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ABSTRACT

This paper reviews the literature on learning styles of Native Americans and Asian-Americans. Four different operational definitions of "learning style" or "cognitive style" are presented, related terms are examined, and inconsistencies of usage in the literature are discussed. Noting the great diversity among Native American cultures, aspects of Native American learning style are described: (1) visual-spatial mode of information processing; (2) tendency toward the global end of the global-sequential continuum; (3) high levels of field independence; (4) tendency toward the imaginal end of the verbal-imaginal continuum; and (5) tendency toward reflectiveness on the reflective-compulsive continuum. These five aspects are also examined in the literature on two Asian-American cultural groups--Cantonese Chinese (primarily from Hong Kong) and South Asians (from India, Pakistan, Sri Lanka, and Bangladesh). This paper finds considerable support for the proposition that culture affects learning style. However, the available research has a number of problems: (1) inconsistency in operational definitions; (2) lack of comparability among studies; (3) possibly inappropriate use of bipolar continua to describe learning styles; (4) validity of test instruments across cultures; and (5) dearth of cross-cultural studies on aspects other than field independence/dependence. This paper contains 83 references. (SV)

LEARNING STYLES OF NATIVE AMERICANS AND ASIANS

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Culture is learned, but how does culture affect the processes by which one learns? How does culture impact on the way one perceives, thinks, organizes, reasons, stores and retrieves information? "Culture is first last and always learned ... [but] few people have any notion of how little is really known about the microcultural details of how learning proceeds - the implicit cultural matrix of learning in different cultures (Hall, 1988, 22-23).

Susan is a member of the Gitksan Indian nation. She is 11. I remember her in a grade 5 lesson on government. Her teacher was dynamic, warm and responsive. But Susan was really struggling with some of the concepts. The night before I sat in her home as her Grandmother explained the Potlatch, the Gitksan system of government, an extremely complex system. Susan seemed to understand. Two nights earlier I listened at a memorial feast as an elder spoke about life, death and his spiritual beliefs. Some very complex concepts, but Susan seemed to understand; her parents also understood at a different level; and her Grandmother seemed to understand at a level that only the wisdom of age can bring.

Susan was learning her culture. And her culture affected the processes by which she learned. Susan's culture helped determine her world view, her life experiences, the way she learned to learn, the way she perceived, organized, reasoned and remembered.

I think of similar experiences I've had with other Native Americans. I think of similar, yet different, experiences I've had with Asian learners here in North America and in their homeland cultures. And I wonder how much culturally-related processing we miss as educators? How much do we fail to understand? How much do we see as weaknesses rather than strengths?

This paper examines some of the relationship between culture and learning processes, particularly learning styles. The results are illustrated in two groups of cultures - Asians and Native Americans.

Introduction

Educators in North America have long been curious and concerned about the varied achievement of ethnic minority students. Some minority groups, on the average, achieve well above majority

students in some areas, while some achieve far below (Gibson, 1987; Ogbu, 1987). There is abundant evidence of low achievement and high drop out rates (Coleman, Campbell, Hobson, McPartland, Mood, Winfield & York, 1966, Jacob & Jordan, 1987), and the cross-over effect in which achievement begins to plummet at about age ten (Hall, 1989).

Achievement problems of minority students have at least three major sources. One is bias and discrimination in the education systems (Grant, 1975; Gutman & Bar-Tal, 1982). Another is related to economics (Coleman et al., 1966; Vernon, Jackson & Messick, 1988). The third is cultural, related to cultural differences and "secondary cultural discontinuity" (Jacob & Jordan, 1987, p. 259). "If we are going to equalize the opportunities we provide, we must consider culture" (Bennett, 1986, p. 4). This paper relates to the third source, but elements of the first two sources are involved too.

In the remainder of the paper I examine the meaning of "learning styles" and related terms. Then I discuss application of learning styles to understanding cultural differences in the way students learn. Finally, I apply this to Native American and Asian learners. A premise throughout is that culture does affect learning styles, but there are not clear learning style patterns or profiles that are unique to each cultural group.

I have made some rather arbitrary limitations to keep the size of the paper manageable. One limitation is to emphasize cognitive and perceptual processes at the expense of social emotional factors, and I tend to emphasize formal learning situations. I have also avoided a search for pervasive personality traits and focussed on components of processing. Finally, I have emphasized North American learners with some reference to their homeland cultures.

What is Learning Style

Picture for a moment six year old John doing the Block Design task on the WISC-R in which he must reproduce, with colored blocks, a design illustrated for him on a card. His many eye movements back and forth from design to blocks may indicate he is copying the design, section by section, part by part. Picture a second boy, Alec, who looks only occasionally at the original design and concentrates his eye movements on the block design he is building. John may be using an analytic-sequential learning style; Alec may be using a global learning style.

Picture Susan in the Grade 5 class on government. Susan may be using imagery to understand the concepts, while her teacher may be concentrating on verbal processes.

The concept of learning style has its bases in individual differences and in cognitive psychology (Keefe, 1990). The term customarily refers to the usual cognitive processes by which a learner perceives, codes organizes and remembers (Keefe, 1987; Schmeck, 1988). Learning styles may also refer to characteristics of the physical environment in which an individual learns (e.g.

Wauters et al., 1989) or solely to sensory modality (Kaulback, 1984).

Cognitive style is usually defined in a manner very similar to the definition of learning styles (Messick, 1984, p. 61; Shipman & Shipman, 1985, p. 229) or used interchangeably (Kyllonen & Shute, 1989), except when it refers specifically to Witkin's notion of field independence (Witkin & Goodenough, 1977). Generally learning style is used with learning tasks and cognitive style with broader cognitive task.

The connotation of "style" is inconsistent throughout the literature, sometimes even within the same study (e.g., Kaulback, 1984). Style is used operationally in at least four different ways:

1. the usual (or characteristic) cognitive or learning process (e.g., Messick, 1984).
2. the preferred (i.e., preference stated by subject) process (e.g., Kolb, 1985).
3. the strongest (similar to a cognitive ability) process (e.g., Ramirez & Castaneda, 1974), or
4. a specific cognitive or learning process (e.g., Kirby, et al., 1988).

There is often an implicit assumption that the process for which an individual states a preference is the same as the individual's usual process, and is also the same as the strongest process. There is nothing in the literature to support such an assumption. Conceptually the meanings are different, albeit related. The second boy, Alec, in the example above: may usually use a global process in to Block design; he may say he prefers a global process (although not likely for 6 year old); he may have a strength in using a global process; or we may refer to the specific global process he used in this situation. It will become apparent from the selection of studies in this paper I see utility in use of the first, and last two operational definitions. But I have serious concerns about measures which uses stated preference, especially for children (see also Davidman, 1981).

In this paper, learning style and cognitive style are used interchangeably to refer to the usual cognitive process(es) employed by an individual in performing a cognitive task, unless otherwise stated, (e.g., to distinguish between a usual learning style and a learning style strength).

From the information processing perspective, learning styles are governed by executive control processes (as in Gagne, 1974), or Sternberg's (1988) metacomponents. The processes are considered to be procedural knowledge stored in long term memory (as in Anderson, 1985). The distinction between styles and strategies is both vague and varied. Usually the former is more general, the latter more specific to tasks and domains (Messick, 1984, p. 61-2). The two boys in the example could be described as using two different styles or two different strategies.

The distinction between cognitive abilities and styles is more important and more clear, "styles are propensities rather than abilities; they are ways of directing the intellect that an

individual finds comfortable" (Sternberg, 1990, p. 366). Note however that cognitive abilities and learning style strengths are conceptually similar, and their measurement often overlaps. There are two differences in their measure. The first is usually in the perspective of the investigator (e.g., a cloze test can be used as a measure of verbal ability, or as a global learning style strength). The second difference is usually that abilities are much broader categories (e.g., verbal ability, numerical ability) whereas learning and cognitive styles are narrower (e.g., global style strength, visual style strength).

I have emphasized the meaning of learning style strengths because it can be very useful in understanding learning processes, provided it is not confused with usual learning styles. It is as important for educators to know the learning style strengths of an individual, as it is for them to know the usual learning styles. In research, the term can help to conceptualize strength of a cognitive process without the usual associations that the term ability has with intelligence and achievement.

Learning styles are usually bipolar continua (Tiedeman, 1989), although there is no conceptual requirement to be bipolar. The bipolar requirement is useful in educational applications, but in the research it is unnecessary and often unsupportable at the present. Examples of bipolar learning styles suggested by Kyllonen & Shute (1989) include: holistic processing - serial processing, active/impulsive orientation - passive/reflective orientation, top down - bottom up, spatial representation - verbal representation. Witkin's field dependence - field independence (Witkin & Goodenough, 1977) is the most researched measure of cognitive style. It is dismissed by some as a measure of ability (e.g., Kyllonen & Shute, 1989) because it is operationally defined as a learning style strength not as a usual style. Descriptions and critiques of various types of learning and cognitive styles are found in Messick (1976), More (1987), Shipman & Shipman (1989) and Tiedeman (1989).

One problematic feature of learning style and cognitive style research is the claim of one all-pervasive style, almost a personality trait, that applies across all dimensions of human functioning. Witkin claims that one's position of the field independent - dependent continuum is consistent across perceptual, intellectual, social and emotional domains for an individual (Witkin & Goodenough, 1977). The Kaufmans believed that the simultaneous-sequential dimension was pervasive enough to base their intelligence batter on it (Kaufman & Kaufman, 1983). Schmeck felt that "all cognitive styles can be encompassed by one broad inclusive dimension" (1988, p. 327). In my opinion, this sort of claim is not supportable by the literature, nor is it necessary.

Learning Styles and Culture

Let us return to the original question. How does culture affect the processes by which one learns? What of the two boys, described above doing the Block Design task of the WISC-R? If John (analytic style) is Anglo and Alec is Native American (global style), is culture one of the factors in their learning style

selection? This could be the case (More, 1984). If they both received the same score, do they have the same ability with "Block Design" even though they appeared to use different processes? Indeed, should their scores even be compared when they appear to have used different processes?

Investigations of relationships between learning and culture are not new (Cole, Jay, Glick & Sharp, 1971) and they continue unabated. However, the emphasis is on ability not process (e.g., Irvine & Berry, 1988; Jacob & Jordan, 1987). Perhaps Sternberg's (1990) advice needs to be applied specifically to the cultural arena: "Styles of thinking and learning are every bit as important as levels of ability and we ignore students thinking style at our own peril - and theirs" (p. 367).

There is certainly evidence of relationships between culture and learning style. However, definition and measurement of those relationships are problematic. Relationships between culture and cognitive style, as conceptualized by Witkin, have been studied extensively (e.g., Berry, 1976). Some consistencies have emerged for various cultural groups including Mexican-Americans, Native-American, Blacks, and Jewish Americans (Vernon, et al., 1988). But considerable within-group variation requires very cautious interpretation of the results. Furthermore, there are major measurement problems: the measure is almost always restricted to a perceptual task and it is a measure of proficiency or strength of processing, not a measure of usual or characteristic processing.

Qualitative observations of learners in their own cultural setting suggest a strong link between culture and learning style (Swisher & Deyhle, 1989; Cooper, 1980). Banks focused on minority groups in the U.S., especially Black Americans. He reported that some researchers "have found that ethnicity has a powerful effect on behavior related to learning" (1988, p. 461). Anderson also focused on Black Americans. He concluded that cultural aspects of cognitive/learning style, as "cultural assets", were important to more effective educational service delivery (1988, p. 8).

The experimental anthropological work of Cole and others (Cole et al., 1971; Cole & Means, 1981) demonstrates relationships between culture and how people think. Their use of cognitive task analyses comes very close to learning styles analysis.

One approach to studying relationships between culture and learning styles is to analyze patterns of mental abilities in different cultures. The "patterns of abilities hypothesis" postulates that "members of different cultural groups will typically develop different mental abilities or, more likely, that they will develop the same abilities but to different degrees" (Vernon et al., 1988, p. 208). It is the relative strengths of the various abilities (cognitive styles?) within a particular cultural category, that is the focus of interpretation. Most of the abilities tested in North America are very broad (e.g., verbal knowledge, memory, number, reasoning) and do not lend themselves to a learning style/cognitive style interpretation. Measures of very specific abilities could be useful in investigating culture - learning styles relationships. Results from this approach, which

indicates learning style strength, are not equivalent to results which indicate usual learning styles. However, both types of results will help to understand culture - learning style relationships. In any event, "it would be premature to offer a definitive statement regarding cultural influences on patterns of abilities" (Vernon et al., 1988, p. 229), let alone on learning style strengths.

Native American Learning Styles

One of the difficulties in studying learning styles of Native Americans is the great diversity among their various cultures. The cultures of the Haida, the Malecite, the Navajo and the Creek are very different. Even greater variety has been introduced by the impact of non-indigenous cultures. Consequently, the discussion below must be interpreted in the context of significant inter-cultural differences among Native American cultures, as well as intra-cultural differences and individual differences within cultures.

Visual-spatial

One of the most common generalizations about Native American information processing is in visual strength, visual spatial strength and usual visual mode (Swisher & Deyhle, 1989). Visual and visual-perceptual strengths are reported among Canadian Indians and Inuit (McArthur, 1968), among Alaskan Eskimos (Kleinfeld, 1973), the Kwakiutl (Rohmer, 1965) and the Pueblo (John Steiner & Ostereigh, 1975). Reports of visual mode as a usual style are reported among the Navajo (John, 1972) and Alaskan Eskimos (Kleinfeld, 1973).

Many studies of Native American studies have shown superior Block Design sub-scale scores on the WISC-R. Whether this shows a spatial strength (Kaufman, 1979) or simultaneous (global, holistic) strength (Kaufman & Kaufman, 1983), is unclear.

Global-Sequential

The global-sequential dimension is becoming increasingly prominent (Schmeck, 1988, p. 329; Kirby, 1984; Keefe, 1990). I have found it particularly useful with Native American students, although I have used the learning style strength rather than usual learning style conceptualization (More, 1988). Global processing emphasizes the whole, tends to use scanning, makes greater use of overviews and meaningful context. Sequential processing emphasizes processing the parts in a temporal order, and breaking down into component parts, analysis. A whole language approach to learning to read may be more effective with a more global learner; a phonetic approach may be more effective with a more sequential learner.

A tendency toward global style strength over sequential for Native Americans compared to Non Natives has been demonstrated in a number of studies (More, 1988; Bryant, 1986; Krywaniuk, 1974). If it can be argued that Bannatyne's categorization "Spatial ability" is significantly a global measure and "Sequencing ability" a

sequential measure, then we have additional indications of global-sequential learning style strengths among Native Americans. McShane & Plas (1982) recategorized WISC-R scores using Bannatyne for a group of Ojibwa an Sioux children. They found Spatial scores were indeed higher than Sequential scores. Kaufman and Kaufman (1983, p. 152-154), using the K-ABC, reported Simultaneous scores were greater than Sequential scores for a group of Navajo children but not with a group of more assimilated Sioux children [The K-ABC has been significantly discredited as a measure of intelligence (Steinberg, 1984). However the criticisms do not appear to affect the legitimacy of using some of the subscales as measures of global-sequential processing for groups].

Although the global- sequential continuum has been studied as a learning style strength for Native Americans, there is very little reported on it as a usual learning style.

The major problem with the use of the global-sequential continuum is in its clarity as a construct, and therefore in its measurement. Is global processing an internal, holistic and simultaneous process, or is it a more external sensory-perceptual process, or is it two related processes? Is sequential processing the same as analytic processing? Are they two processes which always occur together? Is global processing properly conceptualized as being at opposite ends of a continuum or should they be considered separately? These questions need to be answered more clearly for more effective investigation to be possible.

Field dependence - Field Independence

A significant degree of research has been done using the field dependence- field independence continuum and Native Americans. Field independence is the degree to which an individual can separate a figure from complex background, restructure information to solve problems, distance oneself during social interaction (Berry, van de Koppel & Annis, 1988).

Berry (1976) found high levels of field independence for hunting-gathering societies and industrial societies. He found high levels of field dependence for agricultural societies. For example, he found Native Americans who were migratory hunters and gatherers in north western Canada to be more field independent than the Native American in that area who relied on agriculture (Berry & Annis, 1974). In general, studies have found Native Americans to be relatively strong on field independence (Swisher & Dayhle, 1989; Dinges & Hollenbeck, 1978; Weitz, 1971). This may be related to the hunter-gatherer nature of most traditional Native American cultures. Or it may be related to the combination of strong native American visual-spatial abilities, and the usual measurement of field independence with visual perceptual tasks such as the Rod and Frame on the Embedded Figures Test (Denny, 1988; Swisler & Deyhle, 1989). Or it is likely a combination of both.

There are two significant problems with the use of the field independence - dependence continuum and its use with Native American cultural groups. The main problem is confusion between the underlying construct and its measure. The underlying construct is degree of psychological differentiation across perception,

higher level cognitive processing, social interaction and affect. But it is usually measured only with a perceptual task. Is the construct "exaggerated" (Vernon, 1972, p. 366) far beyond its importance? A second problem is that, while it does discriminate between agricultural and industrial societies, it does not discriminate in a useful manner between industrial and hunter-gatherer societies. This limits its usefulness in understanding cultural differences between Native American and European cultures (Denny, 1988).

Verbal-Imaginal

Another continuum on which Native American learning styles can be investigated is verbal- imaginal. The use of imagery as a tool for understanding highly complex concepts was an important part of learning in many traditional Native American cultures (Tafoya, 1982; John, 1972). Systems of legends are an excellent example of such usage. The explanations of Susan's Grandmother and the elder, in my example above, included many images. These were not just visual images. Some were aural images, others were olefactory. Some images were very abstract, not directly related to any of the senses.

Observations of Susan, and informal interviews with Native Americans of many ages and many tribes, have led me to suggest a verbal-imaginal continuum of learning style. The imaginal end may be more than visual coding for long term memory as in Paivio's (1971) work. It may enable a deeper level of processing, especially in the use of analogies. It may be related to global processing or it may facilitate it. But when I try to understand the image behind the killer whale or the eagle, as Susan listened to a legend, I realize that it is much more than simple visual imaginal coding taking place. There seems to be a type of abstract processing taking place that is qualitatively different from that which is possible from the verbal label "killer whale". This is conjecture at this point. But it appears to be a direction worth pursuing.

Reflective - Trial/Error/Feedback

The reflective - impulsive continuum is a more commonly used cognitive style continuum. A more impulsive learner responds more quickly and usually has a higher error rate: the reflective learner responds more slowly and usually has a lower error rate (Messer, 1976).

Reflectiveness is often reported as an important aspect of many Native American cultures. Furthermore, based on reports of the way many Native American children learn to learn (e.g., Swisher & Deyhle, 1989), one would expect to find greater reflectivity. Study of this continuum as a learning style, is confounded by the problem of self-confidence. As a result of the cultural dissonance between home and school, many Native American students show low self-confidence in school (e.g., Bruneau, 1985). A student who has low self-confidence in school is likely to reflect longer before replying to a question, regardless of cultural background.

There is an inconsistency between the expectation and the research results. The one study of Native American subjects in the literature failed to find significant differences between Native American and Non Native children (More, 1984).

As I have tried to understand this inconsistency I reviewed my interviews with Native American elders. This led me to conceptualize the continuum as Reflective - Trial/Error/Feedback (or TEF). The Reflective end of the continuum is related to traditional learning. It can be described as watch-them-do (e.g., learning to make a fishnet), listen-then-do (e.g., learning values through teachings of an elder), or think-then-do (e.g., thinking through a response carefully before speaking). The term Trial/Error/Feedback is used rather than Impulsive to more clearly illustrate the process that occurs if this is to be an effective learning process. TEF learning involves the learner attempting a verbal response, knowing there will be some errors, and successively refining the response on the basis of feedback.

Concern about the contrast between traditional learning styles of many Native Americans and contemporary classroom practice has been raised frequently enough to warrant further study of this approach to learning styles.

Modality

At one time modality preference and learning style were understood as synonymous by many people working in Special Education. The meaning of learning style has broadened. But the modality use and modality strength remain important in working with Native American learners. This topic has already been covered under the visual-spatial heading. The evidence indicates that Native Americans generally use the visual mode more frequently and more effectively in relation to the aural mode compared to Non Native learners (Kaulback, 1984).

Asian Learning Styles

The variety of Asian cultures is almost overwhelming. It is not the purpose of this section to imply they are the same. Certainly students from Asian cultures have some similarities of experience in North American schools - bias and discrimination, often assumed to be culturally similar because of perceived physical similarities, seen as similar because of perceived reputation for relatively high achievement especially in math and science. But even these similarities disappear upon closer examination.

In this paper, I look at only two Asian cultural groups - Cantonese Chinese (primarily from Hong Kong) and South Asians[1]. They were not chosen to imply that they represent all other Asian cultures. They were chosen because they are two of the largest groups of Asian North Americans, their cultures are very different, and their number is rapidly increasing as a result of immigration patterns.

Cantonese Chinese Learning Styles

The learning styles research on Cantonese students in Hong Kong and in North America, is sparse by comparison to the Native American literature (e.g., Gardner, 1986). There is some literature on achievement and abilities which has a bearing on learning styles (Chan & Vernon, 1988; Vernon et al., 1988). There is also some anthropological literature (e.g., Guthrie, 1985) which serves as useful background but is not discussed here.

Yu and Bain (1985) studied field independence-dependence, and conceptual style using the Sigel Cognitive Style Test (Sigel, 1976) and Vygotsky Blocks (Ghuman, 1975). Their subjects were 8-11 year old Chinese and Chinese-English children in Hong Kong, as well as Chinese-English and Anglo children in urban Alberta in Canada. They found that the Chinese and bicultural children in both Hong Kong and Canada scored significantly higher on field independence than the Anglo children. They did not find significant differences on conceptual style between the groups. Correlations between cognitive style and conceptual style were statistically significant but very low, the highest correlation was 0.16 (Yu & Bain, p. 140).

The results confirm other findings of higher field independence among Chinese subjects (see also Enright, 1987; Hansen, 1984) in both Hong Kong and North America. The low correlational results "raise doubts concerning the claim of unity of the perceptual and conceptual stylistic behaviors" (Yu & Bain, 1985, p. 140).

The results of Gardner's (1986) construct validity study of the K-ABC have application to the global-sequential continuum. Her subjects were Cantonese, English and Punjabi speaking third graders in Vancouver and born in Canada. The Cantonese scored much higher on Simultaneous (Global) than Sequencing processing. However a confirmatory factor analysis, while supporting the Simultaneous/ Sequential factor structure for English and Punjabi students, failed to support the model for the Cantonese students. Exploratory factor analysis supported a two factor, rote-memory/reasoning structure. Examiners also noticed that "the number of Cantonese appeared to remember the [Spatial Memory] pictures in a set sequence usually moving from left to right" (Gardner, 1986, p. 141). The high Simultaneous score came primarily from the Triangles subtest (which had a high Simultaneous factor loading), and Spatial Memory (which had a very low Simultaneous loading, but a high Sequential loading). The low Sequential score came primarily from the Hand movements subtest (which had a low Sequential loading). In other words the Spatial Memory subtest seemed to be processed sequentially, rather than simultaneously as the model predicts, and processing style for Hand movements was unclear.

Gardner's results raise serious questions about the use of the K-ABC as a measure of intelligence especially across cultures. It also a reminder of the problem of construct validity in cross-cultural measurement.

However, there are some useful applications of the subscale aside from the application to intelligence testing. The high Cantonese scores on the Triangles (the highest Simultaneous loading) and the much lower scores on the Number Recall subtest

(the highest Sequential loading), support the conclusion that the Cantonese group was much stronger in Simultaneous (Global) processing then Sequential compared to the English and Punjabi children.

Studies by Flaugher & Rock (1982) and Vernon (1984) reported that Chinese (language not given) students tend to have stronger visual-spatial skills. This may be the reason for the high Simultaneous scores.

The learning styles information in this section, so far, relate to learning styles strength rather than usual learning styles. There is a dearth of literature on usual learning styles for Chinese learners. However, some additional information on Chinese learning style strengths can be gleaned from research on patterns of abilities.

If the emphasis is on patterns of ability within cultures, reasonable hypotheses about the processing styles behind those patterns can be generated. For example, Lesser (1976) developed differential ability profiles for grade one Jewish, Chinese, Black & Puerto Rican children in New York. He then used these profiles to predict cultural groupings from Grade 6 ability data on the same children. In grade 1 he was able to predict cultural group correctly on 56% of the children (66% of the Chinese). Using the same profiles he correctly predicted 58% on the Grade 6 abilities (75% for Chinese). The Chinese profile was to score slightly below the mean on Verbal, and above the mean on Reasoning, Number and Space. A task analysis of the items in his ability measures could produce hypotheses of the usual and/or stronger learning styles which might produce this profile.

South Asian Learning Styles

One must be cautious in considering South Asian cultures because of the vast differences within the sub-continent. Language, religion, caste and geography are but four of the factors which are related to the huge variations (Vernon, 1987; Sinha, 1979).

Vyas (1988) studied the field independence-dependence of Gujarati boys in Gujarat, Britain ard the U.S. He also included English middle-class and working class boys in Britain. The Gujarati boys in Britain and the U.S. scored significantly higher on field independence than the Gujarati boys in India but still lower than the English speaking boys in Britain. This indicates a trend from field dependence to greater field independence as the boys were assimilated into their new cultures.

Vyas also concluded "that influences on field dependence are more emic (culture-specific) than etic (universal cross-cultures)" (Vyas, 1988 p. 145). In other words cultural influence is not as great as influences within a culture in determining field independence of a learner.

Gardner (1986) found that her sample of Punjabi-Canadian children scored slightly higher on the Sequential scale than the Simultaneous (Global) scale of the K-ABC. The confirmatory factor analysis supported the two-factor structure of the K-ABC for Punjabi children although the Hand Movements (a sequential task)

subscale had little effect on either factor. To the extent that sequential processing and field dependence are similar, Gardner's results in North American corroborate those of Vyas in India and Britain. Note that the cultural roots of Gardner's subjects were in Punjab, whereas Vyas' subjects were from Gujarat - two very different cultures.

There is considerable literature on cognitive styles and abilities within India as they relate to caste, poverty and urban-rural differences (Das, 1988; Sinha, 1979). Some of these studies demonstrate differences between cultures and culture-like groups within India. Sinha (1978) altered the Embedded Figures Test (EFT) by associating stories with the perceptual disembedding task, because he the EFT tasks appeared meaningless to Indian subjects. He found that urban subjects scored higher on field independence than rural, schooled scored higher than non-schooled.

Das and Khurana (1988) studied caste, SES, and effect of malnutrition on cognitive processes. Caste is no longer legal in India but its effects are still apparent (p. 488-490). He found that high and low caste urban children did not differ on Simultaneous task performance level. But higher caste children scored higher on tasks which were significantly Sequential. One of the Simultaneous tasks, Raven's Progressive matrices, is "often regarded as an adequate test of nonverbal intelligence" and the processing measured by the Sequential measures, especially decoding, "is crucial to early stages of reading (p. 496). The authors discussed the opportunity of higher caste children to develop their Sequential processing skills in the home environment and used this to discuss the lower achievement level of many lower caste children.

The low SES, and malnutrition studies showed that these factors adversely affect cognitive development in young children (Rao, 1979, cited in Sinha, 1988). However similar studies showed that the "disadvantaged had an edge over the middle class in three out of four dimensions" of creativity (Kaul, 1981, cited in Sinha, 1988).

The Indian studies, though few, show some interesting results. They tend to show Indian students as higher in field dependence than non-Indians. But, more interesting, they demonstrate that factors other than culture have a significant (possibly greater) effect on learning styles.

Conclusions and Discussion

We return again to the original question: How does culture affect the process by which one learns? How does Susan's culture affect her usual learning style and her learning style strengths? How do the cultures of John and Alec affect the processes they use to do Block Design task?

There is considerable support for the proposition that culture does affect the processes by which one learns. The research on field independence-dependence (e.g., Berry, 1976), on the relationships between learning at home and at school (e.g., Swisher and Dehyle, 1989), on modality (e.g., Kaulback, 1984) on patterns of abilities (e.g., Vernon et al., 1988) and on various bipolar

continua (e.g., Messick, 1976; More, 1984) demonstrate that relationships exist.

The nature and direction of the relationships are not clear. There are serious problems in understanding, defining and measuring the constructs involved. A great deal of the research has been limited to one construct, psychological differentiation (field independence), and to perceptual measures of it. Few studies have used comparable samples.

Inconsistency in the operational definition between usual learning style and learning style strength is common. In many studies, learning style is deferred as the usual process but measured as process strength. Yet it is the combination of the two that holds greatest promise for research and application. The notion of learning style strength can be conceptualized without the connotations that come from its relationship to intelligence. Usual learning style can be measured through direct observation rather than stated preference. Studies can be developed using both learning style strength and usual learning style as dependent variables. This would provide a potent source of meaningful research results.

The use of bipolar continue to describe learning styles is popular and useful in an educational setting. But it unnecessarily complicates the research. At this point it is more useful to define and develop appropriate measures of the processes, separately, for each end of each continua. Once the frequency and strengths of each process can be measured, then the question of bipolarity can be investigated.

As in all cross-cultural research, one encounters the problem of different implications for different cultures, for the same learning task. If the differences imply different cognitive processes then we are measuring that which we want to measure. But if the differences come from other sources (for example, differences in motivation to find the one correct response for a Japanese person compared to a South Asian person) there is serious validity problem (see Irvine, Schoeman and Prinsloo, 1988 for a more complete discussion).

There is a dearth of cross-cultual studies of cognitive/ learning styles other than field independence-dependence. Higher level cognitive processes in particular, need more investigation. This is not a simple task even within one culture. But the potential for understanding human cognitive functioning makes the effort worthwhile.

A major application of learning styles is in education especially in a cross-cultural setting. A four step model can be used.

1. Identify learning styles of individuals.
2. Match teaching styles to stronger learning styles for difficult, important learning tasks.
3. Strengthen weaker learning styles, since some tasks require a particular style.
4. Help students learn to select appropriate learning styles, since appropriateness depends on both the learner and the task (More, 1987).

In summary, it appears that culture does affect the learning styles of Susan, John, and Alec (examples above), although it

does not completely determine their learning styles. The topic is a direction well worth pursuing in research and program development. But for now, educators working with Susan, John or Alec will have to rely more on professional judgement and experience than on the results of research.

Footnotes

[1]South Asia refers to the Indian sub-continent and includes India, Sri Lanka, Pakistan, Bengal & Bangladesh. It seems to be the most commonly accepted term for the region.

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