Metis scored lower than Whites. More importantly, however, Native performance was considerably better on the non-language (culture-reduced) tests. By

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[18]G. H. Turner and D. J. Penfold, "The Scholastic Aptitude of the Indian Children of the Caradoc Reserve," *Canadian Journal of Psychology* 6 (1952): 31-44.

[19]R. S. MacArthur, "The Construct Validity of a Number of Measures of Intellectual Potential for an Alberta Metis Sample" (Paper delivered at Annual Meeting of the Candian Psychological Association, Hamilton, Ontario, June, 1962).

[20]L. W. West and R. S. MacArthur, "An Evaluation of Selected Intelligence Tests for Two Samples of Metis and Indian Children," *Alberta Journal of Educational Research* 10 (1964): 18.

[21]R.S. MacArthur, *"Mental Abilities in Cross-Cultural Context" (Paper delivered at McGill University, Montreal, March, 1966).*

[22]*Chicago: World Book, 1937.*

[23]J.C. Raven, *Standard Progressive Matrices* (London: H. K. Lewis, 1938).

[24]West and MacArthur, p. 19.

using the tests' published norms, the IQ of each pupil at Faust and Ft. Simpson was calculated. The results showed that on the conventional verbal tests the average IQ at Ft. Simpson was 80 and at Faust 87. On the other hand, the average IQ for both groups on the non-verbal tests was 94.[25] More dramatically, it was noted that in 99 cases the non-verbal IQ exceeded the verbal by 16 pts or more (one standard deviation) and in 25 cases by 32 points of more (two standard deviations). The relative "cultural-bias" of each test varied with grade level; however, Raven's Progressive Matrices was the least biased test overall.

Of course to obtain superior Native performance on a test is not to say that the test results are indicative of anything psychological or educational. In this case though, MacArthur was able to demonstrate the tests' validity as a predictor of scholastic aptitude. Test results were shown to correlate moderately with school achievement, albeit at a lower level than the conventional verbal tests. A follow-up study conducted several years later using the scores from the California Achievement Test, revealed that for the Faust sample, Raven's Progressive Matrices was as powerful as the conventional intelligence tests in predicting school achievement over a four year period.[26]

MacArthur has extended his work to include Eskimos in the western Canadian Arctic and has obtained essentially the same results.[27] Again, the verbal tests, particularly those involving vocabulary and oral English, yielded the greatest Eskimo-White differences. Interestingly, it was found that there were no differences in the performance of the Metis in Faust, the Indian-Metis in Ft. Simpson and the Eskimo. Hence it was concluded that

> the abilities measured by these tests do not seem to be differentially affected by whatever environmental differences are associated with Indian vs Eskimo upbringing, as they at present exist for pupils in the western Canadian Arctic. [28]

MacArthur's early work thus demonstrated more appropriate means of assessing intellectual potential or scholastic aptitude in Native pupils than the more commonly used verbal tests. By showing that non-verbal tests have equal predictive ability for scholastic achievement, even after four years, MacArthur has weakened the argument that only verbal tests are suitable for predicting educational success. MacArthur concluded that non-verbal tests such as the Raven's are less culturally biased because the verbal aspects of intelligence are more influenced by cultural variables than are the non-verbal abilities, such as spatial relations. Moreover, the culturally reduced tests were judged to comprise miniature learning situations which do not depend upon past learning but rather reflect the ability to educe relations or to form concepts, and to use them in novel situations.[29]

Although MacArthur emphasized that in testing and teaching greater use should be made of the pupils' non-verbal abilities, he recognized that the verbal weak-

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[25]R. S. MacArthur, *"Assessing the Intellectual Ability of Indian and Metis Pupils at Ft. Simpson, N.W.T."* (Report submitted to the Education Division of the Canadian Department of Northern Affairs and National Resources, 1962).

[26]M. S. Rattan and R. S. MacArthur, "Longitudinal Prediction of School Achievement for Metis and Eskimo Pupils," *Alberta Journal of Educatioal Research* 14 (1968): 37-41. On the other hand, A. Bowd, "Some Determinants of School Achievement in Several Indian Groups," *Alberta Journal of Education Research* 18 (1972): 69-76, found that grade level was a function of general intelligence for Whites but verbal ability (as measured by vocabulary) for Indians.

[27]R. S. MacArthur, "Some Differential Abilities of Northern Canadian. Youth," *International Journal of Psychology* 3 (1968): 43-51.

[28]MacArthur, "Mental Abilities in Cross-Cultural Context," pp.10-11.

[29]MacArthur, "The Construct Validity," p.6.

nesses must be redressed. Consequently, it was recommended that more emphasis be placed on Oral English in Native schools. This recommendation has frequently been echoed by others; nonetheless, Oral English programs in Native schools commonly leave much to be desired and do not continue long enough.

In the mid-nineteen-sixties, a series of studies was conducted by Philip Vernon, then of the University of London Institute of Education. Vernon was completing a major study in several countries of the factors contributing to the developmental of general intelligence and of specific group factors such as verbal-educational and mechanical-spatial abilities. He argued that if we are to assist developing peoples "we must know more about the environmental and other handicaps which retard the development of those abilities which are needed for technological development."[30]

Samples of 40 Indian and 50 Eskimo boys aged between ten and twelve years were drawn from Morley and Cluny, Alberta, and the Mackenzie Delta in the N.W.T. All subjects were judged to be of low socio-economic status. Most of the Indians spoke a Native language whereas the Eskimos spoke more English. Some of the Eskimos lived in school hostels while their parents followed a more traditional hunting and trapping way of life. A battery of tests measuring aptitude, and achievement were administered as were several Piagetian tasks.[31]

On the whole, Vernon's results indicated that the performance of the Eskimo boys was inferior to that of White control group, but superior to that of the Indian boys. On the surface, this finding is surprising as the Indians have more contacts with the Whites than do the Eskimos. Their linguistic handicap was greater, Vernon noted, and he interpreted this as an indication of the Indian resistance to acculturation:

> Thus the most likely explanation of serious retardation in other aspects of intellectual development among Indians is the general maladjustment of the tribal cultures, and the inability of white society to organize acceptable goals. [32]

Like MacArthur's, Vernon's results showed that Native children performed relatively better on non-verbal tests of aptitude than on verbal tests. For example, on the English test, the Eskimo median of 85 and the Indian median of 78 are will below the White average (100 on all tests). Similarly, on the Vocabulary test the Eskimo median was 76 and the Indian 70.[33] On the other hand, on Creative Response Matrices,[34] a non-verbal test of reasoning, the Eskimo median was 89 and the Indian 81. On the Goodenough Draw A Man test, the Eskimo median was 95 and the Indian 96. Hence, although the superior performance of the Eskimos relative to the Indians was not consistent with MacArthur's finding of no differences between the Native groups, the results tend to confirm the conclusion that non-verbal tests are better indicators of potential ability for Native pupils.

Although many teachers of Indian and Eskimo pupils have stated that these pupils do better in Arithmetic than in English, Vernon found that on the average Native children scored 15 points below Calgary White children on Arithmetic. Just

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[30]P. E. Vernon, "Ability Factors and Environmental Influences," *American Psychologist* 20 (1965): 723-733.

[31]For a more detailed description of the tests, see P. E. Vernon, *Intelligence and Cultural Environment* (London: Methuen, 1969), p. 125-137.

[32]Ibid., p. 210.

[33]Ibid., p. 234.

[34]A similar type of test to Raven's Progressive Matrices; however, this test requires subjects to produce the correct answer, not merely to recognize it from six alternatives.

prior to the study the Alberta Department of Education had introduced a new mathematics syllabus which, rather than emphasizing fundamental operations, was more verbally oriented. It was the highly verbal and abstract nature of the arithmetic which probably handicapped the Native pupils, Vernon suggested.[35]

Thus, there are several indications from Vernon's studies that the most highly developed abilities for Native pupils are spatial abilities. This, of course, is quite consistent with MacArthur's earlier finding and, moreover, has been confirmed by his later work.[36] Both authors suggest ways in which this conclusion is educationally significant. Vernon reminds us that such tests are usually indicative of technical-mechanical aptitude and, therefore:

> support the view that indigenous males have considerable aptitude as mechanics, though they seldom get the opportunity to display it and are handicapped by linguistic and motivational weaknesses.[34]

Agreeing that the highly developed perceptual skills and abilities of the Eskimo make him well suited to a modern technological society, MacArthur suggests that spatial and other non-verbal abilities should be used as the media for instruction. Typically, the method of presentation in the classroom is verbal and, therefore, creates difficulties for the Native pupil which other methods of presentation might avoid.[38] Similarly, MacArthur argues that the content of instruction should be the development of *both* verbal and non-verbal abilities. Again, modern schools tend to emphasize the former to the neglect of the latter.[39]

It is important to note that these studies have not shown only that Native pupils are stronger in spatial abilities, but also that Native pupils use spatial abilities to solve a task that pupils from other groups might use, for example, verbal abilities to solve. To illustrate, in a study comparing Eskimo test performance to that of Nsenga Africans, MacArthur found that Eskimo performance was related to what he calls "reasoning from non-verbal stimuli"; whereas for the Nsengas performance was related to verbal ability. Similarly, a form assembly test was a function of spatial ability for the Eskimos but verbal ability for the Africans.[40] Comparing Indians and Eskimos to Whites, MacArthur found that performance on some tests was related to verbal memory for the Whites but not so for the Native pupils.[41] Vernon also found different ability patterns. For example, his Matrices test was a function of only spatial ability for the Eskimos but spatial *plus* verbal ability for the Indians. Thus Vernon remarked that "different groups at similar levels of acculturation, and with similar language difficulties, may show very different patterns of scores."[42] MacArthur, likewise observed that the same tests

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[35]Vernon, *Intelligence and Cultural Environment,* pp. 203-204.

[36]R. S. MacArthur, "Some Ability Patterns: Central Eskimos and Nsenga Africans," *International Journal of Psychology* 8 (1973): 239-247. For a review of psychological research with Eskimos, see J. W. Berry, "Psychological Research in the North," *Anthropologica* 13 (1971): 143-157.

[37]Vernon, *Intelligence and Cultural Environment,* p. 207.

[38]For an elaboration of this point, see J. Kleinfeld, *Cognitive Strengths of Eskimos and Implications for Education* (Anchorage: Institute for Social, Economic and Government Research, University of Alaska, 1971) and J. Kleinfeld, "Intellectual Strengths in Culturally Different Groups: An Eskimo Illustration," *Review of Educational Research* 43 (1973).

[39]R. S. MacArthur, "Ecology, Culture, and Cognitive Development: Canadian Native Youth," in L. Driedger, ed., *The Canadian Ethnic Mosaic:* A *Quest for Identity* (Englewood Cliffs, New Jersey: Prentice-Hall, in press).

[40]Ibid.

[41]MacArthur, "Mental Abilities in Cross Cultural Context," p. 49.

[42]Vernon, "Ability Factors," p. 737.

appear to measure different abilities in different cultures.[43]

Probing the extent to which spatial ability predominates Native intellectual functioning, and why this might be so, has been the object of several recent studies. Much of this work has combined the approaches of Vernon and MacArthur with the studies of Indian and Eskimo perceptual skills conducted by Berry[44] and the notion of a field dependent-independent cognitive style postulated by Witkin.[45] A cognitive style is a construct related to both intellectual abilities and to personality. It is, if you like, a person's characteristic way of thinking about things. Witkin has suggested that a certain approch to child-rearing leads to particular personality traits and cognitive abilities, with the result that the individual is more analytical in his thinking. More recently, this work has been replicated in other cultures. Berry, for example, has shown that parental approaches to child-rearing (leading to the development of an analytical cognitive style) are related to the ecology in which people live.[46] Indeed, Vernon was one of the first to relate the spatial ability of the Native pupils to their home background:

> Thus it seems reasonable to attribute the better performance of Eskimo and Indian groups to the greater emphasis on resourcefulness in the upbringing of boys, perhaps combined with their strong masculine identification . . . the children are still brought up permissively and encourage to explore and hunt.[47]

And MacArthur has confirmed this, suggesting that an extension of Witkin's differentiation theory indicates that the Canadian Eskimo's hunting ecology and child-rearing patterns which encourage independence, foster a broad spatial-field independence cluster of abilities and also a distinctive cluster of abilities involving inductive reasoning from non-verbal stimuli.[48]

Thus, Native pupils are strongest in spatial abilities, tend to use those abilities to solve problems and may have a characteristic "style" which is non-verbal as opposed to the more verbally oriented style of Europeans. What are the implications for education? In addition to those suggested by Vernon and MacArthur, these findings suggest to the present author that many (but not all) Native pupils may have a different learning style or mode of learning from that of most White children. It is not unreasonable to assume that individuals will use their strongest abilities when learning or solving problems and, therefore, the classroom is likely to contain activities which for the European teacher (or the European-trained Native teacher) are verbal tasks but which for the Native pupil are spatial or non-verbal tasks. The teacher may then be of little use in helping the child to understand, for she is approaching the task from an entirely different direction. As yet, we know little about how extensive these differences are or which ways they affect classroom learning. Two years ago, the present author conducted an exploratory investigation into Indian and White differences in concept learning. For White eight year olds, concept learning appeared to be a distinct and unitary ability. On

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[43]MacArthur, "Some Ability Patterns."

[44]J. W. Berry, "Temne and Eskimo Perceptual Skills," *International Journal of Psychology* 1 (1966): 207-229.

[45]For a full description of this theoretical approach and supportive research, see H. A. Witkin and R. B. Dyk *et al, Psychological Differentiation: Studies of Development* (New York: John Wiley, 1962).

[46]A very complete review of the cross-cultural studies examining this construct can be found in H. A. Witkin and J. W. Berry, "Psychological Differentiation in Cross-Cultural Perspective," *Journal of Cross-Cultural Psychology* 6 (March, 1975): 4-87.

[47]Vernon, "Ability Factors," p. 732. For a theoretical discussion of spatial ability and its development, see I. McF. Smith, *Spatial Ability: Its Educational and Social Significance* (London: University of London Press, 1964).

[48]MacArthur, "Some Ability Factors," p. 244.

the other hand, for Indian children of the same age the learning tasks involved two distinct abilities; one resembling concept learning and one related to verbal ability or the use of verbal mediators.[49] Further work is being conducted into this area but, nevertheless, the preliminary results suggest that concept learning (the heart of the curriculum) is influenced by different ability patterns or learning styles. Until more information is available, teachers would do well to hold open the possibility that their pupils may be approaching school trasks in a quite different manner. And, as MacArthur recommends, the use of non-verbal method and materials as the media of instruction is desirable.

One further exploration into Native spatial ability is worth reporting. Vernon remarked that such ability is usually indicative of mechanical aptitude and one of his students, A. Bowd, set out to see if this was the case for Indians.[50] Five samples of boys aged between 12 and 14 were selected from three Indian tribes, one Metis colony and a White urban blue-collar group. Results were consistent with previous research, showing that on a general spatial-mechanical ability factor the Native boys performed as well as the urban Whites. This was true in spite of the low socio-economic homes from which the children came.[51] Moreover, the study showed that the presence of tools or mechanical objects in the home was associated with superior mechanical ability in all groups.

In addition to the well developed spatial-mechanical ability, Bowd also found that Native pupils were inferior to Whites in verbal ability. Verbal ability was found to yield the highest correlation with scholastic achievement (as measured by grade level). Unfortunately for those suggesting that Native pupils are suited to careers in technology, several mechanical tests were shown to be related to verbal ability.

> Verbal ability, at least to some minimal level must be recognized as necessary to the development of mechanical aptitude. While the Indian boys studied have demonstrated a generally high overall spatial-mechanical ability, their verbal performance falls short of the white group. The acquisition of mechanical knowledge, tool naming and the understanding of mechanical principles depends upon basic verbal abilities.[52]

Hence, it is not surprising that Bowd's major recommendation was for special training in the English language for Native pupils.

Thus, notwithstanding the Native child's strength in spatial ability, educators are again faced with the debilitating effects of poor verbal ability. And, one might ask just what it is about verbal ability that makes it predominant. It could be that verbal ability is merely symptomatic of other, more powerful factors, such as acculturation to school-life. For example, a study of reading achievement in Indian Affairs' schools revealed that children from isolated, northern, rural areas who did not speak English at school entry but who had one year of kindergarten were reading at a higher level at the end of grade one than children from southern reserves who spoke English as a first language but who had not participated in kindergarten.[53] Thus, perhaps it is the learning of school appropriate behaviors, or "good work habits" or "school English" which is most important. In a later arti-

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[49]I. R. Brooks, "A Cross-Cultural Study of Concept Learning" (Ph.D. diss., University of Calgary, 1975).

[50]A Bowd, "Mechanical Aptitude and Environment" (Ph.D. diss., University of Calgary, 1971).

[51]It should be noted that socioeconomic status is virtually impossible to equate across cultures.

[52]Bowd, "Mechanical Aptitude and Environment," pp. 185-186.

[53]R. Colliou, *A Studey of Standardized Reading Test Results of Indian Pupils (1965-66) in the Federal Schools of the Indian Affairs Education Division, Department of Indian Affairs and Northern Development,* (Ottawa: Government of Canada, Indian Affairs Branch, 1966).

cle, Bowd in fact suggested that poor verbal ability and school achievement may be a function of the quality of English spoken in the home.[54] Indeed in an extensive survey of a sample of Canadian Indian reserves, Hawthorne[55] reported that many Indian parents carried out only restricted conversations with their children, frequently answering in monosyllables. Moreover, the English spoken by the adults was often inaccurate and dependent upon a limited vocabulary. Reading is thought to be an infrequent activity and, in fact, a recent study in British Columbia indicated that Indian children ". . .were significantly less able to recognize the acts of 'reading' and 'writing.' Their concepts of the communicative function of reading and writing were significantly immature."[56]

On the other hand, language could act to inhibit school learning only because the medium for instruction in the school is verbal. Perhaps, as Bowd, MacArthur and Kleinfeld suggest,[57] school learning would be improved by the use of teaching aids such as charts, diagrams, maps and concrete objects. Venn diagrams and symbolic pictorial aids have been recommended for use in teaching abstractions, even language concepts.

Yet, there is a third alternative: that the Native child's capacity to spontaneously use verbalization in problem solving is poorly developed. And, as Luria has postulated[58] perhaps intelligence is really the ability to use abstract verbal terms to process information. This question was studied by Schubert and Cropley in 1972[59] who examined the possibility that there were qualitative differences in the intellectual processes of Native and non-Native children.

Samples were drawn from two groups of Indians, one in an isolated part of southern Saskatchewan and one from a reserve near Regina, and from two groups of Whites, one from a rural region near Regina and one from a middle class area of the city. Children were given the Wechsler Intelligence Scale for Children,[60] followed by a training session on the Block Design and Similarities sub-tests. Subjects were then retested on these subtests and, in addition, their ability to verbally regulate their behavior was assessed. Results showed that although White children obtained higher scores that Native children (with the northern Indians scoring over 25 IQ points lower on the Performance scale and 35 on the Verbal), all groups benefited to the same extent from the training in spontaneous internal verbalization. Further, there were significant differences between the groups in their ability to verbally regulate their behaviour, with urban Whites scoring highest. This ability was found to be positively related to age to IQ. The authors noted that previous experience had suggested that White children with IQs similar to those of the northern Indians did not make any such gains following training nor did they initially show as much ability to verbally regulate their behavior. Hence, the low IQs of the northern Indians were judged to stem from

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[54]A. Bowd, "Linguistic Background and Non-Verbal Intelligence: A Cross-Cultural Comparison," *Journal of Educational Research* 68 (1974): 26-27.

[55]Hawthorn.

[56]J. Downing, L. Ollila and P. Oliver, "Cultural Differences in Children's Concepts of Reading and Writing," *British Journal of Educational Psychology 45 (1975): 312-316.*

[57]*Bowd, "Some Determinants," Kleinfeld, Cognitive Strengths,* and MacArthur, "Ecology, Culture, and Cognitive Development."

[58]A. R. Luria, *The Role of Speech in the Regulation of Normal and Abnormal Behavior* (London: Pergamon Press, 1961).

[59]J. Schubert and A. J. Cropley, "Verbal Regulation of Behavior and IQ in Canadian Indian and White Children," *Developmental Psychology* 7 (1972): 295-301.

[60]D. E. Wechsler, *Wechsler Intelligence Scale for Children* (New York: Psychological Corporation, 1949).

different causes from the low IQs of White children and the two racial groups were thought to differ qualitatively in intellectual processing.

> The major difference between the northern Indian child and the urban white child looks to lie in the fact that the former does not habitually and spontaneously analyze his experience in verbal terms and does not formulate internalized rules that might guide him in new learning situations.[61]

The data are interpreted to indicate that Indian children have not developed the information processing strategies to succeed in the White world and that their schools have not helped them to overcome this deficit. The authors note that Soviet research claims to have developed preschool programs to aid the development of spontaneous verbal regulation of behaviour and urge North American educators to do the same. The problems many Native children face in transferring present learning to new situations and in preventing present learning for interfering with previous learning, could stem from the child's inability to use words as labels and as cues. For example, in arithmetic a child may respond to a problem such as 2 + 3 correctly because through practice, he has learned to respond by adding the two numbers. Note, he may not realize that the plus sign indicates addition, indeed he may be unaware that the sign is called a plus sign for that reason. Similarly, he probably does not understand that in questions of addition the answer must always be greater than the larger number in the problem. Hence, when the teacher progresses to 4 — 2 the child will treat the question as a new problem, not benefitting from his experience with the previous addition problems. Again, he may respond to the problem as a whole and not to the specific operation sign, saying "yes, the minus sign means subtract." Not only will his previous learning be of little use, but his present learning will interfere with the past, so that on returning to addition problems, the teacher will very likely find that the child has "forgotten" how to do them. This can be overcome by teaching the children to attend to the operations sign, and to label the process thereby indicated. They will then begin to use verbal statements as labels for the problem-types and as cues for the process required for problem solution.

To conclude this brief review, recent studies of intellectual functioning in Native children have yielded some consistent findings which suggest that present educational practices do not meet their needs. This is not to blame teachers of Native children, most of whom work exceptionally hard to do the best they can. Rather, it is to say that we, as educators, have not been able to appreciate that cultural differences result in different ability patterns and, perhaps, styles of learning. Native children are strong in spatial-mechanical ability and reaching them via this mode (rather than through verbalization) should prove fruitful. There is evidence to suggest that their style of mode of cognition is more visual than verbal and teachers should be prepared for the fact that these children may be approaching tasks from very different points of view. To what extent such differences affect concept, rule and principle learning is not yet known and, clearly, work should proceed in this area. The weaknesses in verbal ability must be redressed by a greater use of English as a Second Language program in the junior elementary schools and by continuing them throughout the child's schooling. As Schubert and Cropley, and Bowd have pointed out, to increase vocabulary is not sufficient. Rather, attention must be focussed on the role of language in cognition and in assisting children to develop internal verbal systems for use in information processing and problem solving.

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[61]Schubert and Cropley, p. 300.

This is not to deny the important role that affective factors play in learning and, of course, in a cross-cultural situation many of them are crucial[62] Indeed, Vernon pointed out that a prime reason for the inferior performance of the Indian children relative to the Eskimo probably lay in the problems Indian people have in dealing with White society.[63] What this paper attempts, however, is to argue that classroom teachers and curriculum developers can now build on information presently available from studies of the psychology of Native people.

Recently in Canada a considerable sum of money has been directed towards making the curriculum "more relevant" for the Native history (sometimes even Native language) in the school syllabus. This, though admirable, is not enough. A curriculum can be made more relevant only by gearing it to the strengths, needs and learning styles of those children who are the consumers of that curriculum.

From a psychologist's point of view, this means the use of materials which come from the child's own environment and which are used initially *in the same manner* as they would be in his home. Problems and solutions should not be dependent upon verbal presentation but rather non-verbal methods such as charts and diagrams, and active manipulation of objects should be employed. Lessons should be highly structured, logically sequenced and presented in small steps with explicit instructions and immediate feedback and reinforcement. Attention should be paid to the role language plays in cognition. Thus, lessons must teach the child to attend to the relevant attributes of the problem or concept and teach him to use sub-vocal verbal statements to label and cue the required processes. Curricula and lessons developed with these factors in mind should be more relevant to the Native child by virtue of the fact that they relate to the way in which he approaches school tasks.

Les enfants indiens n'obtiennent pas de bons résultats dans les écoles de l'Ouest malgré les récentes améliorations qui ont été apportées à l'éducation des autochtones.

Les ouvrages de psychologie consacrés à ce problème, semblent montrer que les enfants autochtones sont meilleurs dans les activités spatiales que dans les activités verbales et peut-être même qu'ils ont un différent "style" pour résoudre les problèmes.

L'auteur examine des cas d'espèce et analyse les implications qu'ils peuvent avoir pour les enseignants.

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[62]For examples of how affective factors can affect classroom learning, see J. Kleinfeld, "Classroom Climate and the Verbal Participation of Indian and Eskimo Students in Integrated Classrooms," *The Journal of Educational Research* 67 (1973): 51-52; and J. Kleinfeld, "Effects of Non-Verbal Warmth on the Learning of Eskimo and White Students," *The Journal of Social Psychology* 92 (1974): 3-9.

[63]Vernon, *Intelligence and Cultural Environment* p. 210.