A SEARCH FOR ALTERNATIVE THEORY FOR "COGNITIVE STYLE"

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ABSTRACT

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The concept of cognitive style is examined in general, and particularly the style defined by H. A. Witkin and colleagues. Placing cognitive styles in the context of cross-cultural teaching, a summary of the levels of adaptation from Ward (1973) is used, this requires transformation in terms of language, vocabulary level, illustrative material, pedagogical expectations of the learners, world view and cognitive style. World view is examined, and found to be very amorphous, at times being equated with culture, or personality, metaphysics or religion of a society, and at times equivalent to cognitive style. The concept of style in general is examined and found similar to typologies with their long history of use in psychology. Cognitive styles are classified as perceptual, conceptual or categorical and thinking. Four of the most elaborated dimensions frequently classified as styles are examined in more detail, the Rigid-flexible and dogmatism scale of Rokeach, the cognitive controls of Gardner and associates, the convergent-divergent production of Guilford, and the field independence-dependence of Witkin (FID).

The FID dimension is examined in detail. There has been criticism of this work by a number of students of psychology, regarding the definition and statements of the theory, its terms, regarding the validity of the measures, and the interpretations due to the low shared variance. It becomes evident that due to the vagueness and ambiguity of the terminology, due to the tendency to import natural language connotations into the interpretation, and the relatively low shared variance on replications, it is impossible to know what is being tested. The most appropriate interpretation would appear to be that of Gardner *et al.* (1960), that FID is a function of attention and the ability to shift attention. However, this is not consistent with the definition of Witkin. It is pointed out that Gardner's factor analysis yields a definition that is the logical intersection of a set of factors, Witkin's the logical union. Due to Witkin's form of definition, the measures are inevitably correlated with a large number of other tests. Therefore the utility of the concept is seriously weakened until this issue, as well as the others is resolved. In the light of the problems presented, and the fact that the same tests are used to define abilities, as well as the fact that this type of testing yields a static image of cognition, it is suggested that a more appropriate approach would be in terms of an information processing model which easily accommodates the information available for cognitive styles.

The problem of cross-cultural applications of style measures is examined. Notable among the problems are the difficulty of

translation and attaining an understanding of the task for subjects in an unfamiliar testing situation. Using the concept of attention, style studies are interpreted in the cross-cultural context, and some suggestions made for teaching and research.

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ILLUSTRATIONS

TABLE OF ABBREVIATIONS

Abbreviations relating to the global-articulate cognitive style of Witkin and associates are the following:

BAT	Body Adjustment Test
CEFT	Children's form of the Embedded Figures Test
CI	Cognitive Index
DAP	Draw-a-Person Test
EFT	Witkin's form of the Gottschaldt's Hidden Figures Test, called the Embedded Figures Test, also Witkin's Embedded Figures Test (WEFT).
FID	Field Independence-Dependence, the designation for the global-articulate cognitive style.
GEFT	Group Embedded Figures Test, for group administration.
HFT	Gottschaldt's Hidden Figures Test
II	Intellectual Index
JEFT	Jackson's form of the Witkin' EFT, a shortened form.
KBD	Kohs Blocks Designs, subtest of the Wechsler Adult Intelligence battery.
PI	Perceptual Index
PRFT	Portable form of the Rod and Frame Test
QEFT	Questionaire form of the Embedded Figures Test
RFT	Rod and Frame Test, also Witkin's Rod and Frame Test (WRFT).
TEFT	Thurstone's form of the Gottschaldt Hidden Figures Test

WEFT Witkin's Embedded Figures Test

WRFT Witkin's Rod and Frame Test

Relating to Guilford's Structure of Intellect model of cognitive functioning, are the following abbreviations. The three letter ones are made from the three letters designating the values for the three dimensions of the model as shown on Figure 1.

CBS Cognition of Behavioral Systems

CP Convergent Production

DFI Divergent production of Figural Implications

DFT Divergent production of Figural Transformations

DMC Divergent production of Semantic Classes

DMI Divergent production of Semantic Implications

DMR Divergent production of Semantic Relations

DMT Divergent production of Semantic Transformations

DMU Divergent production of Semantic Units

DP Divergent Production

DSU Divergent production of Symbolic Units

NFT Convergent production of Figural Transformations

NSI Convergent production of Symbolic Implications

NST Convergent production of Symbolic Transformations

SI Structure of Intellect model

The following symbols are used generally or for the information processing model of cognition:

IMS Intermediate Memory Store

IP Information Processing model

LMS	Long-term Memory Store
N	Number of subjects in a sample
p	Level of significance of a statistic
r	Correlation coeficient
STM	Short Term Memory store
z	Normalized expression of a correlation coeficient r.

CHAPTER I

THE PROBLEM OF "COGNITIVE STYLE" IN CROSS-CULTURAL TEACHING

If the educational enterprise is concerned with learning, it must orient itself to the constraints and nature of its material. Learning is an internal process in the individual and, as such, depends on the internal desires, goals, activities and cognitive capactities of the learner. Those who are charged with education, however, have within their power only external conditions. The problem of the teacher is, therefore, to arrange the circumstances, context and conditions most appropriate to the learner. The context includes the following: a) conditions that enhance motivation, b) provision of information in a form appropriate to the learner and c) provision for the opportunity to assimilate and use the information.

Motivation

Motivation is generally considered at two levels, (except by strict behaviorists), as extrinsic or intrinsic. Extrinsic motivation, the provision of rewards or punishment, are clearly within the power of the teacher. But contrary to the behaviorists, there are large areas of complex learning where extrinsic motivation is not appropriate, and may even be counterproductive. On the other hand, the teacher does not have direct access to provide intrinsic motivation. In this case there can be some selective process so that motivation is matched with

curriculum or where motivation exists but is low, some strategies might be used to heighten it.

Information and Assimilation

While motivation is of prime importance, its inaccessability does not lend it to manipulation. The main effort of the teacher is, therefore, directed at the other two aspects of the learning context, the information, its form and the provision for assimilation and use. In order to carry this out it is necessary to specify what information is to be transmitted, and the form in which it is to be transmitted or communicated must be arranged. The requirements of appropriate information, appropriate form, and adequate means requires a knowledge of the way an individual learns, the state of his present understanding, his modes of thinking and other personal characteristics. This is to say that the design and operation of an appropriate learning system must be based on the characteristics of the subject matter to be learned, the characteristics of the individual learner and of the learning process, and the capabilities of the modes of teaching available to carry out the task.

Cognitive Learning as Focus

The focus of the present study is on the learner, the learning process, and the modes of teaching within the constraints of the situation. Learning will be considered as basically a cognitive process. This is to say that the cognitive processes, from the stimulus of the sensory networks of the individual, to the responses made, and the implication these processes have for the practice of teaching are to form the subject of inquiry. This is not to say that the affective

results of teaching are not important. But if cognition includes the perception and processing of cues by the person, any external stimulus that changes the affective state must be processed cognitively before it produces a response. The affective response is part of the total response. Therefore, while the present focus is on the cognitive, it is understood that in fact affective states and cognitive processes cannot be isolated, as will subsequently appear.

Orientation and Scope of Scope of Study

"Cognitive style" is one construct that is presently being investigated extensively as a key to understand cognition generally as well as across cultures, and also as a method of matching teachers and students for optimum learning. At the same time a number of important criticisms have been made regarding the presuppositions, the theoretical formulation, the testing and interpretations of the data. Due to the fact that these critiques have not been analyzed and evaluated, but ignored, the value of on-going research is very questionable. Therefore the present study is directed toward an evaluation of the "cognitive style" literature, an examination of the theoretical foundations, statements, tests, and correlations with other variables in order to provide a solid foundation for further work. It will become evident that the present status of the concept of "cognitive style" is very weak, its definition vague, and presently it is not known what is being measured. In light of this finding, a modified interpretation is suggested, and some implications from this interpretation are drawn for cross-cultural research and teaching. It is well to point out here that most cross-cultural work does not seriously seek to sample the practices of a society, but tries

to characterize a complex non-Western society along simple and ill-defined dimensions. Individual differences are not considered. Western society is taken as an unexamined norm.

Problem of Cross-Cultural Education

The problem of cross-cultural education has become critical in recent years. As colonial governments set about to rule around the world in the last century, educational institutions and systems were organized to provide the civil servants necessary in each country. The graduates became the clerks and workers in government and business organizations. Since there was power and prestige to those in positions, education became the process by which tribal, peasant, and nomadic peoples acquired the language and skills necessary for these jobs. The technical and scientific knowledge required was generally quite limited, so that the acquisition of a Western language and customs were the real objectives. The model of Western liberal education served well for this. The amount of knowledge of specific subject matter, such as history and literature was relatively secondary, since much of the specific practices and regulations in government and business were learned quickly on the job. There was a great faith in the power of education to transform people and to "civilize" them. The holder of a certificate had access to jobs and position that were generally to be desired. Since schools frequently had students from several language areas, little was done to adapt the teaching and materials to fit the specific needs of the student. It was expected that the student would change and adapt to fit the system.

Educational Expectations

More recently the expectations of education have been enhanced in the Third World. With the coming of national independence, many more educated people were needed, and universal education was seen as the way to create modern, prosperous nations. On the level of individuals, education was the door to the modern world, to wealth, prestige and power. The result has been that large numbers of persons have made great sacrifices in order that their sons and daughters might be educated, only to find that after all was done, jobs were scarce, power and prestige did not automatically accrue to the certificate holder, and frequently formal education had prepared them for jobs that did not exist, or for which access depended on other than educational credentials.

Adapting Education

At the same time, the individual in each country wants to be respected as a person. Many countries have newly come to appreciate their own cultural heritage, and to deny that all history of importance occurred around the Mediterranean or the North Atlantic. If each culture and individual in it is to be respected, then education must be adapted to the needs of individuals, and their uniqueness and the uniqueness of their culture are to be respected.

Questions for Education

Because of these factors, the problem of education has become critical. On the one hand, what kind of education should be provided for people of the Third World? How is it to be made to fit their

needs, so that the graduates may be productive and useful citizens? What is needed to provide for the development of each country? On the other hand, once it is clear the type of education needed, and the information to be learned is decided, how can the education process be adapted to be the most effective in helping the learner acquire the skills and information they need to function? Of particular interest in the present study is the preparation of people who will be directly involved as change agents in local communities.

Western Orientation to Curriculum

In the past, much of the curriculum and methods have been taken from the West. Much of the content had little relation to the life of the students, so understanding was not very important. Teachers frequently came from the West and had little or no knowledge of the student's life and culture. Much of what was taught was culture specific to the Western world, and of no importance, or even sometimes counterproductive, in its Third World setting. The requirements that vocational students in Africa learn the syllabus of the City of London Guilds, learning to build fireplaces in Khartoum, and the use of wall-paper in the humid tropics are just two cases that could be multiplied by any observer of the Third World education (Hanson 1965).

Do People Think Differently?

Other studies of real importance to any technological society such as mathematics or the natural sciences are considered by the students to be so difficult that they strive to avoid the subjects. Their teachers did the same, so have little comprehension of the disciplines.

They teach so the student can pass the examinations if he can memorize a certain minimum of material. Western languages, particularly French, English, Spanish or Portuguese are the trade languages, but millions of persons use local languages for most purposes. Nevertheless, all teaching is done in the Western languages. If one seeks to understand the difficulties that the student has, an old debate is revived. Do the students not understand simply because the medium of instruction is unfamiliar, or do they *think* differently? Is the problem of learning due to merely different concepts than the ones that are current in a given culture, or do different people acquire concepts differently, are their ways of combining concepts different from those of the West? For instance, it is frequently heard that in the thought of the Far East there is not the dichotomous division in analytic thought that characterizes the West. Instead of finding the truth as one or the other of alternatives, it may be both-and.

Anthropological Attempts to Answer

There have been a number of attempts to resolve the issue in the anthropological literature. The concept of "primitive mentality" was raised and today it is generally conceded that all people fall essentially within the same range of mental capacity. There may be some evidence for intelligence being genetically based, but it is very difficult to disentangle the genetic effects from the effects of diet and of socialization. Since it is presumed that those with higher intelligence are able to move to positions that provide better nutrition and a more adequate social environment for their children, and since nutritional and social factors may contribute so much to the variance registered

in the tests, it may be impossible to separate the variables (Layzer 1975; Heron 1968).

How do People Think Differently?

What then are the differences that exist between different peoples? Do some people think in images, while other think in concepts? Do some people think using processes different from the typical modes of induction, deduction, analogy and syllogistic reasoning? Do the tendencies to use these differ predictably? Are there differences that are of such a nature and magnitude that they justify the creation of teaching materials and strategies to cope with them?

Psycholinguistic and Psychological Approaches

There are a number of ways one can approach the problem of making cross-cultural comparisons of thinking. Cognitive anthropologists have studied the categorical or semantic hierarchies that exist in different languages. Some psycholinguists have postulated a fundamental transcultural "deep structure" to all language that would permit translators to analyze a linguistic unit like a sentence to that level of coding, and then by using a series of transformations, reconstruct the sentence in the target language. It is assumed that mental structures are similar to these linguistic "deep structures". A number of efforts have been made to study the methods of categorization of a given culture and to relate these to mental structures. Other studies have concentrated on finding the presence or absence of mental structures and processes studied by dominant schools of psychology, such as those of Freud and Piaget. A further recent approach has been through

the concept of cognitive styles, which will be the focus of this study.

Levels of Functioning

One way to approach the problem is to sort out the levels of functioning in a society, and the types of transformations that would be necessary to adept teaching strategies from one culture or society to another. Ward (1973) has divided these into six categories or levels:

Level 1: Translation (language)

Level 2: Adjusting the vocabulary (to make the reading level of the adapted material match that of the original).

Level 3: Changing the illustrations to refer to local experiences.

Level 4: Restructuring the instructional procedures implied and/or specified to accommodate the pedagogical expectations of the learners.

Level 5: Recasting the content to reflect the local world-and life views.

Level 6: Accommodating the learning styles ("cognitive styles") of the learners.

Levels 4 to 6 not well Analyzed

The first three levels are quite clear and one believes to be beyond debate. The real question arises with respect to the final three. Level four of educational expectations will receive a minimum of discussion, level five, world view, will be treated at somewhat more length, for it coalesces to some degree with the last, level six, cognitive style. Cognitive style is the focus of the present study. Much research has been carried out with respect to cognitive styles, and while there has been criticism regarding theory and testing, the

major observation has been that the whole area has not been adequately analyzed. An analysis is here made of the theoretical statements, definitions, testing and interpretations of cognitive style studies.

Level 4

Regarding Level 4, it seems quite clear that there are specific expectations of the context in which a person is to learn a given subject matter in a particular society. This is to say, in our society it is expected that English, history, mathematics and natural science are to be learned in an institution called a school. If a person learns outside the school, his learning may not be considered valid. In many cases he cannot become certified to practice what he has learned, for instance, in many professions where a license is required to practice. The child that learns to read before coming to school creates problems. Today it is expected that a young person will learn to drive a car in school, an expectation that has changed completely in the last generation. But few expect to learn to be masons, or mechanics, or electricians in a school. None expects to learn a mother tongue at an institution organized especially for that purpose. In other societies the expectations are different, but they exist, and are very strong. For instance, to become a shaman among the Mayan Indians requires a long apprenticeship to an experienced shaman, probably the individual's father or grandfather. In recent years the traditions of Western schooling and their relation to social and economic advantages have served to create educational expectations of schools and institutional learning in many areas of the world where formerly most if not all teaching and learning was carried out by informal modes. It is within

this institutional complex that much of the present conflict arises. It is not basically an issue of what is expected of an institution as institution that creates difficulties, but the type of thinking required by the modern technological society that the institution fosters that produces conflict. Schools require a kind of mental activity that places a heavy emphasis on the ability to analyze and separate attribues and specific abstract characteristics of information, and to relate these elements. Thus while educational expectations differ from culture to culture, and must be taken into consideration, the issues of "world view" and "cognitive style" are more important and more highly interrelated.

World View

The concepts of "world view" and "cognitive style" at first sight would appear to relate to two quite different and easily distinguishable aspects of a person's thought world. As we shall see, it is not possible to define such a neat division. As Ong observes:

> World view is an illusive term, but when we speak of someone's world view in any of its senses, we do not simply mean the world impressing itself upon his passive receptors, sensory or intellectual. A person does not receive a world view, but rather takes or adopts one. A world view is not a datum, a *donné*, but something the individual himself or the culture he shares partly constructs; it is the person's way of organizing from within himself the data of actuality coming from without and within. A world view is a world interpretation. (Ong 1969:634)

What is a World View?

The term world view is used extensively in anthropological and other works, but usually it is taken for granted that everybody knows

what it means, or a definition is given that seems to be satisfying but helps little if one is trying to pin down the specific items involved, or actually to describe the world view of a particular culture. For instance, Hoijer (1962:266) relates language to culture by saying that "all cultural systems (including language) refer back to the unformulated metaphysics that serve as the raison d'etre of the culture as a whole." Redfield (1955:86) refers to the "outlook on life" or world view as "the whole meaningful universe seen from the inside view." Later he calls it "the natives conception of the cognitive along with the normative and affective" (1955:88). In these passages the world view essentially covers all aspects of mental activity as seen from an insider's point of view, an emic stance. Redfield contrasts the idea of world view with that of "ethos," a people's "organized concept of the Ought," and the "national character" as the modal personality type of the culture (1953). Of course, if the world view includes the normative, it also includes the Ought, the "ethos," though he states elsewhere that the ethos is the outsider's view of the culture's values, the etic interpretation. He goes on to say that a thinking person's world view is his cosmology, presumably a formulated understanding of reality, quite similar to Hoijer's concept that a world view is a metaphysics of a society. This metaphysics is then the basis on which decisions are made by the individuals, and it should be possible to deduce the world view of a people from the decisions and actions they take.

Ethos and Themes

In order to simplify the problem, certain schemes have been proposed for characterizing a world view. One of the most prominent

has been mentioned, that of "ethos." Proceeding from the assumption that cultures are integrated wholes, systems that have typical modes of responding in all areas of life, Benedict (1959) studied and categorized cultures as fitting certain types, conceived of as consistent patterns of thought and action. The two most discussed types were the Dionysian and the Apollonian, the first being explosive, annihilating the bonds of life, and the latter as conforming to strict laws. Further examination, however, reveals that most if not all cultures are not really sufficiently well integrated to be able to describe their characters along one dimension. Morris Opler (1945) proposed that there would be, not one, but a number of "themes" that control behavior in a given society. The level of integration depends on how well these themes balance one another. This approach seeks to specify a limited number of dominant principles that serve as the basic postulates of a society, from which foundation, individuals arrive at decisions. If some of these are at variance, there will be certain areas of life which cannot be isolated from others and conflicts will appear, thus showing the degree of integration that exists within the system.

Concept of Culture and World View

The same understanding of culture is common among sociologists. Parsons (1957:131) expresses it saying

> A culture is a . . . system. It must, that is, have coherence as a set of orientations which tie together the many particular aspects of men's experience and needs . . . . We all know that we cannot consciously hold contradictory beliefs without strain . . . . The role of culture in human life implies that men must be concerned . . . with the meaning of their experience, that is, not merely with whether a given experience

> gratifies a wish or fills a need, or contrariwise involves pain or deprivation, but also with the *fit* between the expectations of experience which have been defined for him in his culture and the actuality which he himself experiences.

The tendency to integrate various aspects of culture is due to the strain it produces in individuals when various aspects come into conflict with each other in practice, and the effort of individuals to reduce or escape these conflicts.

Language and World View

Hoijer (1962:266) as already mentioned, relates language to culture as an expression of the metaphysics of the culture. As the morphemes of a language provide a set of symbols that relate to the basic concepts of a culture, there is an intimate interaction between the two. Harvey and Schroder (1963:99) express it by saying

> In a sense, one's system of concepts provides a nexus through which one anchors oneself in space and time: in terms of which one's very being is; without which one as a receiving and appropriately responding organism would not be,

making the "system of concepts" tantamount to a world view. The difficulty arises when one tries to isolate the concrete premises that express the world view. Greenberg (1954) concludes that there are vague groupings of ideas, but that no overall world view can be taken from language since it provides elements and rules that can express many different philosophies. Greene comments after studying the problem in terms of psycholinguistics that, "At present there appears to be no generally satisfactory solution to this problem of making a distinction between knowledge of a language and knowledge of the world" and further says that linguists have not had much success in their

analyses above the level of the sentence (1972:73). Due to this fact, psycholinguistics can not make many sure statements about such high level generalizations as those expressed in world view.

Normative and World View

Ethos and themes therefore are ways to delineate a specific world view, and though they are usually formulated by outsiders (anthropologists), there seems to be no reason to consider them as different from world view if, in fact, they do describe the underlying presuppositions that are the springs for decision and action in a given group. The Ought is the normative aspect of a culture and as Redfield defines ethos, must be the internalized rules that come into play together with a particular set of circumstances to produce a given decision. Thus they are also the unspoken premises or the metaphysics of a culture, in short, a world view. In this respect it is curious that anthropologists, who generally consider religion as relating to a fictitious supernatural, and thus unreal, have concentrated so much of their effort on religion. The reason may be related to the idea that each group has its metaphysics and this is most completely and purely found in its religious expression. Craig (1968:65) calls religion the most typical aspect of a culture. Parsons defines religion or a religious system as 1) a more or less integrated set of beliefs concerning entities which are "supernatural", sacred or set apart. 2) A system of expressive symbols. 3) A set of more or less defined activities, interpreted as important in light of beliefs, but are from the point of view of instrumental interests of daily life "useless." 4) It gives some sense of the "we" who share common

beliefs and share in the system. And finally 5) it has the sense of providing a relation to the supernatural that is intimately connected with moral values. From these attributes of a religion it is apparent that in some sense the religious system is the carrier of much of the world view of a culture, and therefore in trying to understand the culture it is necessary to come to terms with the religious system and beliefs.

National Character

There have been other studies directed toward defining "national character," which Redfield defined as a modal personality type. Two of the most notable of these studies are Benedict's *The Chrysanthemum and the Sword* (1946) and Salvador de Madariaga's *Ingleses, Franceses, Españoles* (1951). In Madariaga's study each national character is typified by an expression which is unique in the language and cannot be translated into the others, "fair play," "la raison," and "la dignidad." In each case a whole constellation of attitudes, actions and responses cluster around the expression, and differentiate these characters. Again, as with ethos, or themes, these national characteristics must be internalized cognitive structures of some type that produce the typical reactions under certain circumstances. But do these characteristics really pervade the culture, or are they only expressions of ideals, what is considered to be right, again the Ought? For instance, How does "la dignidad" which is so characteristic of a don Quixote compare with the earthy, rather opportunistic Sancho Panza in Cervantes' famous work? Clearly not all reactions or decisions of any people can be described simply in one dimension. Inkeles (1961)

has analyzed the concept and shown that national character is too general a concept. It is often related to such things as child-rearing techniques, to institutional patterns, cultural themes, it becomes the reason for action and for racial psychology. As with ethos and themes, studies of national character are suggestive--which may be the problem with them--but not very useful for the task of defining a world view.

Studies of World View

Mendelson. Some anthropologists have tried to define world view for specific cultures, and the results are quite varied. Mendelson (1953) studied a Tzutuhil village in highland Guatemala in order to understand their world view, which he defined as "socially sanctioned choices of emphasis in thought and behavior" (1956:509). In fact what was studied was a certain religious scandal that had arisen within the community. Certain isolated observations do seem to indicate aspects of world view, for instance, the Indians are not troubled by the conflicting ideologies of non-Indians around them as orthodox Roman Catholics, Protestants, etc. but believe that they must maintain their own customs and practice because if they do not, they will be punished by the gods (1956:401). At the same time the Catholic or Protestant can violate these same customs without fear, because they do not touch them. These specific observations are collected, but not formed into a cohesive system or world view, perhaps they cannot be. But in the midst of it all one wonders why religious practices specifically are chosen for observation, unless it might be that they form the rationale that a knowledgeable person

uses to justify his activities and it may be that this religious formulation does come close to expressing the understanding people have of the reality in which they live.

Kluckhohn and Leighton. Another more complete example of an attempt to describe world view is found in Kluckhohn and Leighton's *The Navaho* (1946). In the last chapter they attempt to summarize the Navaho's view of life under nine heads or premises such as 1) life is very, very dangeous, or 2) nature is more powerful than man. The authors say that these nine are only "some" of the premises, and give examples of conflicts that have arisen between administrators and Navahos due to making decisions based on different cultural premises, each of whom, the administrator or the Navaho, considers his own premises "natural" and therefore universal. It is evident that 1) these are very general rules that form the basis of many of life's decisions; that b) the premises are generally completely unconscious and unexamined, but accepted as the foundation on which the universe functions; and that c) the ones deduced by an observer are at best a limited set of a potentially very large number of premises, and being unexamined, contradictory premises may never have been brought into juxtaposition so that the opposition would become apparent. These premises must be learned in some way, and be stored in the memory of each individual, for while they are shared, they only become apparent in the actual decisions and responses of individuals, thus they are part of the cognitive baggage of the individual.

Studies of Psychologists: Rokeach

For the psychologist something similar emerges from the examination of the way people function. For instance, Rokeach (1960:258) says,

> For if a person's total belief system can be meaninfully placed along a spectrum from open to closed, then this total state of mind should be reflected in any area of human functioning that requires that new systems be entertained or formed.

Thus in order to discuss the degree to which people are open or closed to accepting new structures or elements into their thinking, it is necessary to recur to come background construct as "total belief system," which must be made up of the premises on which a person works, for these are, as unexamined beliefs, received and accepted, not the fruit of conscious effort. Rokeach also sees these premises as operating in all areas of human functioning, a total state of mind.

> We mean it to include each and every belief and disbelief of every sort the person may have built up about the physical and social universe he lives in. We mean it to represent each man's total frame work for understanding his universe as best he can (1960:35).

He further defines personality as "an organization of beliefs or expectancies having a definable and measureable structure" (1960:7). The concept of culture as defined by Wallace (1969) as "a system of cognitive structures" seems to bring us full circle, for in this sense culture is equivalent to personality and to world view, or a set of cognitive structures which form the basis for all mental functioning in the cognitive, normative and affective activities.

World View as Artifact of Visual Culture

At this point Ong (1969:75) raises an interesting question. May it not be that the concept of world view itself is a figment of Western man's world view? He says,

> However we break it down or specify it, the term world view suggests some sort of major unifying perception, and it presents the unification as taking place in a visual field. 'View' implies sight, directly or analogously.

And, "the universe for us is essentially something you can draw a picutre of." He contends that this visual mode of understanding is of recent origin, post renaissance, and even with printing we are not completely freed from the former mode which was much more auditory in preliterate society. The preliterate society uses a more "auditory synthesis," as was expressed in harmony, with sound becoming the equivalent to power. He goes on to say,

> But I believe that another productive way to supplement our concept of world view is to move from the concept of world sense to the concept of world-as-presence. By presence I mean the kind of relationship that exists between persons when we say that two persons are present to one another. In terms of presence we cannot achieve the precision we achieve by resort to the visual imagination for models representing the structures of consciousness. But by thinking of the world as-presence we gain in immediacy and in a certain kind of relevance. In the strict sense only persons are real presences. A world conceived of in terms of presence is a *hominized* world. Animism exists in primitive cultures for a variety of reasons, no doubt, but one reason would appear to be the relative emptiness of the primitive universe. Since there are very few persons around, personal presences are projected into the otherwise empty world (1969:646).

Contrasts between Subcultures

This contrast between world view and world as presence calls our attention to the degree we perceive and think in visual terms in the

western world, and how this conceivably leads to misunderstanding even the inability to attribute reality to anything that is unseen, and so to make many cultures incomprehensible. The difficulty non-literate people have with two dimensional pictures would tend to bear this out. School provides this experience for the first time to many. As we shall see later, one of the types of perception referred to as a style has to do with the perception of relations, especially interpersonal relations that have been found in ghetto situations, and may also be the key to some of the findings of studies of non-Western people where they appear poor on analytical tests.

Conclusion

In conclusion then, the concept of world view is not very useful as it stands, for we do not know whether other people have one. The need for conceptual consistency may be part of Western culture and, therefore there may be no need for a unifying principle among others (Khokhlov and González 1973, Mendelson 1956). The problem with world view, themes, ethos, national character, culture and personality then, is that they are all attempts to organize the universe as perceived into some relatively simple, few and easily comprehensible rules or statements that will allow a person to predict the behavior of another in a given set of circumstances. The question remains as to whether the enterprise has any potentiality of success in the complex world of events. This being the case, it is necessary to turn to the concept of cognitive style in order to see if it is a construct that will aid in understanding cognition and through this understanding, indicate ways to attack the problem of teaching cross-culturally.

Cognitive Style

The last category of transformations that might be made to adapt teaching to the cross-cultural situation refers to differing cognitive styles (Ward 1973). The key style referred to is Witkin and colleagues' cognitive style of field independence-dependence (FID). Witkin (1967) defines cognitive style as "The characteristic self-consistent modes of functioning found pervasively throughout an individual's cognitive activities (perceptual and intellectual)." While this is the most frequent style mentioned in the literature, and the one on which most research has been conducted, it is not the only style identified, though as the terminology varies, the style referred to at times is called a perceptual, a conceptual or cognitive style, or a personality style. Generally speaking the styles might be classified under these three headings.

Perceptual Styles

Horowitz (1970) traces some of the history of this concept to Sir Francis Galton in 1893. In his *Inquiries into Human Faculty*, Galton found that different thinkers function according to different modes. His concept of style was based on the notion that a person's thought processes depend directly on perception. His major interest was in heredity, and perception was conceived as being genetically controlled. He established a typology which is still used in studies of cognition. The typology was based on the kinds of images different people use in thinking, whether they are "visualizers," "audiles," "kinesthetes," etc. The typology was related to personality types,

so that the different cognitive styles were reflected in various ways of responding to different situations. Later Betts (1909) reported that people were not this specific in their thought processes and images, but that they had either vivid impressions in all sense modes, or those who had vague impressions visually, also had vague aural ones. Angell (1910) found that people shift from one mode to another so a person would not function exclusively using one style, but would have at most a preferred style. More recently Roe (1951) reported that people with a visual style predominate in the physical sciences, those with a verbal style in the social sciences, but that most people have no preferred style, and they develop according to the needs they have. On the other hand Wober (1966, 1967) has continued this line of studies to develop what he calls "sensotypes" where certain types or modes of perception are more highly developed in some people than others due to the type of socialization and learning experiences they have had. Some extreme cases are reported however, such as the man so dominated by visual images that all symbols had to be converted into images before he could use them (Luria 1968).

Conceptual Styles

A number of styles can be classed as conceptual, for they relate to the formation of concepts, or the way concepts are manipulated. Included are also styles that attempt to categorize thought or cognitive processes.

Lumpers-Splitters. Other students of cognition use the term "cognitive style" to refer to ways to categorize or conceptualize, rather than modes of perception. Several see the basic difference in

the number of attributes or properties that a person uses to isolate a category or concept. Some persons, such as Piaget's pre-operational children, center on a single property, and include in the category any object that possesses it (Schroder *et al.* 1967, Johnson 1972). Others combine a variety of attributes in a single category, thereby creating complex concepts. These two types are the "lumpers" and the "splitters." This type of style is one that changes with age, and possibly with the type of material the individual is categorizing.

Similarities-Differences. Maccoby and Modiano (1966) use cognitive style with respect to the way Mexican peasant children form categories on the basis of similarities or differences, but do not think much in generalities. According to this study, children in industrial societies must learn to manipulate abstract concepts and categories, while peasant children are faced with the problem of more concrete cases. The peasant's need is to discriminate, to observe differences, be they in plant life, weather, kinds of insects in the crops, etc. For this purpose, it is more important to observe differences than similarities. According to his perspective, cognitive styles are used in forming categories, but useful ones, so that the specific demands of life give rise to the particular style.

Categorical Styles

A further way of regarding styles as categorical or conceptual is found in Kagan, Moss and Sigel (1963). Three styles are recognized: analytical-descriptive, inferential-categorical, and relational. The analytical-descriptive refers to identifying parts (analysis) and relating these on the basis of similarity. Inferential-categorical

styles are related on the basis of an inference about the stimuli that are grouped together. Relational categories group stimuli on the basis of a functional relationship involving a group of stimuli. The three categories are identified by the use of a variety of tests that picture people with different dress, posture, or orientations with respect to one another. The inferential style was so predominant that the experimenters excluded it and concentrated on the analytical and relational. The subjects who were characterized by the two remaining styles were considered as perceiving and categorizing either on the basis of details (analytical) or of perceived whole (relational). The two categories are similar to Witkin's global-articulated style data, not only with respect to the ability to differentiate or analyze, but also in regard to dependence on family and friends, motivation for social recognition and concern for intellectual mastery. Also, as in Witkin's data, males tend to be more analytical than females. As the experimenters found it necessary to exclude answers that were inferential, because this was the preferred form, it seems questionable to consider the less dominant styles as determinative (1963:212). Nevertheless, due to the high level of congruence with the more extensive studies of Witkin's styles, further consideration of Kagan's studies will be taken up later.

Cognitive Complexity

In contrast to the Kagan, Moss and Sigel study, Schroder and his collaborators differentiate styles on the basis of a separate factor, that of cognitive complexity, the ability to use many or few dimensions

to interpret the environment. As Kagan considers grouping of stimuli by relations to be a lack of differentiation, Schroder considers it to reflect the ability to distinguish attributes that can then be related. That which Schroder considers a skill, Kagan finds to be the lack of ability to discriminate. Then what appear to be clear contrasts of styles can be quite different aspects of thinking, depending on the underlying variables that are deduced from the interpretation of the tests.

Abstract-Concrete

A further contrast used in characterizing concepts and conceptual styles is the abstract-concrete one. Primitive mentality has been characterized as concrete, while scientific thinking is abstract. This contrast has been used to distinguish Hebrew from Greek thought. Gladwin (1970) examined the thought of Micronesian navigators in this context, but found that the contrast was not useful, since all aspects of thinking contain elements of both. Much of daily life calls for concrete concepts, concepts related directly to perceived entities, even in industrial and sophisticated society, while Micronesian navigation depends on some concepts and constructs based on mythology that do not have any referents at all in reality. Gladwin says that the modern contrast in psychology was originally used by Goldstein (1941) to distinguish sets of pathological conditions, and was never intended as a way of distinguishing normal subjects as primitive or modern.

Field Independet-Dependent

The field independent-dependent (FID) style is identified especially with the work of Witkin and his associates. At first it was conceived as being a perceptual dimension, but later has been interpreted as an issue of the degree to which a person is dominated by the context or field in perceiving an object, or is independent of the context. Most recently the interpretation is that the style involves the ability to extract a figure from its embedding context. The tests for this style and the interpretation generally given it are related to a number of other styles as we will see later when examining this style in detail.

Convergent-Divergent

The convergent-divergent contrast in thinking is considered by some to be a style, though not so by the originator of the idea. The dimension comes from the work of Guilford, and relates to the way people work to solve problems and create new ideas. Divergent thinking involves a free floating process like brainstorming in order to generate as many different solutions, thoughts, ideas, as possible. The contrasting form is convergent which is related toward formation of unique solutions, refinement, bringing together different aspects of a problem to form one integrated solution. These dimensions are related to the issues of creativity.

Cognitive Controls

A number of other styles have been studied by Gardner and his colleagues. They use a different terminology, and also use factor

analysis in their studies. For them the term that corresponds to style for others, are called controls; the term style being reserved for a series of second order factors. However, as they do not use the terms consistently, and the first order factors are more similar to other investigators' styles, we will consider them to be styles. The styles they observe then are first, sharpening-leveling which distinguishes between those who have clear and discrete impressions and memory, and are analytic on tests such as the embedded figures test, as against those who have less distinct and clear impressions and perceptions. The leveler tends to assimilate differences into the same category, while the sharpener tends to discriminate. The focusing-scanning style is an information gathering strategy, relating to the way an individual looks within a narrow or wide range to find information. The constricted-flexible control relates to the FID style, but was not sufficiently clear to be interpreted. The equivalence range relates to the way people categorize into large, general, or small specific groups. The tolerence for unrealistic experiences relates to the difference between the uninhibited, freely ranging thoughts in contrast to the more restricted, bounded and rational thinking of other people. As these are factors, they represent clusters of ratings on a series of tests.

A number of these styles will be discussed later, some in more depth. On a cursory examination it would seem that there is considerable overlap among the styles listed. For instance the FID appears related to the sharpening-leveling as well as the constricted-flexible control. Cognitive complexity seems to relate to equivalence range, wide-narrow categorizers and lumpers-splitters. Due to the fact that the way the

different styles appear to relate, it will be necessary to later examine in more detail the similarities and differences in the principal ones.

Personality Styles

A number of studies have revealed ways of functioning that are conceived of as affecting not only the cognitive processes, but also the emotional and volitional aspects of life. Johnson (1972) discussed some attributes of cognitive styles derived from studies of creativity as energy, personal dominance, responsiveness, femininity and interactivity. The creative were confident, self-assertive, showed a great variety in thinking and ways of adjusting to situations. The characteristics related to creativity measures did not correlate with the I. Q. and some studies of these factors provided clear differences among early school children, high school students and adults. Personal dominance appeared in measures of dogmatism that relate to modes of thinking. The dogmatic individual will focus on a limited amount of information and evaluate other situations from that limited perspective. The dogmatism factor is related to that of flexibility to be considered later. A further contrast in styles is between impulsiveness and reflectiveness (Kagan *et al.* 1964, Johnson 1972). The impulsive type is related to the dogmatism factor in that closure is made with little information, while the reflexive will keep the options open for a longer period, and postpone judgment, perhaps never arriving at closure. These styles are general, and will be further considered with respect to information processing. The studies of Witkin relate to personality variables, especially the self concept.

The Problem of "Cognitive Styles"

In light of the extensive work done on styles, and the possible implications for teaching and learning, it is necessary to examine the field in more detail. As Witkin himself has mentioned (1962:80), due to the rapid expansion of the field and the great variety of work done, there is a need to bring together, organize, and evaluate what has been done. Since that time when Witkin wrote, the field has literally exploded in the number of studies.

Need for Analysis and Theory

While the cognitive style hypothesis has been extremely productive in suggesting further research, there appears to be a paucity of theoretical analyses of the subject. At the same time, a number of criticisms have been made of the "style" approach, and specifically of the "field independence-dependence" dimension. Vernon (1973) raises the question whether there is anything that the style concept contributes that standard multivariate analyses of ability measures do not treat just as well. Guilford (1967) finds that the style measures are multifactorial and load differently on various factors,

> Both the FID score and a Gottschaldt-figure-test score correlate with so many other variables that they both give the impression of being factorially complex. That leaves us wondering which of several common factors accounts for their intercorrelations (1967:180).

Cattell (1965) discusses the FID tests and finds that they load on his factor UI-19 of independence, which is one of his personality factors. He states,

> In the present writer's opinion, when these stylistic features are properly analyzed and correlated, it will

> be found that one or two of the main temperament factors, not the whole personality, can be predicted from them (1965:141).

A study by Arbuthnot (1972) seriously questions the validity of the interpretations of the FID measures due to the low level of shared variance on replications of the earlier studies of Witkin and associates. Johnson (1972) states,

> It appears, finally, that many interesting cognitive styles and problem solving methods have been described, but as yet, not well analyzed. Traits that are grouped under one broad term may be analyzed into narrower traits, and some that go by different names may turn out to be the same. The relations with ability traits also have not been well analyzed.

And later,

> From the psychometric point of view, cognitive styles have not been analyzed as thoroughly as cognitive abilities. As far as we know, most of them are rather narrow traits, limited to certain materials and testing methods, but further work may demonstrate more generality (1972:227).

Referring to Thurstone's factors of *flexibility of closure* (Gottschaldt's Hidden Figures) and *Speed of Closure* (Street Gestalt Test) he says,

> These differences between contrasting groups obtained by Hettema were interaction effects, which are notoriously difficult to replicate and to interpret, but they demonstrate the intriguing individual differences that have fascinated students of cognitive style (Johnson 1972:448).

Questions to be Examined

Considering these critiques, mostly from established scholars of psychological testing, and from people who have factor analyzed the results of these and similar tests, a number of basic questions need to be resolved. First, what do the style tests test?--the validity question. Second, how do these style tests relate to other tests and to the interpretation of styles?--a theoretical question. Third, on

the basis of the several remarks that styles need to be better analyzed before any judgment can be made, the relation between the theory and evidence needs to be further examined, another theoretical issue.

Purpose of Present Study

In order to carry this out and resolve these questions, the present study proposes to examine the field of cognitive style in general, and the field independence-dependence dimension in particular, in order to ascertain if the concept of style has a referent, to examine the magnitude and distribution of the style differences in order to assess its value for a) understanding and explaining cognitive processes in general and cross-cultural differences in particular, and b) for suggesting some ways to modify teaching methods and materials that will enhance learning in non-Western cultures. On consideration of the evidence, and the process by which cognitive styles came to be identified, some alternatives will be suggested with respect to the theoretical basis for cognitive styles, and the proposal will be made that they might better be organized on an information processing model.

Styles and Learning

As Biggs (1968:97) points out, the determinants of learning are not exhausted by the concept of I.Q., there are other moderator variables that exercise considerable influence on the outcome of learning. In line with the set of transformations necessary to adapt teaching to other cultures as mentioned in Ward (1973), cognitive

styles should be considered as one of the possible areas in which modifications might be made if teaching is to be effective. The style studies have originated in a variety of ways and were not related to education. In view of the limited success of studies in experimental psychology to resolve educational problems there is considerable merit in approaching the problem from other directions.

Principal Emphasis on FID

It is necessary to examine more than one style, nevertheless, the major emphasis will be placed on the FID style of Witkin and associates. This style is the best known, and has been studied most extensively, with well over 2,000 citations presently in the bibliography (Witkin *et al.* 1973, 1974, 1976). In this most studied style, the work began by observing the remarkable differences in the ways people orient themselves in space. As studies were pursued, it became evident that the scores on the tests of spatial orientation correlated with certain other test results, for instance, the speed with which people could pick out simple geometric figures from within complex ones. These test differences were sustained over periods of time, and were apparently independent of the scores on I. Q. tests. Also, it was observed that there were certain changes as children matured. In this way, the concept of style was linked with psychological growth and development, in the sense that an individual becomes more specialized and differentiated as he grows to maturity. Since the measures are primarily perceptual, it appears that, during growth people learn to function in certain ways, and that they develop into preferred modes of perception. Of course, all responses are mediated

by the same mind, so that it is to be expected that the ways people perceive will also influence the way they react in other situations. For this reason, there should be links between modes of perception and the controls and defenses that a person uses in order to maintain his psychological equilibrium, thus relating styles of cognition to personality variables.

FID and Education

Any factor that has such wide reaching implications in the whole of mental functioning clearly has implications for education. In the earlier work there was some reference to education, but it was not systematically explored. More recently Witkin *et al.* (1977) have published a study spelling out some of the implications for teaching and learning. A number of studies are cited in which styles have been investigated with respect to the activities of teachers and learners. The evidence indicates that if the student and teacher are of the same style, more learning takes place than if there is a conflict of styles. If the styles develop during growth, and relate to the way teaching is carried out, then it is important to understand the process, and in what ways it is subject to modification, if indeed it is. Therefore, in order to know what contribution style studies have for education and for cognitive studies in general, we now turn to an examination of the literature. The four major styles will be considered and then a more detailed examination will be made of the FID style in particular.

CHAPTER II

PRINCIPAL STUDIES OF STYLES

From the general literature on styles there are a few that serve to focus the issues, and a large number of other studies related to these dimensions. The issue of rigidity and flexibility has been studied by many investigators, and one of the principal works is that by Rokeach and his associates. A second study that has brought together information on several factors, and has defined styles in a different way is that by Gardner and his colleagues. Their study considers the sharpening-leveling dimension, as well as scanning-focusing, tolerance for unrealistic experience and differentiation. A third style, divergent-covergent thinking comes from the work of Guilford, and is related to the general model of mental abilities called "Structure of Intellect." For it there have been many tests and factor analyses. The fourth study, and the one that has served to stimulate more cross-cultural study than any other, is that of field independence-dependence through the work of Witkin and his associates. These will be examined in order.

The Rigid-Flexible Dimension

The rigid-flexible dimension seems to be a natural one, for some people appear as stubborn and others pliable--as John Bunyan's Christian encountered on the way--some are tolerant, others bigots; what precisely

is the difference? The history of this dimension as studied by psychologists is traced by Chown (1959) and apparently was derived originally from the early concept of perseveration (Neisser 1894) and Spearman's mental law of inertia. The concept was considered similar to William James' tough-tender minded, and Thurstone's radicalism-conservative dimensions, but Eysenck found these to be orthagonal. Frenkel-Brunswick (1949) defined the rigid person as a tough conservative. The dimension was tested extensively through the 40's and 50's with many non-significant results, and frequently no overlap in the tests. The result has been considerable confusion in the field.

Rokeach's Study

One of the best known series of studies are those of Rokeach and his colleagues (1960). Following a number of other studies, the principal work cited above sought to distinguish a rigid-flexible dimension from an open-closed dimension. The orientation of these studies came from the field of social psychology, related to the studies of prejudice and ideological fixedness, as seen in the political orientation of groups like the Nazis, communists, Ku Klux Klan, etc. and from these, extended into the study of belief systems in general. Previously studies of dogmatism have been related to specific beliefs as absolute measures of the strength of the system and its resistence to change. Rokeach's contention was that one was dealing with structures that are rigid or flexible and therefore might be just as well "left" closed and dogmatic as there might be "right" dogmatic and and closed people. The difference between rigidity and dogmatism is

seen as the difference between altering single beliefs or altering beliefs that threaten the whole system.

Theoretical Assumptions

The theory assumes that there are three levels of perception. Perception is used in this study, not to mean signals or percepts, but as the integrated and formulated understanding an individual has as he or she takes in the whole situation. Therefore, while it includes perceived information, it also includes the mental processing of it in relation to remembered information that serves to filter and interpret it as a whole, so the person can respond appropriately to the whole situation. Returning to the levels of perception, they are as follows: 1) Central, or the person's self perception. This level of belief is taken for granted, and consists of primitive beliefs from which others are derived. This perception comes particularly from the generalized other, and in not challanged by the individual, but taken for granted. 2) Immediate. This level consists of the significant other, the authority for the individual. It varies from the acceptance of authority at one extreme to a very loose mode of dealing with other's opinions. At this level one knows that there are others who see things differently but the individual adjusts to this. 3) Peripheral. At this level beliefs are compared with the primitive ones the person holds, and accepted or rejected according to the authority. Information for the closed person is kept isolated or compartmentalized in order that it not enter into conflict with other information he or she has. The closed person is expected to be less differentiated in perceiving stimuli, more egocentric, and with a more narrow concept domain. The

open person has broader concepts, is more tolerant of new information and accepts or rejects more on the basis of his own understanding than on the basis of authority. For both this area is open to greater change, even though the type of change might be different. Thus, the closed communists blindly followed the official shifts of policy at the beginning of World War II when Hitler and Stalin were arch enemies, but quickly reoriented themselves when the pact was concluded between the two powers at the beginning of the war. Again, when Germany invaded Russia, these persons quickly changed to favor the Allies. On the other hand, the open communists could not integrate these shifts as they were not isolated in their belief system, but created intolerable tensions; thus they would reject the party due to its opportunistic changes of direction.

Belief-Disbelief System

Another basic concept of the study was that each person has a belief-disbelief system that defines the personality which is "an organization of beliefs or expectancies having definable and measurable structure" (1960:7). The belief-disbelief system is asymmetrical, varying in strength and definiteness. A Lutheran, for instance, would have a set of beliefs largely in common with others of his church. He would place people belonging to other religions along a line of diminishing similarity, being nearest to other protestants, then Roman Catholics further away, then Jews, Muslims, Buddhists, atheists, communists, etc. In the more distant disbelief systems there would be less differentiation, and more influence of authority.

Testing Instruments

In order to test these hypothesized relationships two principal instruments were used. The first is a dogmatism inventory or opinionation scale, used to measure the degree of intolerance and authoritarianism of a person. It was expected that the closed person would feel more alone and isolated, helpless and uncertain, that he would be fearful of the future, be subject to more internal conflict and would be self-righteous. The statements of the questionaire were ones that indicated the acceptance or rejection of persons and beliefs. The scale was for six responses from strongly agree to strongly disagree with the excluded middle.

Doodlebug Problem

The second instrument consisted of a series of tests as variations of the "doodlebug problem." This problem was conceived as a small belief system that would be different from the ordinary expectations of the individual. As the conditions of the problem were modified one by one, the time of solution changed and was interpreted as being a measure of rigidity or closedness. The three beliefs or conditions laid down were that the bug could move around a grid in only certain directions, forward, backward, or to the side, but not diagonlly. Once started hopping in a given direction, the bug must hop four times before changing direction. Also, the bug cannot turn. The keeper places a pile of food on the left, or west of the bug on the grid, and tells the bug that he can reach the food to eat in just four jumps. What, then, are the jumps that the bug has to make to reach the food?

Interpretation of the Problem

According to the author there are three beliefs in the "miniature belief system" or "cosmology", and it is necessary to overcome these beliefs in order to solve the problem. These beliefs are the facing belief, that the bug must face the food to eat it, but the bug can land on it in order to eat it; the direction belief, the bug is limited to move in only four directions; and the movement belief, that he can only change directions after four jumps instead of changing at will. It was hypothesized that the ability to distinguish the rules implications was a function of the ability to analyze, and was related to the rigidity of overcoming a single belief, while the ability to synthesize would be to integrate the beliefs into an action or single response, solving the problem. Therefore, as the subjects talked their way through the problem, the time required to overcome each belief was measured, as well as the total time for solving the problem. The time from the beginning to overcome each belief and the difference between this time and the final solution were correlated with measures of the opinionation scale and another measure of rigidity in order to substantiate the hypothesis.

Subjects and Results

The subjects were college students who had been tested on the opinionation scale and the rigidity scale, and were selected from the two extremes of the population. Fifteen were selected who were representative of the four cells of the matrix: open-flexible, closed-flexible, open-rigid, and closed-rigid. Of the correlations only one

was significant at the $p = 0.05$ level, though the others were in the expected direction.

Questions Regarding Tests

While this study is frequently cited in the literature, there are a number of serious reservations regarding it. For instance, is the problem a belief system, or is it seen by the subject to be more of a game? Certainly there is not the strong emotional envolvement that there is in a belief system, with the accompanying pressures from the reference group. A change in the game rules does not necessarily require a change in the whole system. It is questionable whether analysis and synthesis can be separated in the way proposed, for Rokeach himself considers that the two go together, but that there is more analysis taking place in the part of the problem involved in defining the conditions than in the second part where the conditions or beliefs are put together. Another difficulty is that the instructions are not clear, in that one is left with certain ambiguities unresolved until defined by the experimenter. For instance, the instruction that the bug cannot turn does not make it clear that when changing direction after four jumps, the bug turns in the direction of the jump or not, for there is no indication that turn means 90^{o} or 180^{o}. Also since bugs normally land on what they eat, and do not have to be facing it, this is not defined in the instructions, and one would ordinarily assume that once on the food, he could eat. Such points are not clarified until the subject becomes stuck, or comes up with the wrong solution and then when corrected finds out the implicit rules understood by the

experimenter, but undefined for the subject. On the other hand, if the instructions clarify these points, there is no problem.

Extension to other Variables

Following the tests that have been discussed, the results are correlated with a number of other studies, extending the concept of open-closed into other areas. The studies were correlated with anxiety tests, with child rearing practices, with communist party members in contrast with Roman Catholics, with measures of loyalty to the government, with esthetic systems to see if the closed person would reject new forms of music more than open persons, and also the results were studied from the standpoint of the threat to one's beliefs. There was a tendency for the closed person to reject new music, but the results were not significant. However, there was a correlation between anxiety and the dogmatism tests. In two factorial studies it was found that dogmatism and anxiety loaded on the same factor. From this standpoint there was one curious result in the study. For Roman Catholics there was a significant correlation between the two, but the communists scored high on dogmatism, but low on anxiety. The result was explained by saying that the communists were so busy in party activities that they did not have time to think and therefore become anxious.

Relationship with FID Tests

The measures used for measuring field independence-dependence were also used with the subjects who had been measured for rigidity and dogmatism. It was expected that in order to define the beliefs on the

doodlebug problem the subject would have to extract information from an embedding context, and therefore the measures for field dependence should correlate with the data of the bug problem. However, the results were not significant with the EFT, nor with Koh's Blocks. A further series of block designs was administered in which the subject had to transform the orientation of the design, or enlarge the scale of it with more blocks. Of the six results, three are listed as significant ($p = 0.06$, 0.06 and 0.09) while the others were not considered significant ($p = 0.39$, 0.47 and 0.19). As a whole most of the tests show very weak results, a majority of them being not statistically significant, and this should be interpreted in the light of the fact that the subjects were chosen from the extremes of the rigidity and dogmatism scales.

Conclusions

The commentary Chown makes regarding the earlier studies of rigidity can equally well be applied here. She was aware of some of Rokeach's earlier studies, but his book was published the year after Chown's critique. The conclusion is that most of the studies of rigidity reflect changes of set, and that set is not a unitary dimension. Training in a specific problem solving strategy leads to greater efficiency in solving that type of problem. If the student is aware that there will be a variety of problems, he will adapt to that, changing set when necessary, thus the real problem is how to test for rigidity. As Johnson (1972) comments, the testing problem is one of trying to fool the subject twice.

The Sharpening-Leveling Dimension

The concept of sharpening-leveling is one of a series of "controls" that have been studied by a group of clinical psychologists, working chiefly at the Menninger Clinic. From these studies, and related ones in the literature, five cognitive controls have been defined: sharpening-leveling, focusing, scanning, constricted-flexible, equivalence range and the tolerance for unrealistic experiences. Gardner and his colleagues who have done these studies consider that the constricted-flexible control to be equivalent to Witkin's FID style (Gardner, Holtzman, Klein, Linton and Spence 1959). Thus, there is a difference regarding the concept of style between these studies and the others discussed in this paper; the difference stems from their concept of human mental processes.

Psychoanalytical Orientation

The frame of reference for cognitive controls comes from the clinical orientation of psychoanalysis. The personality is considered to be structured, and there is a hierarchy of mental processes. Responses differ due to a different personality structure, the product of the way a person has adapted to reality, and expecially the way the individual has learned to cope. At the most basic level there are the components that underlie perception, recall, judgment, etc. which mediate all information received and responses made. Cognitive controls are stabilized structures of related components that combine and program properties, relations and constraints, and that affect perception and responses in accord with certain patterns. These

cognitive controls are composite structures that interact to determine types of responses that an individual makes; they are hierarchical and may be clear and well defined or vague. We shall concentrate on the intermediate level of controls which correspond to what other investigators class as styles.

Cognitive Controls

More specifically

> cognitive controls are conceived of as slow-changing, developmentally stabilized structures: a) they are relatively invariant over a given class of situations and intentions; b) they are operative despite the shifts in situational and behavioral contexts typical of cognitive activity from moment to moment (Gardner *et al.* 1959:5).

These controls govern the feedback and serve a varied comparative function until adaptive need is met, and the sequence of responses terminated. The controls apply rather automatized standards of adequacy to responses, and if they do not meet the standards, renew activity until they do. The outcomes of cognitive controls are patterns of attribution to the quality of stimulus events and ideas that are compared and judged to be relevant or irrelevant. The leveling-sharpening control seems to pertain to the formation of memory schemata, the equivalence range refers to the adequacy of fit of concepts to the total schemata, while scanning refers to the extent of feedback given in the process of perceiving and assimilating information.

Factors and Clusters

On the basis of extensive work previously by Gardner and his colleagues, as well as numerous other investigators, the identified controls were studied in a series of experiments. The results were

factor analyzed and five factors were separated for men and six factors for women to account for the variance. Each of these factors was represented by a certain profile of response types for the different tests, none of the tests being pure with respect to any specific factor. This result would be expected since all stimuli and responses must be mediated by many of the same structures. In the end, these factors were grouped into several clusters representing "cognitive styles" which were then correlated with the items on a personality inventory. One cluster was difficult to define, and so not interpreted; two were interpreted for men and three for women. The final hypothesis was that individuals who were homogeneous on the clusters would also be more homogeneous on the controls than an equivalent group on any single control. This was borne out for women, but not for men. Thus the clusters were considered to be more predictive than the controls themselves, as was expressed,

> The appearance of sharpening, for example, in two clearly distinguishable combinations indicates that sharpening is relevant only to a limited aspect of cognitive organization; it does not dictate a subject's other factor scores, nor does it tell us much about broader aspects of his personality organization (Gardner *et al.* 1959:123).

The clusters that constitute styles were not designated by names descriptive of their characteristics, but only with a number. The controls found by factor analysis contributed significantly to the variance in five cases, scanning and tolerance for unrealistic experiences were sensitive for men, and field articulation loaded principally for women and to a limited extent for men. The three that loaded principally for women were field articulation, leveling-sharpening and equivalence range. Another factor, flexible-restricted, loaded

slightly for men but was not sufficient to be interpreted. The factor of special interest here is the sharpening-leveling.

Previous Use of Terms

According to Gardner, the terms sharpening and leveling were used previously by Wolf and later by Carmichael, Hogan and Walter to characterize changes in remembered items. Allport and Postman used the terms with respect to changes in rumors. Gardner and his colleagues contrast their use with these previous definitions, making the sharpening-leveling dimension or control a principle of personality organization.

Results of Factor Analyses

The sharpening-leveling factor was found significant only for women. It was conceived as a control that would influence some persons to be cognizant of relatively small differences or changes in stimuli. From this understanding it was expected that the levelers would have more difficulty distinguishing embedded figures, and that they would have more of a tendency to assimilate a new stimulus to an existing dominant cognitive structure rather than to reorganize the structure. However on testing, it was apparent that the factor measured something else, for the EFT did not correlate significantly with the sharpening-leveling factor as elicited by other tests. It did relate more with the time-error tests where the subject was presented a series of figures and asked to estimate if the one in view was larger, smaller or the same size as the previous one. The levelers tended to adjust their judgment to the most recent previous

image presented, rather than maintain a more stable memory for comparison, which the sharpeners did, therefore making more accurate size judgments, less influenced by the series previously presented. Similar results occurred with serial presentation of weights for comparing their weight with the previous one in the series, or the previous but one.

Size Estimation and Word Association

As had been suggested by Freud, in line with Piaget's centration hypothesis, and formulated by Schlesinger (1954), certain persons would tend to exaggerate the size of objects near the center of attention while others would underestimate their size. While this was found to be more highly related to the scanning-focusing factor, it was also found to load on the sharpening-leveling factor. The levelers tended to overestimate the size of objects at the center of attention. They also tended to be erratic in judging relative sizes, a problem that may be caused by a lack of ability to maintain attention on stimuli, or to have a stable memory of previous stimuli, especially if there were intervening ones in the series, making for variable estimates of size and weight. On tests of free word association where the subject must respond with all the words called to mind in a three minute period by a word like "dry" or "house", the leveler tended to make many associations, frequently distant ones which tend to substantiate the interpretation that the leveler assimilates stimuli that are only partly or peripherally similar, neglecting to take into account the differences that could make them seem different for the sharpener. The leveler's associations were frequently not well defined. On the test with aniseikonic lenses the leveler was slow to recognize the

true situation. On the test of reading color names of words printed with ink of another color the leveler tended to be slow to distinguish the contradicting stimuli, while the sharpener was able to respond quickly and accurately.

Sex Differences

While the test for the sharpening-leveling factor did not load for men, it was interesting that some of the same tests did load for men on the scanning-focusing factor, which contributed a larger part of the total variance than any other factor. For instance, the leveler was similar to the focuser (low on scanning) being inaccurate on estimating the size of squares of light, on the memory test of size estimation they were highly variable, and on the free association word test with the word "dry" they were constricted, having only near associates. The male focuser and the female leveler also had long mean times to solve the EFT. On the other hand, they were opposite on the color-word reading test, apparently the scanner takes more time due to the conflicting cues, while the focuser can tune out the conflicting stimuli, and respond rapidly. The leveler was probably slow due to the difficulty in attending to one specific cue, the lack of ability to differentiate easily. If this is so, it is apparent that slow time can be the result of different causes. This points up the need for theory and procedures that can distinguish different results that are superficially the same. There were a number of other tests that loaded on either one or the other of the two factors, but not both, and in this way served to distinguish and provide the basis for the names assigned to the factors. We shall return to this issue

of combining the results of various factors or controls as it is the combination of controls that constitute styles for Gardner.

Field Articulation

The other factors or controls are called styles by other writers. The field articulation or field dependence factor studies in part supported Witkin's data and in part conflicted. Gardner and his colleagues found significant loadings for women but not for men, while Witkin reports the opposite. Gardner's data however, are not convincing regarding men due to the fact that one fourth of the male sample dropped out of the testing process before taking the RFT for field articulation, and those who did not continue were the most variable on other tests, and might well have represented the critical part of the distribution. The separation between the sexes on all of the controls is notable and the authors consider it an artifact of the sample rather than a real difference, since other similar tests conducted previously by the authors did not bear out the difference. The results of Gardner's studies regarding field articulation will be discussed in more detail in the section dedicated specifically to the field independence-dependence dimension.

Tolerance for Unrealistic Experiences

The control of tolerance for unrealistic experience was significant for men. The tolerant were able to freely associate with minimal tension for words with rather distant or tenuous links. The tolerant were quick to recognize and accept the distortion of the aniseikonic lenses, while the low scoring persons seemed to resist accepting the

distortion. On a first trial the intolerant would not admit the distortion, but readily did it on the second trial when it became clear that the experimenter expected them to see it. This contrasts with those who were levelers who did not seem to perceive the distortion, for their responses on the second trial were the same as on the first trial. On the tests that required comparison of image sizes or of weights the tolerant would assimilate more to the previous presentation in the series rather than maintain a memory that would provide a standard against which to judge the stimulus. Thus the tolerant tend to assimilate as do the levelers, while the intolerant are more perceptive of absolute sizes, or of what the stimulus should be like. Thus when given instructions as to what the size of a test image would be, the intolerant adhere to their expectations, and resist change, even though the image size does in fact change. Their range of free association was more limited, more literal. Overall, the tolerant were more relaxed and accepting while the intolerant resisted unexpected changes.

Equivalence Range

The equivalence range factor was significant for women and was in some ways similar to scanning for men. For instance, both high scanners and those with a broad equivalence range made many and distant associations with the words "dry" and "house". They also sorted into few groups with loose and relational defining criteria as "objects found in the kitchen", or "things used in sewing." Those with a narrow range would stick to more specific similarities for grouping and therefore made relatively large numbers of groups. Those with a

narrow range seemed able to compartmentalize, keeping expected size and retinal image separate on the size constance tests. The narrow equivalence range also appears to be related to a more impersonal and objective way of categorizing objects rather than the more functional and personal mode of the broad range individual.

Style Clusters

A style for Gardner and his associates is a particular set or cluster of values that is a profile of the controls. In order to test the validity of the concept the control scores were clustered by a method developed by Cronback and Gleser, and modified by Gardner *et al.* in order to give weight not only to gross differences between individual profile scores, but also the angle between the vectors. The clustering technique is basically one of converting all values on the controls to z scores and then calculating the distances between each vector and grouping those that were within 5, 10 and 15% of the extreme differences. In this way seven clusters were found for men, and six for women. There were also certain cases that did not fit into any of the clusters. It was hypothesized that there would be greater homogeneity among the subjects of a cluster on a 234 item personality inventory than among those high or low on any given control factor. This was tested and was of borderline significance, the authors concluding that nothing definitive could be derived until a study were made of a large number of subjects. The clusters were not given descriptive names as the controls were, for they did not represent unitary factors, but sets or profiles. No interpretation was made for the significance of the profiles either, so that it was not possible to see the implications

for either clinical or educational diagnosis. The clustering technique is suggestive but it would be necessary to carry out extensive testing in order to see if clusters do in fact appear, or if the degree of similarity between vectors becomes a continuous function with only arbitrary cutoff points possible to mark the clusters.

Value of Styles

The sharpening-leveling control appeared in clusters 2 and 6 for women, and so only relate to a limited number of cognitive activities. The authors conclude that due to the way these controls vary, they are only important for certain styles, and that they do not dictate the scores on other dimensions, that they are not indicative of the broader aspects of personality organization (1959:123). The same situation holds for the other controls, for example field differentiation was found to be related to two of the women's clusters, but none of the men's.

Controls and Personality

The clinical interests that motivate these studies lead to a psychoanalytic interpretation that relates cognitive controls to personality and defenses of people. Levelers are said to be more given to repression as a defense against conflict, while sharpeners tend to isolate conflicting situations so that they are not felt to be in conflict. The idea is that levelers have broad and ill-defined memory schemata, so that fine differences are not noted, in this way cases that are only alike in certain gross attributes will be assimilated into the same structure. In this way conflicting circumstances are dealt with by simply not allowing awareness of the differences to rise

to the level of consciousness. On the other hand the sharpeners as well as the extreme scanners perceive the differences and cannot avoid conflict by ignoring or repressing the threatening material, but cope by isolating the conflicting elements into water tight compartments, so that the conflict does not reach the conscious level, and thus is avoided.

Cognitive Implications

Gardner's analysis relates cognitive activities to motivational states as the controlling factors in mental processes. It is assumed that the personality structure relates to the controls and mediates all cognitive functioning, thus determining factors are motivational and not cognitive. The clinical orientation of course, seeks to deal with these personality variables. From the purely cognitive standpoint, it is apparent that the differences between individuals on the scales of controls they have studied could be critical. For instance, in problem solving the person who does not scan widely, who achieves closure before all pertinent information is taken into account will not achieve correct solutions, especially in realistic rather than contrived problems, where there is a context of great variety, only a portion of which is pertinent. The leveler who does not take into account all the information, due to not taking note of critical differences will likewise have difficulty learning many types of material. He will face difficulties with problems that require fine discriminations. Of course the opposite problems will appear for the extreme scanner or sharpener. The scanner may continue to include more and more information until the situation is so complex that no solution is possible, even

an approximate one. The sharpener may discriminate so closely that essential similarities are lost in the welter of minute differences, and again it will become an obstacle to resolving problems. Thus it would seem that there is a need to take into consideration the dimensions made apparent in the study. One aspect is especially curious, why should there be such differences in the factor studies between males and females. Is this an artifact of cultural expectations in our society, or is there a difference that stems from physiological differences. What is especially notable is the contrast between the experimental results of Gardner and the results of Witkin's studies with respect to sex, where men and more marked in their differences than women on the field independence-dependence style.

The Convergent-Divergent Dimension

A difference in cognitive processing that is generally accepted by psychologists, and is classified as a style by some is the convergent-divergent dimension (Biggs 1968, Johnson 1972). This contrast comes from the work of Guilford and his studies regarding creativity. The problem of how people generate responses to particular situations depends upon the information given, and the type of solution that is either possible or expected. Certain types of problems have a unique solutions. With any given set of pertinent data, there is only one possible answer. This type of problem is found in mathematics and many parts of the physical sciences. In contrast to this there is the type of problem that may have a variety of solutions, several of which might be equally adequate. For instance the design of a house, an advertizement, a short story or a speech, any one could take a variety

of forms, be executed by different techniques and make use of different materials and still be adequate. While some solutions might be better than others, the problem is basically the creation of a series of possible alternatives, and then an evaluation that compares the qualities of each in order to find the preferred solution. This contrast of convergent-divergent thinking involves the use of given information and conditions to produce a response. The input is generally complex, and the output is the result of a complex combination of these, so that the convergent-divergent dimension is not a simple process.

Structure of Intellect Model

The convergent-divergent dimension is not considered by Guilford to be a style, but two dimensions of a much larger and more complex model which he designates the "Structure of Intellect" (SI), and is presented in the diagram (Figure 1). Convergent and divergent production are two of his class of operations that process information which is of different content and of various types of products. The other operations of the SI model are cognition, memory and evaluation.

SI Model Code

In the SI model, a code is used that assigns letters to each dimension so that there is a three-letter designation to specify any one cell. The operation is named first, the content second, and the product third. Thus CBS represents C-cognition, B-behavioral and S-systems. The strategy has been to factor analyze tests, and to create new tests that will load differentially on all of the possible

120 cells. A large number of these factors have been isolated, through certain categories are still not well represented, especially the behavioral and figural content categories. For instance, only six of the 30 possible behavioral categories are represented by tests, and 15 of 30 figural categories have tests that load highly on these cells. On the other hand, only two symbolic and no semantic factors lack tests. Many however, are represented by only one or two tests (32 of the 120). Thus of the 120 possible, 45 have no tests, 32 have one or two tests, and 43 cells are represented by multiple tests with appropriate factorial loadings.

Background of the Model

The general background of the model is cognitive psychology, following in the testing tradition of Spearman, Binet, and Thurstone, but systematizing the types of factors expected and seeking to verify each factor suggested by the three dimensional SI model. The procedure has led to an extensive program of test construction, testing and the integration of comparable studies by other experimenters so that an enormous amount of information has been organized within the model. The model was constructed in response to the inadequacy of hierarchical models of intellectual factors as earlier constructed by Spearman, Burt and Vernon. The hierarchical models were not adaptable to the parallel types of information content that became apparent through the extensive factor analyses made during the 40's and 50's. Notable among the parallel categories that reflect different content were the tests that loaded on verbal, numerical and spatial abilities. Since these three types appeared continually, and therefore required separation into

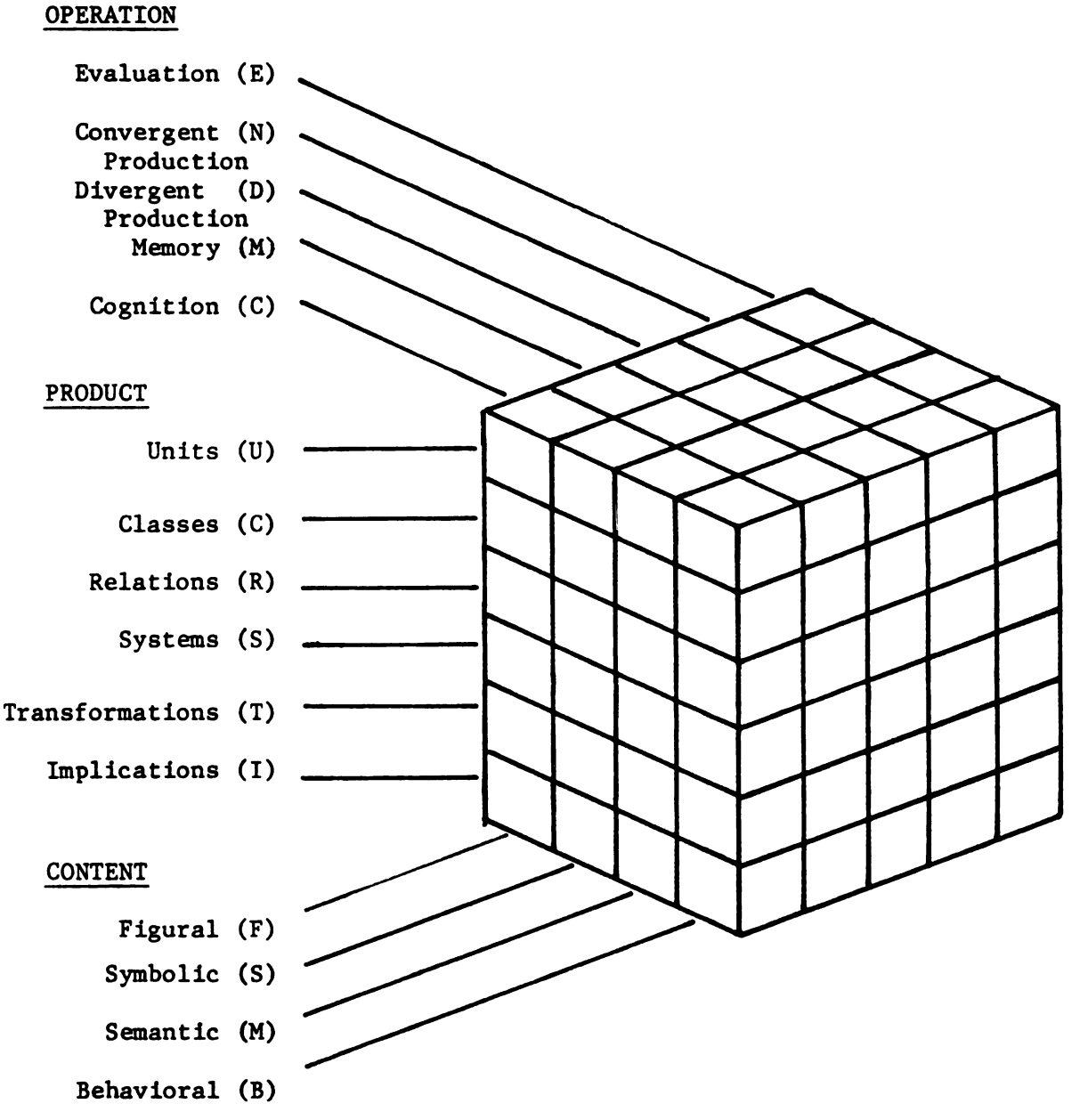


Figure 1

STRUCTURE OF INTELLECT MODEL

From Guilford (1967:63)

different factors, but could not be considered as levels of generality one above the other, the hierarchical model was discarded and the three dimensional SI model was constructed to take its place.

Operations

The set of dimensions of interest at this point is that involving operations. Other sets will be considered later with respect to other styles. The operation categories involve perceptual, memory and reasoning abilities, which have been long recognized as separate. However, the reasoning ability did not appear to be a unique category, but seemed to separate in tests of creativity into abilities that use information to reach unique and singular solutions to problems in contrast to abilities that serve to propose alternative possibilities, these were labeled first convergent and divergent thinking respectively, and then convergent and divergent production in order to avoid the ambiguity of the word thinking. Basic to both these processes is memory and cognition or awareness in Guilford's terminology. Since the information used to generate either type of solution must come either from memory or directly from perception, convergent and divergent production depend on the abilities to perceive and remember. In reality, neither convergent nor divergent production are unitary, but break into a number of factors, many of these parallel with other types of operations as shown in the SI model.

Divergent Production

Divergent production (DP) represents those abilities that appear in many creativity tests and separate into three factors of fluency,

two of flexibility, and one each of originality and elaboration or planning. According to tests done by others, fluency was seen to divide into word, ideational and associational, which fit the SI categories of products as units, relations and systems. Flexibility separated into spontaneous and adaptive, neither being similar to the studies of the type considered previously under the flexible-rigid dimension. The DP tests generally present a word, a figure or some pattern and the subject is asked to produce a variety of responses within a given time span. Two types of scoring can be administered, either with respect to gross productivity, as the number of words the subject produces, or the length of a story; or a qualitative scoring can be applied so that not only the number but the type of response can be evaluated. For instance, in the Utility Test, the problem is to generate as many uses of a brick as possible within five minutes. Some subjects may produce many applications but all of the same general type, build a house, a school, a church, etc. while others think of a variety, as to make a book shelf, to hit somebody with, to grind into a red powder for coloring, for sharpening a knife, etc. This test is used to identify divergent semantic units (DMU) or ideational fluency when scored for the total number of uses generated. When the quality of novel uses was scored, the factor was spontaneous flexibility, or the ability to shift classes, so identified as divergent semantic classes (DMC). The other fluency factors are identified as follows: word fluency with divergent symbolic units (DSU), for these tests relate not to the meaning but the form of words, and associational fluency with divergent semantic relations (DMR), and makes use of

tests that involve such problems as producing a number of antonyms, a type of semantic relation. The flexibility factor, adaptive flexibility, appeared on tests that called for the subject to shift categories, and to change set as tested by Match Problems, or Planning Air Maneuvers in skywriting. The Match Tests usually present a number of squares outlined by matches, the problem is to produce a different number of squares by removing or moving a specified number of matches. This factor is divergent figural transformations (DFT). The originality factor was shown to involve semantic transformations (DMT) and loaded on tests like that of Unusual Responses where a series of words are read off and the subject must respond as quickly as possible, the test is scored for unusualness of response. Those who scored high on this test were scientists, artists, musicians, engineers and writers, while politicians, salesmen, teachers and executives scored low. The ability to elaborate or plan involves finding implications and loaded on two categories, divergent production of figures and semantic implications (DFI and DMI). The tests that exhibited these factors were the spontaneous elaboration of non-functional decorations on familiar objects such as trunks, chairs, tables, etc. or planning how to solve a problem of morale in the military.

Convergent Production

Convergent production abilities (CP) involve finding a unique solution to a problem, not generating a variety of curious responses. The process involved is usually that of logical deduction or arriving at the consequences of a compelling inference. On occasion it is difficult to make a neat separation between DP and CP, not because

they do not represent different categories, but because tests might require operations that involve both abilities to some extent. To pose any type of a problem requires that some definition or cues be presented. If the information given can lead to a variety of solutions, it is DP, but if the conditions are such that one response might be highly probable while others would be possible but remote, practically the test becomes CP. Therefore several tests do load on both dimensions. Except for the tests involving convergent figural transformations (NFT), all of the tests of convergent production are symbolic or semantic. It is interesting that the only figural ability involving CP is found to load on tests of the type of Gottschaldt's Hidden Figures (HFT), similar to the Embedded Figures Test (EFT) of Witkin, the characteristic test for field independence-dependence to be considered later.

Convergent Production Tests

The tests that load on convergent abilities are largely types of logical problems and frequently include specifically mathematical problems. Others that are based on meaning are also of logical ordering, but not mathematical, for instance the naming of opposites based on meaning, identifying similar syntactic constructions, or ordering series according to meaning. This set of operations has not been well studies according to Guilford (1967:171), a fact that is curious since so many school subjects would be expected to lie in this domain, all studies where specific responses might be expected. Of the 10 CP categories attested to some extent, only five have adequate tests, though a number of the tests load to some extent on the other factors. The best attested factors are symbolic and semantic systems (NSS and

NMS), figural and symbolic transformations (NFT and NST), and symbolic implications (NSI). The tests for NSS are Word Changes and Operation Sequences, both of which are univocal on this factor. These tests require systematic substitutions of letter combinations or numerical operations symbols to arrive at a predetermined transformation. The semantic systems were tested chiefly by ordering pictures, sentences or steps in a process. The tests for transformations all include some type of redefinition or reorganization, and not analysis in the sense of seeing the relationships between parts in order to have a better understanding of the whole. On the contrary, there is more of a destruction of the whole in order to reorganize it along other lines. The figural transformation (NFT) loads on Gottschaldt's Hidden Figures, and tests involving the penetration of camouflage, these latter also load on symbolic transformations (NST). The other standard test for NST is Camouflaged Words, where the letters in a sentence must be divided in a new way to form other words. Word Transformations is another test essentially like the Camouflaged Words, except that only partial sentences are given. Three tests were found that marked semantic transformations, but none loaded heavily. These tests had to do with the redefinition of some object for a different use. For instance the crystal of a watch might be used as lens to start a fire, or a pair of pliers and a shoestring might be turned into a pendulum. The tests for symbolic implications (NSI) are basically logical operations, either matters of substitutions in a series to produce a given outcome, or choosing certain operations to obtain a specific result. The semantic implications were weak but seem to involve deductive reasoning.

DP and CP in Problem Solving

The convergent-divergent opposition seems to provide a fruitful way of describing certain mental operations that are recognizable in tests as well as in ordinary thinking. The testing regimen generated by the SI model is not complete and at many points the tests or factorial results are weak. Nevertheless, such a systematic approach does seem to bear fruit in its ability to organize a large body of test results and to suggest some new avenues for examination that might throw light on mental processes. In the model it is clear that the convergent-divergent dimension is not a simple one, but does involve a variety of content levels, and types of materials. For instance Berlyne (1965:311) points out that all directed thinking is of both types. Most problems require divergent thought at the beginning and then convergent thinking to choose among the alternatives previously generated and to arrive at a specific solution. He quotes McKellar (1957) as likening the contrast to autistic versus directed thought, or the authorship-editorship contrast. Guilford would see a threefold set here, goal directed rigorous thinking, goald directed reflective or meditative thinking and autistic or wish-fulfilling thinking (1967:215). The computer simulations for problem solving use both approaches, first the context and conditions are scanned, then the repertorire of possible solutions is viewed in order to see if one or more might fit, these are then compared to see if they do produce a solution. Popular manuals to improve thinking also advise this two step process, first divergent thinking to provide a large number of possible alternatives, then convergent elaboration and selection to arrive at a final solution. The process is clarified by Reitman (1965:139) when he defines a

problem as a situation in which either the initial or the final conditions are not adequately specified, or the process of using the given information to arrive at a final condition is not clear. His examples of problems are "to build a self-propelled vehicle" or "to join two pipes." In these cases he notes that any particular way of analyzing the problem imposes constraints that eliminate certain alternative possibilities, in this way various analyses begin by diverging and each one is then refined, the constraints examined and a possible selection made by convergent processes.

Cross-Cultural Implications

Factorial analysis is clearly a tool of value in separating variables, for the most part the tests are not univocal, but involve a number of traits or processes. Another aspect is probably of even more importance for cross-cultural work, and this relates to the applicability of tests, and their interpretation in the context of another culture. Most of the problems presented in tests are highly culture specific, they require literacy, the interpretation of two dimensional photographs and drawings, the understanding of arithmetic problems, all activities common in the educational systems of the West, and even are constantly visible in the toys and mass media presentations that impinge on the senses of even the youngest children. These same materials and processes are notably absent for most of the people of the third world, and the question therefore arises with respect to their validity and utility as tests when transplanted across cultural boundries. The model may be valid, but certainly most of the testing procedures will not serve. For instance, the test of DP in which the

subject must generate plot titles for a movie, or the interpretation of a series of cartoons in order to designate the appropriate missing frame would be almost impossible to administer in many societies, and the implications drawn would be even more tenuous. It should be noted that in the work of Guilford and his associates, the SI model suggests dimensions to be tested, and then they write or search the literature for types of tests that might load on what they conceive to be the factor. This whole process is heuristic, not statistical, and underlines the critical importance of creative thoughtful organization and development of theoretical models, if statistical procedures are to be of any value.

The Global-Articulate Dimension

The dimension that has motivated the greatest amount of study regarding styles is the one variously called field dependence-independence, differentiation, or global-articulate, and has been studied extensively for nearly three decades by Witkin and his colleagues. The basic work describing this research is in *Psychological Differentiation: Studies of Development* by Witkin, Dyk, Faterson, Goodenough and Karp (1962). As the subtitle indicates the basic orientation of the work is along developmental lines. The thesis is that a person develops from an original undifferentiated cognitive state to a progressively more highly differentiated state. The neonate, according to the theory, does not clearly differentiate between objects or between the self and others. As he or she develops, their experiences progressively lead to greater differentiation between the self and the non-self, and

especially between the self and the mother with whom the child has such close association in the early months of life. As the children develop, they create more highly refined mental structures, ways of perceiving and responding that involve and characterize all of the individual's cognitive activities. As some persons develop more, and others less, some become highly differentiated, others less, and this appears in many ways, in the self concept, in the perception of the role of the mother and to a less extent of the father, a well or ill defined body concept, and a developed frame of reference for organizing life's experiences. Thus there is a continuum of possible degrees of differentiation on which an individual may appear. The level of differentiation is, in this sense, a measure of maturity (1962:Chpt. II).

Personality through Perception

Since it is assumed that all mental functions develop toward higher levels of differentiation and organization, it would be logical to expect that this level of functioning would be apparent and could be tested by studying any part of mental activity. If this is so, and perception is the most accessible aspect of mental activities, then the choice to study personality by means of information gained from an examination of perception is quite reasonable. An earlier work by Witkin and his associates in fact carried such a title: *Personality through Perception* (Witkin, Lewis, Hertzman, Machover, Meissner and Wapner 1954). Witkin's earlier work was concerned with the relationship between spatial and body orientation as related to visual perception for screening and training pilots under the Civil Aeronautics Administration. Later studies shifted more to developmental changes in

perception and to personality. The philosophical orientation appears to have been that of Gestalt and social psychology, especially the work of Heinz Werner and Kurt Lewin. Later there was also considerable influence from clinical psychology, which appears in the way perceptual cues are seen to relate to particular personality types, to suffer specific kinds of mental distortion according to the perceptual style, and to be strongly influenced in this by the child rearing practices of the family.

Differentiation Hypothesis

From the "differentiation hypothesis" that all cognitive activities develop from a less to a more differentiated state, it is evident that a number of tests or observations should correlate and bear this out. The developed person should be able to separate figure from ground or field. He should be more adept at organizing a relatively unorganized filed, or to reorganize one in terms of some non-dominant pattern. He should be able to analyze perceptual experience and to organize it on a more cohesive basis. The differentiated person should be less dependent on others, especially his mother, he should have a clear self concept. The label field dependence-independence comes from this ability to see oneself as separate from the mother, and also from the ability to separate figure from ground. As a perceptual category, the dimension is called global-articulate. The point at which a person stands on this dimension is designated his cognitive style.

Cognitive Style

The person's cognitive style is conceived in some sense as innate, but to a large degree modified by experience, either enhanced or retarded, as the person matures. Social interaction is considered to be the chief determinant, and this is largely the result of child rearing practices in the early years. Once this period is passed the style is stable, self consistent, and experiences little change from year to year. It consists of a mode of "cognitive functioning that is pervasive in all mental activity" (Witkin 1967:234) and can be termed global-articulate, field independence-dependence (FID) or undifferentiated-differentiated. The concepts of differentiation and integration are contrasted, in that it is possible for a person to have a highly differentiated cognitive structure, but not have it well integrated, and therefore not to have adequate defenses and controls, that is, not to be well adjusted. The level of differentiation is tested by perceptual measures, personality tests and direct observation or interviews.

Evidence

The differentiation hypothesis rests basically on three tests. A fourth, a variation of one of the others, was discarded after finding that it did not correlate well with the other three, even though it had face validity. The first of these tests is called the Rod and Frame Test (RFT). A luminous square and a luminous rod that can be rotated independently on the same axis are presented to the subject in a dark room. The S at times is sitting in an upright chair, at other times the chair is tilted. The problem is for the S to align the rod

with the true vertical when the frame is tilted. The second test has two variations, both have the S sitting in a chair that can be tilted within a room that can also be tilted. For one test called the Room Adjustment Test (RAT) the S adjusts the walls of the room to a true vertical while either upright or tilted himself. In the other version, the Body Adjustment Test (BAT) the S is to align himself with the vertical while the room is tilted. In all of these tests there are conflicting cues, the field dependent person is more influenced by the visual field in which he operates and so aligns the rod, body, or room, not to the true vertical as sensed through proprioceptive cues, but with respect to the visual cues of the surrounding field. The third test is the Embedded Figures Test (EFT) which is a modification of the Gottschaldt Hidden Figures. These figures are of the type shown in Figure 2, and the S must find the simple figure in each of the series of complex figures. The set is timed, five minutes for 24 figures. The more differentiated person should take less time to complete the series. The figures as used by Witkin were modified by making the embedding context more difficult by coloring them.

Intercorrelations

The intercorrelations of these tests reported by Witkin include testing by others as well. Of 42 coeficients for adults, 22 were not significant at the $p = 0.05$ level, for children ages 10 to 17, 15 of 33 coeficients were not significant. Most of the non-significant coeficients were between the RAT and the other tests, and therefore this test was discarded from the battery as a poor measure of FID. Among the other coeficients for adults 12 of 16 were significant.

The tests separated along sex lines, six were significant for men but not for women, and one was significant for women and not for men. This contrasts with the findings of Gardner *et al.* (1959) who found that the tests of FID correlated significantly for women, but not for men. That study also found that the RFT and EFT did not correlate, but in fact loaded differentially on different factors. From the scores on the three principal tests, the RFT, EFT and BAT, a weighted average was calculated and labeled the perceptual index. Three other indices were also calculated. An intellectual index was made using the average of scores on the Wechsler Intelligence Scale for Children (WISC) subtests of Block Design, Picture Completion and Object Assembly. A verbal index was used that consisted of the average of the scores on the WISC subtests of Information, Comprehension and Vocabulary. The cognitive index was a relatively high correlation between the perceptual and intellectual indices ($r = 9.66$), but low between the perceptual and verbal indices ($r = 0.26$). The cognitive index of course correlates with both the perceptual and intellectual indices since it is the average of these.

FID Tests Compared with Other Tests

The tests that form the standards were compared with a long series of other tests with quite varied results. It was expected that the EFT would correlate with Holtzman's Form Recognition Test (FRT), a modification of Thurstone's Hidden Figures where incomplete line drawings of familiar forms, for instance, faces or animals are hidden in a picutre. The EFT was considered to be an embedding context, while the Form Recognition Test was seen as a distracting

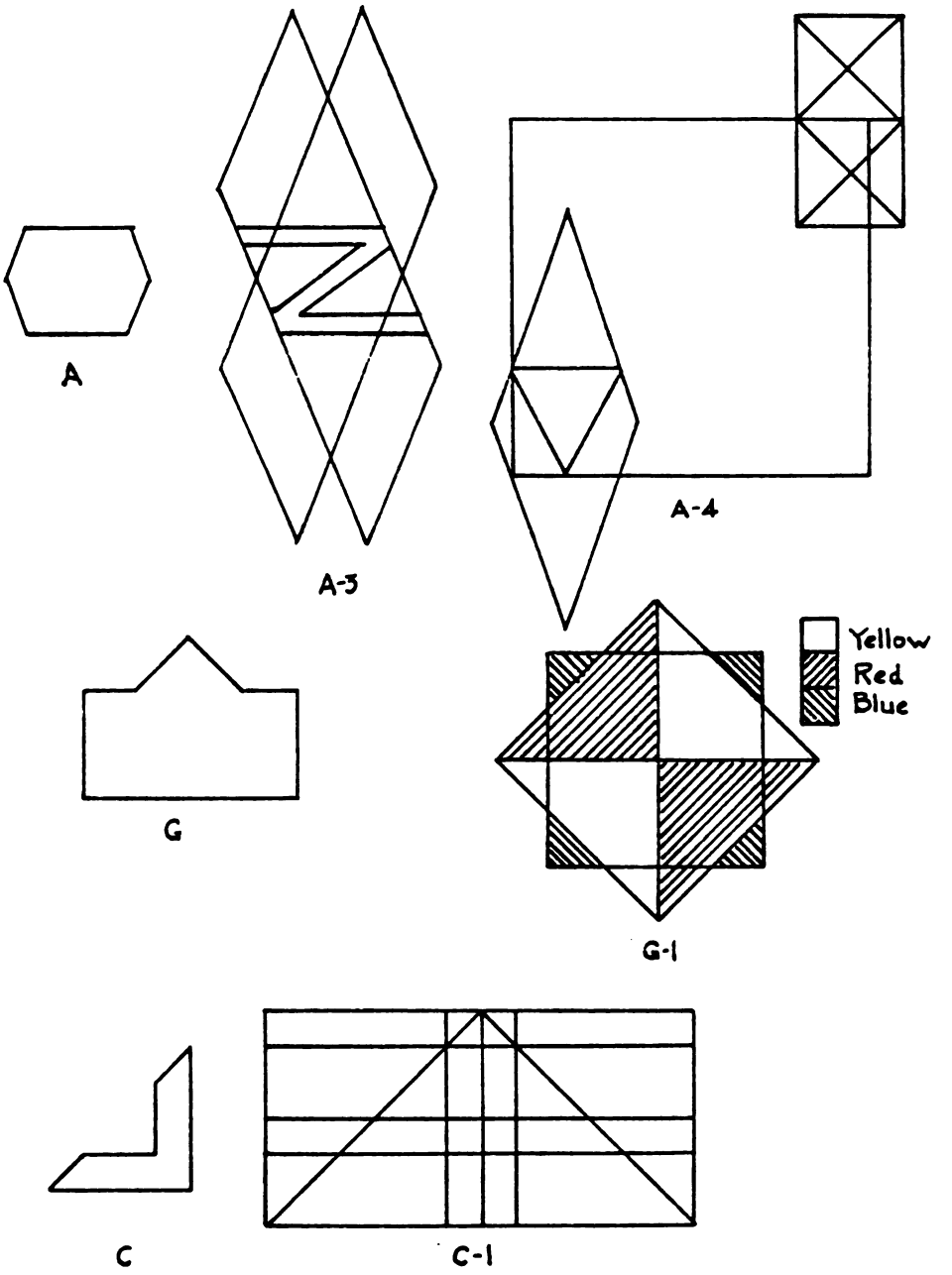


Figure 2

EMBEDDED FIGURES TEST

context, the two correlated at r = 0.54 for the achromatic FRT and at r = 0.46 for the chromatic version. A test reported by Jackson (1955) that correlated with the EFT involved word recognition against a background of noise with values of r = 0.46, p = 0.05, for men, but not significant for women. On the other hand Karp administered a series of tests including the EFT, BAT and RFT and also tests with distracting contexts to 150 men and found no significant relationship. The results were factor analyzed, and the two sets loaded on different factors. Another study however, showed that the achromatic EFT loaded on the FID factor, and the chromatic version on the distracting factor. Thurstone's study using his modification of Gottschaldt's Hidden Figures revealed a factor that he designated flexibility of closure, or the ability to shake off set in order to take another set. The EFT is a slight modification of the Thurstone form of the Gottschaldt test, and they correlated at r = 0.46. Higher correlations between these tests have been obtained by others. It is strange that the correlations should not be near 1.0 since the only difference is that fewer figures are used in the EFT and they are colored. Other studies have found significant relations between the Thurstone Gottschaldt and the RFT and BAT, though generally much less than with the EFT. The FID measures have also been studied with respect to other measures of Thurstone's flexibility of closure, the Hidden Figures Test (HFT), and the Two Handed Coordination Test. The HFT is similar to the Holtzman Form Recognition Test, and did not correlate significantly with the perceptual index, though in a factor analysis it did show the principal variance on the FID measures. Two types of Two Hand

Coordination Tests were made, one is a tapping test used by Thurstone where the subject taps in a different sequence on two circular places at the same time, this test correlated significantly with the EFT. The School of Aviation Medicine Two Hand Coordination Test requires the subject to turn control knobs to track a target, but the controls act in an unexpected way, requiring the reorientation of normal coordination patterns. One test of this with the perceptual index was significant for men, less for women, while a replication was not significant. Gardner, Jackson and Messick (1960) studied the relationship between cognitive controls and the FID tests and according to Witkin confirm that field articulation and flexibility of closure load on the same factor, lending strong support to the differentiation hypothesis. However, Gardner *et al.* conclude that the factor cannot be field dependence or articulation in the sense that Witkin interprets it, but is related to the ability to selectively attend to cues that are in the field, not in the figure. This discrepancy will be examined in more detail later. Podell and Phillips (1959) also tested the EFT, Thurstone's Gottschaldt, and Two Hand Coordination and found them all to load on a factor he calls "spatial decontextualization." These all seem to be different names for the same factor.

Unclear Terminology

The discussion of FID and perceptual constancy (Witkin *et al.* 1962:52) is difficult to follow and seems to be contradictory. The field independent person is said to be "stimulus directed" and does not perceive objects as constant when illumination, perspective and distance vary, that is the person interprets according to the actual

image that falls on the retina. On the other hand the dependent persons sees things according to their "stable characteristics," which presumably means the way the object looks under more standard conditions, i. e., a square seen at an angle actually presents a diamond shape to the observer, so the field dependent person interprets it as a square for he is controlled by the context. The independent person interprets it "independently of the context in which it occurs." Does this mean that the articulated person sees the square as a diamond, unaffected by the context? The dependent person is said to perceive the item and interpret it as embedded in its context, that is in a "relatively global" manner. What precisely does it mean to perceive in context? It does not seem possible to assign clear meaning to the terms "stimulus directed," "context," or "global." A number of studies are cited relating to this constancy of perception, but the evidence is conflicting, possibly due to the lack or clarity of the terminology. A study by Pérez (1955) cited by Witkin concludes that the analytic person is more able to shift, that is adopt an analytic attitude than the field dependent person when estimating image size. Witkin concludes that the analytic person is more able to operate at a higher level of differentiation than the dependent person, but does not necessarily do so. If this is the case, is a person's cognitive style the typical way of perceiving constant and pervasive in all cognitive activities?

FID and Speed of Closure

The factor identified by Thurstone as "speed of closure" has correlated with the Gottschaldt HFT in some studies but not in others.

The Street Gestalt Completion Test, based on the identification of impoverished figures, is used to measure the speed of closure. According to Witkin, Crutchfield, Woodworth and Albrecht (1958) the RFT was not related to the Street Gestalt Test, while Goodman (1960) found a significant relation using a modified Street Gestalt Test, with more time to answer. Witkin dismisses this study by saying that the time difference involves different processes, and therefore measures something else, thus he considers the FID and speed of closure to be different. The argument might be conceded since the average allowed time for each identification is three seconds for the Street Gestalt, while the version Goodman used allowed 30 seconds per figure. On the other hand the EFT is also a timed test which allows 12 seconds per figure, so the EFT might be expected to relate to speed of closure on this aspect, the EFT being intermediate between the two speed of closure tests.

FID and Intelligence Tests

Another major area of mental function examined is that of intellectual activities in relation to the FID studies. From theoretical grounds and earlier testing, it was expected that there would be a relation to general intelligence with respect to the ability to break up or analyze a field into parts. Using the 1937 Revised Stanford Binet, IQ did correlate significantly with the perceptual index for both boys and girls of 10 years. To examine the matter in more detail the WISC tests were administered to two groups of children ages 10 and 12, one group had been previously tested on the FID battery. Again significant correlations were found between IQ and the perceptual index for boys,

but it was not significant for girls. The perceptual scores seemed to correlate more than the verbal subtest scores, so the results were factor analyzed. A special form of the EFT was made and used with the children, along with other tests, Thurstone's Goktschaldt, a Recognition Efficiency Test, a Color-Word incidental learning test in two forms, a Reconciliation of Opposites test and a Letter Cancelation test along with the BAT, RAT, and RFT. Three factors appeared, one identified as verbal comprehension (I), a second called attention-concentration (II), and a third of analytical field approach (III). The three factors as shown by the intercorrelations are clearly different, though with some overlap between I and II, and again between II and III. The only case of common variance between I and III was on the picutre completion test for 12 year olds. Since the field articulation tests load on spatial abilities, and the picture completion is a test of recognition of missing elements of a meaningful picture, it might be expected to involve the ability to interpret pictorial displays. The loading of this test on the verbal factor for 10 year olds was only $r = -0.17$, and the test results were quite variable on this two year age span, and so possibly not reliable. Factors I and II share variance on Block Design, Comprehension, Digit Span and Intentional learning subtests, factors II and III share on Block Design, and the Childrens Embedded Figures Test (CEFT). The loadings of 0.25 or more are given by Witkin, some of them are quite variable, for instance the digit span for children of 10 years is 0.25, but for those of 12 years it is -0.06, and the WISC Mazes load -0.10 for the 10 year group, and 0.57 for the 12 year group. Such variation would seem to mark the tests as either not

testing reliably, or the samples are very different. When the three factors are correlated, I and II, and I and III have intercorrelations of between 0.25 and 0.36, while II and III have values of 0.17 and -0.11. The verbal factor does share variance with the FID factor. The three WISC tests that load highest on the verbal factor are selected and used to calculate the verbal index, the three highest on the analytical factor give the intellectual index, and the three highest on the attention-concentration factor are averaged to give the attention-concentration index. These were then correlated with the perceptual index and only the intellectual index was found to be significant, so it was concluded that the variance of the correlation between the WISC IQ and the FID tests was concentrated in the Picture Completion, Block Design and Object Assembly subtests, pointing to a contrast between verbal abilities and analytical abilities. Is this result inherent in the data or an artefact of having chosen to compare only those tests that do not load on more than one factor? As Selvin (1957) points out, the chances of obtaining the desired results are very high with this selection method. The point is important since the intercorrelations of the factors show a relationship. The loss of information may be important for another reason. The Arithmetic subtest loads strongly on both I verbal, and II, attention, the question should be raised as to why? There must be something in common between the two, and by finding it, a better understanding of what was not common would be possible.

FID and Guilford's Adaptive Flexibility

As was previously mentioned the FID tests are similar to a factor that Guilford has called "adaptive flexibility." Witkin and his colleagues gave a series of tests to college students in order to study the relationship between the FID tests and Guilford's factor. The standard battery of FID tests was along with the Block Design, Picture Completion, Vocabulary and Comprehension subtests of the Wechsler Adult Intelligence Scale (WAIS), and two of Guilford's tests, Insight and Match Problems. The intercorrelations show a high degree of commonality except for the Vocabulary test. A close examination of the matrix of intercorrelations reveals that the three tests used by Witkin for the FID battery correlate very highly (0.74 to 0.86), but that the Block Design, Insight and Picutre Completion also correlate with the EFT from 0.72 to 0.80, and all of these involve spatial perception, pattern recognition, shift of attention from the dominant features to cues in the context, and none involve the kinesthetic cues required of the RFT and BAT. The correlations with the BAT are in the 0.49 to 0.53 area, the RFT in the 0.65 to 0.67 area. Thus one could conclude that there is something shared between the EFT, Block Design and Insight Problems that does not appear on the RFT or BAT, the most obvious difference is that of kinesthetic perception. The common feature among the others seems to be spatial perception, and the ability to shift set. One ability that could be important to all of these is the ability to focus attention on non-dominant features at will, disregarding the obviously dominant. Apparently several factors are at work here.

FID and Set

In the examination of the ability to overcome set, Witkin *et al.* examine the literature concerning it, and find that the evidence is quite variable. The Einstellung test for breaking set is the Luchins Water Jar test, where the S can use a single set of operations to solve the problem, and then on a test problem can either use it or another shorter solution, this is called the critical problem. A further problem is then presented that can not be solved with the set formula, but only by the shorter method, called the extinction problem. The ability to break set was seen as the ability to solve the critical problem by the shorter method, or as a function of the time required to solve the extinction problem, that requires breaking the set. While some of the tests have demonstrated a relation between this test and the EFT, Guilford's factor analysis loads it on two verbal factors like many of the mathematical problems. On the other hand, there seems to be some relationship between the time to solve the extinction problem and the EFT. Witkin attributes this to the ability to overcome an established mode of organizing elements in order to organize them in a new way, a matter of overcoming embeddedness. This would seem to be largely a problem of sematics.

FID and Projective Tests

The cognitive demands presented by projective tests would seem to relate to the ability to overcome an embedding context in the sense of being able to impose structure on a relatively unstructured display. The Rorschach and TAT tests were administered to the same groups tested with the WISC battery and correlations were found between the

projective tests and the perceptual and cognitive indices, but not with the intellectual index. A modified Rorschach test, Hertzman's "W sign" test, interprets the type of results on the basis of how much of the inkblot was utilized in the response, and so measured the ability to impose structure on a relatively unstructured field. This test and replications by others was correlated with the perceptual index scores. Rorschach clusters however, were not found to be significantly correlated. The TAT requires the S to organize a story around a picture. The TAT scores did not correlate with the perceptual index scores, so it was concluded that the ability to overcome a verbal context is different from that required to overcome a figural context. The TAT scores did correlate with the verbal index scores. Other tests to measure the ability to impose structure on poorly organized fields were carried out with out-of-focus tachistoscope presentations of pictures. It was expected that the field independent individuals would be able to organize the blurred pictures better and so identify them. This did not prove to be the case.

FID and Cognitive Clarity

In order to examine the issue of field independence-dependence in everyday activities, a concept called "cognitive clarity" was evolved, defined as reflecting "the extent to which information and impressions are discrete, structured and assimilated or blurred, confused and unassimilated" (Witkin *et al.* 1962). Thus an independent person should experience the world in a relatively clear and organized way, while the dependent individual would have a more blurred and poorly structured perception of experience and events. Structured interviews were used

to evaluate experience in terms of 1) means-ends relationships, 2) space-time, 3) self-others, 4) efforts made to fill out deficient information, 5) expression and relevance of response and 6) the ability to abstract and generalize. These interviews were taped, rated, and then correlated with the indices mentioned earlier. There was a relatively high correlation with the perceptual, intellectual and cognitive indices, though the authors state that no inter-rater reliabilities were calculated. One aspect of the study, that of self-awareness, is similar to another study made by Bieri, Bradburn and Galinsky (1958) which rated subjects with respect to their description of others. If the description involving superficial external attributes or more internal characteristics was correlated with the EFT, dependent persons tended to describe others on the basis of externals. It is interesting that this was significant for women, but not for men. Sex differences in dependence correlations usually tend to be greater for men than women. This work was replicated with one of Witkin's groups of students, and was significantly related with the perceptual index scores.

FID and Body Concept

A further aspect of Witkin's study related to the previous paragraph has to do with the body concept. Subjects' drawings of people were rated on scales of clarity, details and sophistication. Again the correlations with the perceptual, intellectual and cognitive indices were significant. A number of independent experiments have been made by others, and show relationships between explicitness of body concept and the FID dimension. Inter-rater correlations were

calculated on a number of these and found to be quite high, giving confidence in the reliability of the correlations. The body concept has also been investigated by other means, the Finger Apposition Test (Epstein 1957), and one studying the discrimination of writing letters on parts of the body with a blunt instrument (Silverman, Cohen, Shmavonian and Greenberg 1961), and found to correlate with the BAT and RFT.

Self-Concept

There is a larger issue that involves the way the body is experienced, relating to the self concept as a totality. The identify of the self was studied in relation to the FID dimension by means of several experiments. The first was a "task-attitude" test with respect to the TAT. It was hypothesized that children who were more field dependent would be more likely to request greater clarification from the test administrator than subjects who were more independent. The dependent person might also be more self deprecating in the face of difficulties, would be more anxious and tense during the test, and the stories created would not show much evidence of an "I". The ratings had good interjudge reliability and correlated well with the three indices. It was also expected that global children would persist more in monotonous tasks if demanded by an authority figure, but this did not prove to be significantly related to the indices. An incidental learning test using presentations of colored words, where attention was drawn either to the color or the word, was to see if the other aspect was learned also. The correlations with the perceptual and cognitive indices were low, though significant, while

the relation with the intellectual index was not. A number of studies are reported with respect to the expression of dependent or independent attitudes on the part of individuals. The studies use a variety of techniques, from rating patients by psychologists to formal testing situations. Generally the tests indicate a relationship between the global person and dependent attitudes in contrast to the articulated person who was more independent and authoritarian. These measures are related to other tests having to do with attentiveness to others in contrast to the more cold impersonal attitude of the independent individual. For instance, the global person remembered faces better than the independent. The question has been raised as to why this should be so, and why the more articulated person would not be more precise in his identification, and therefore more accurate in remembering faces. The answer was given that the global person describes people more by external constructs and therefore identifies them better.

Group Pressures

A number of studies were made to judge the influence of group pressures on people. Tests of peer opinion opposing the subjects with respect to perceptual tasks, authoritarian pressure, attitude change, reports of influence and syllogistic reasoning opposed to one's social attitudes, all correlated with the global-articulated measures. A few of the tests using illusions or reversible figures with pressure group influence were not significant. Field dependent individuals were also found to be more suggestible with respect to interpreting Rorschach inkblots, identifying odors from labeled bottles of water,

and on Binet's progressive weights. A number of alternative interpretations of these findings are presented that show that the problem of testing field dependence is more complex than some tests seem to imply. For instance, observing an independent person in certain situations might lead to judge him dependent due to the fact that he gave in to pressures, while in fact he still maintained his position and opinion, but judged that in that specific case it was not worth the conflict, thus he is more selective in how he makes decisions. These types of responses might well confound the test results since the processes by which people arrive at decisions in complex contexts may be quite varied according to the perceived possibilities and pressures of the moment, causing apparent wide variations around a norm that represents the individual's more typical way of responding.

Controls and Defenses

The psychological mechanisms that produce control of responses and defense mechanisms used to counter anxiety were also studied in relation to the FID dimension. This was done primarily by a reevaluation of the projective tests by a clinical psychologist, who evaluated the responses on a five point scale. The idea behind this was that the more articulated or field independent person would have more highly structured controls and defenses. The more dependent or global individual would be less developed, have more fluid, easily penetrated defenses, and would tend to use repression or avoidance to escape conflict. This contrasts with the mode of anxiety reduction for the independent person, who tends to intellectualize their defenses. The

results correlated with the perceptual index and were supported by reports of analogous studies of other psychologists. A more specific reanalysis of one TAT card representing overt aggression was rated and correlated with the three indices. The results were significant when related to the perceptual index, but not when related to the intellectual or cognitive indices, though the tendency was in the hypothesized direction. Studies of the frequency with which subjects could recall dreams were expected to be related to the global-articulated dimension, in the sense that the more articulated tend to remember more dreams, and the global would tend to repress their dreams. The expectation was realized with a group of youths who volunteered to keep a diary of their dreams for a two week period.

Miscellaneous Tests

A number of subsidiary aspects were studied; activity, verbal skills, pathology and sex differences. Regarding activity, the earlier expectation that the differentiated person would be more active, i.e. would actively structure a field, did not prove out. Activity was found to be much more complex and not really related to the indices. For instance, measures of assertiveness and counteraction in early studies were correlated, but did not hold up under cross-validation. The attitude expressed by the posture of the subject in non-posed photographs did correlate but the evidence for a clear relationship was not evident. Verbal ability on the WISC subtests did not correlate with the perceptual index as noted earlier. Ratings of verbal expressiveness during interviews did not correlate either, though it was expected that it would. This might be due to the

extremely broad and inclusive definition of verbal expressiveness that was used in the rating procedure. On the whole the field dependent subjects tended to do better on the verbal parts of the WISC than the independent ones. A number of other tests and observations bear out the conclusion that verbal fluency, expressiveness and the ability to extract from a verbal context are all of a different sort than the global-articulate dimension. With respect to pathology, the FID dimension seems to cut across the whole spectrum of states, not correlating with any particular type. Among the cases of hospitalized persons tested, both differentiated and undifferentiated persons were found in all classes of illness. The only conclusion from a number of these studies is that in the extreme cases the dependence or independence in pathological cases, there is more of a tendency for the dependent individual to manifest problems of self-identity and self-awareness, whereas those who are paranoid tend to have a highly articulated perception of reality. Alcoholics and ulcer patients tended to be more dependent, though some of these patients were also at the other end of the spectrum. Regarding sex differences the evidence reported from many studies "demonstrated sex differences down to the 8 year level (1962:221)." These studies include subjects from the U. S. A., England, France, Italy, Hong Kong and Holland. The differences were found to correlate with the masculinity-femininity scales within the sex group as well as across sex. The differences between the means however, was small compared to the range of differences within each sex. All of these last topics are much less definitive than the earlier sections with respect to the evidence to

substantiate them, nevertheless, they are used in defining and discussing the implications of the differentiation hypothesis.

Parent-Child Relations

The last half of the Witkin study is dedicated to the issue of the relation between the child and his parents, especially the mother, and the effect of this on the development of a dependent or independent orientation. Interview material is used to understand the origin of the differences encountered among individuals. Basically this is attributed to the way the child develops in his relationships to others, primarily the mother, and secondarily the father and siblings. The influence is considered as an interaction between the genetic characteristics and the type of relationships that characterize the early years of life. The type of relation examined is, for example, whether there is a free or coercive attitude, whether there was an adequate male model for boys to follow and the variety of experiences, hobbies, activities, etc. available in the home. As expected, children who were more differentiated had mothers who were also more differentiated.

Mother's Interviews

The type of interaction between mother and child was investigated in considerable detail by interviews with the mother and the child, taking into account not only the answers to overt questions, but also the social relations with the interviewer that developed during the contact. The freedom or constrictedness of responses, the confidence or uneasiness of discussion regarding family relationships, revealed much with respect to understanding the type of influences to which the

child was habitually subjected. The material from the interviews with the mothers was rated impressionistically as a whole for each one, no effort was made to make a detailed and weighted scale of values for different aspects. The ratings were correlated with the development of body concept scores and sophistication of body concept scores, but were not significantly related to the EFT scores. The mother's figure drawings correlated with the children's perceptual and cognitive indices, but not significantly with the children's intellectual index. The mother's EFT did not correlate significantly with any of the indices of the children, though the tendency was in the right direction.

Children's Views of Parents

The children's view of their parents was interpreted from their TAT stories. Many of these stories involved an imagined interaction between the parent and child. The stories were rated on a scale of four levels of a supportive and four levels of a non-supportive attitude communicated by the stories. The correlations varied so that the interpretation of the data is difficult. With three groups the scores of the TAT stories of the maternal role correlated significantly with the perceptual index, while the paternal role correlation was not significant. With one older group of boys the perceptual index correlated with the father's role, but not with the mother's, and the other indices did not correlate significantly. On the other hand there was a high relationship between the children's views of their parents and the parent's views for their children. Ratings for the

interviews with the children did not correlate significantly with their perceptual index scores.

Long Term Stability

The final issue with which Witkin deals has to do with the long term stability of the differentiation dimension. Studies were conducted with two groups, with tests at three or four year intervals, in order to see whether the individual would change, basically it was found that there was a general development from a less to a more differentiated level of perception, with no radical reversals. The groups were followed from 8 to 13 years for one, and from 10 to 17 for the other. The coeficients of stability calculated tended to be less for males than for females, though it is a bit difficult to evaluate the meaning of the coefficients as there is no explanation regarding how they were calculated. Other tests of adolescents and young adults give basically the same results. Also, dividing the sample between those who had had some major psychological stress during the period, or a change in status as becoming married and those why had had no notable change showed no significant difference between the groups. Other studies with people who underwent some special treatment, drug therapy, convulsive treatments or tranquilizers showed no significant change from their pre to post treatment states. Work done by Gardner *et al.* (1960) tends to confirm these results. The conclusion is that a person who is global or analytic tends toward a more analytical approach as he matures until about 17 years of age, and then tends to regress slightly, and that for any one person this does not change his relative position with respect to the whole

group. Some tests were cited where there was an effort to change the performance on the tests through training. In these cases it is reported that a change did occur on the specific test for which the training occurred, but that there was no transfer to other tests. For instance, those who were trained on the RAT or BAT did not show improvement on the RFT. A study by Gruen (1955) of professional dancers who use and are sensitive to body cues did better on the BAT, but not significantly better on the RFT and the EFT than a control group of college students. Another study with a matched control group produced no significant differences when compared with Gruen's data. Thus, it was concluded that there is no change in the analytic field approach of individuals through training, nor performance of tasks that require specific aptitude in proprioceptive perception.

Summary of Issues Raised

From what has been seen in the discussion of Witkin's work, there are a number of issues that come to the fore. From the definition that Witkin gives of cognitive style, "characteristic self-consistent modes of functioning found pervasively throughout an individual's cognitive activities (perceptual and intellectual)," the question arises when related to the data as to how pervasive the style is. From the Perez study it is apparent that some people can shift their mode of functioning from analytic to global at will, in accord with the instructions given during the testing period. Also, it has been shown that there may be differences in the way a person is able to structure a visual field in contrast to the ability to structure a verbal field. Also, it has been seen that there may be a variation in

response according to the situation in which the testing occurs, if there is pressure the subject may respond in another way in order to avoid issues that are considered of little value, also as a person becomes older, he becomes increasingly more analytic until about the age of 17, and then regresses somewhat. From these considerations the question must be raised as to how pervasive the cognitive style is, for it changes with time, according to the pressures in a given situation, and does not remain the same when shifting from the visual to the semantic fields. This means that the style as defined must be more limited in its scope and range than originally conceived. It seems that the experimenters have made no systematic attempt to sample the different domains of cognitive and intellectual processes in order to see whether the style was in fact consistent over all these areas of functioning.

Multiple Factor Loading. From another series of observations it is clear that the style measured by the FID tests is not a simple factor, but complex. The measures clearly contrast with verbal abilities, while they relate to mathematical abilities, general reasoning, in fact to all of the WAIS series except verbal. It has been seen that the ability to attend is highly related to the FID measures, and the ability to direct attention to specific material, either in the figure or the field, and this is critical for all the FID tests, as well as most other testing procedures. Not only is it important to fix the attention on a specific detail, but the ability to shift attention from one feature to another correlates with the FID measures. This ability corresponds to that designated flexibility

or adaptive flexibility by Guilford, and flexibility of closure by Thurstone.

What does FID Measure? Another area that needs to be clarified relates to which abilities are measured, with particular reference to spatial and kinesthetic abilities. Both of these abilities seem to be a part of the FID tests, as well as the ability to relate cross-modal perceptions in the case of the BAT and RFT. The EFT is closely related to the ability to perceive geometric figures, and to remember them while looking for the same figure in a complex presentation. In the RFT and BAT there are relations between geometric figures and the kinesthetic sense of body position. How do these relate to the matter of attention and flexibility? Is the concept of global-analytical style related to the intersection of the factors loaded by these tests, or the union of all of the loadings of the various tests?

Terminological Confusion. One of the curious outcomes of the testing procedures used by Witkin was that the global person was better able to recognize person's faces than the analytic person. This corresponds with the global person being better able to relate socially than the independent-analytic person. The explanation of the ability to identify faces better, which of course goes against the FID hypothesis that the global person does not have clear and detailed perception, was that the global person was only perceiving "superficial" characteristics. The implication is that the analytic person was able to perceive something more profound, more basic. What this could be when comparing photographs is a bit difficult to imagine, since the visual image is only skin deep. It does however raise the question as

to whether the FID tests are in fact measuring the effect of socialization in the sense of making people more able to differentiate fine detail as against some more vague and overall impression for the undifferentiated person, or is it a matter of the person being able to discriminate detail in certain kinds of displays, e. g., geometric rather than naturalistic displays. It may by the issue that the type that is the most important for the person is the one he learns to identify best.

Socialization. A related issue is that of socialization. The differentiation hypothesis affirms that the way families, and particularly mothers, relate to their children determines how the children will progress, becoming more or less differentiated and articulated in their perception. This issue is related to the closeness of the child to, and dependence upon the parents. When the issue was studied, the results were not significant, and some puzzling things appeared. For instance, the subjects were divided into three groups, dependent, middle, and independent. Both the dependent and the middle groups were highly influenced by individuals, and both had high regard for their parents. The independent group did not have as close a relation with their parents, and were also influenced by a greater variety of people, that is, their primary reference group was much larger, and less restricted. While it is clear that the influence of the primary reference group has much to do with the development of a person's self perception, as well as the way he or she relates to others in later life, the situation is not as simple as it would appear from the FID hypothesis. The question persists, is the reason so many non-significant results are obtained due to the relatively general

nature of the tests and the theoretical foundations which allow tests to relate in a general way and to correlate at a low level with many other measures? It is clear that the more general an hypothesis is, the more it covers, but with less specificity. Therefore, the theory has much less utility unless the relations stated are clearly defined by lower level statements that are sufficiently specific to allow the theory to be related to concrete cases.

Related Studies of Cognitive Style

Other psychologists have published studies relating to the FID dimension. Three major studies will now be considered, as well as a number of less extensive ones. The first to be considered was by Gardner and associates (1960) and offers an extensive critique of the dimension. This study was mentioned previously. The conclusion reached was that the FID tests measure principally the ability to direct attention selectively. Another study by Kagan, Moss and Sigel (1963) finds that the dimension is not a single continuum, but has three types called styles or classes of conceptualization. These are analytic-descriptive, relational and inferential-categorical. The analytic-descriptive is similar to Witkin's analytic, and the relational is in some ways similar to global, but the inferential category is different, and the tests used to expose this dimension are different. The third study is in a sense cross-cultural in that it relates to the large inner city subcultures. It is by Rosalie Cohen (1969) and uses the Sigel test and the categories tests of Kagan, Moss and Sigel as well as relating the work to Witkin's studies.

Cognitive Control Study

Cognitive Controls. This study is part of a continuing series considered earlier by Gardner *et al.* (1959), and relates cognitive controls specifically to the FID dimension. The authors observe that tests show an overlap between field articulation, flexibility of closure, spatial relations and orientation, the focus of the study is to examine in more detail these dimensions. Most of the ability factors are "little more than labels referring to the apparent contents of paper and pencil tests" (1960:10). They also are susceptible to notable variation for short periods under intense need, anxiety and preoccupation. This means that there may be considerable differences for any individual according to his emotional state at a given moment. Since the testing programs strive for uniform conditions, this could be the reason some investigators conclude that there is long term stability and consistency of styles, they simply exclude much variation from the test situation.

FID as Selective Attention. The authors consider the field articulation dimension in terms of several schools of psychology. They agree basically with Thurstone and his followers in factor studies and reject Spearman's g or general intelligence factor. The FID dimension is related to Thurstone's primary abilities as flexibility of closure. In an examination of the studies relating to the FID dimension they conclude that field articulation is not an issue of dependence on an external field, and that it is not limited to individual differences in the ability to extract items from an embedding context. It is more the ability to inhibit irrelevant

items and to respond to relevant ones, even though they are not dominant features of the stimulus. It makes no difference if the field is organized or unorganized, or whether the items to be attended are in the dominant stimulus or in the ground. The dimension therefore is considered to be an issue of selective attention, to be able to inhibit irrelevant material, be it from memory or from immediate perception. The FID dimension is similar to Guilford's adaptive flexibility and to Cattell's critical practicality (U. I. 19). In Cattell's analysis it relates to his second order dependent sociability vs. self sufficiency, which includes U. I. 19 and relates to self perception and interpersonal attitudes, similar to Witkin's findings.

Psychoanalytical Interpretation. With respect to psychoanalytic theory, from which the authors gain their basic orientation, this dimension is interpreted as related to cathexis, the concentration of desire on some object. The FID dimension is one that develops toward maturity, and has to do with the ability to direct psychological energy selectively. The authors say that the theory provides no specific mechanism for differentiation and can easily integrate the findings. With respect to Piaget's analysis, the FID dimension is related to the ability to decenter, that a person gradually attains as he moves from the preoperational stage to the concrete operational stage. With respect to Gestalt psychology, the dimension is related to the univocality and intensity with which a person can direct his attention. As an example the authors cite the way people tend to solve the EFT. Knowing what figure they are to find, they trace outlines with their eyes, recruiting energy from other parts of the

brain in order to focus it on the perceived object. The authors do not see the field articulation dimension related to the intensity of attention, but only to the ability to direct it.

Testing Program. The authors administered a series of tests to 63 women college students between the ages of 17 and 22. The tests for control principles were as follows: for field articulation the EFT and RFT; for constricted-flexible control, the Color-Word and Size Estimation tests; for leveling-sharpening, Schematizing; for equivalence range, Object Sorting and Size Constancy. Those used for intellectual abilities were the following: for flexibility of closure, Thurstone's Gottschaldt Concealed Figures and Designs; for spatial relations and orientation, Spatial Orientation and Cards; for verbal knowledge, Wide Range Vocabulary; for general reasoning, Mathematical Aptitude; for ideational fluency, Think Categories; for associative memory, Picture-Number and Word-Number; for induction, Letter Grouping and Marks; and for deduction, False Premises and Reasoning.

Test Results. Regarding the field articulation dimension and constricted-flexible control, the expected correlation did not materialize. Gardner and his colleagues did get a higher correlation between the EFT and RFT than Witkin did for women. Two other hypotheses however, were confirmed by the tests, that FID is related to tests for flexibility of closure, and spatial orientation. The coeficients for these were significant, several to the p 0.001 level. On the other hand, when the FID tests were correlated with the tests for verbal knowledge and reasoning, they were not significant though in the same direction. Only one correlation was significant at the

$p < 0.05$ level, and that was between the EFT and the wide range vocabulary. From these results it was concluded that there can be no general intelligence factor g, and that the cognitive processes related to general reasoning and ideational fluency are not significantly related to field articulation. However, FID is related to differences in ego organization, for when the situation demands attention, the articulate person can direct it. With respect to the relation between FID, leveling-sharpeing and associative memory abilities, a relation was expected to appear on these three dimensions. No significant correlations link the leveling-sharpening control with the associative memory abilities however. Slightly stronger correlations were found between the field articulation dimension and the associative memory scores. This is interpreted as meaning that the results on the associative tests are influenced to some degree by the FID abilities and so are determined by broader aspects of personality structure than had been assumed.

Reasoning and Fluency Tests. A concept is described as involving two qualities, characteristics that define it (content), and the domain of objects to which it refers (realm). This second one involves what the authors call inclusiveness, one of the attributes of the equivalence range control as found in previous studies. It was expected that the equivalence range would correlate with the abilities of inductive and deductive reasoning, associative memory and ideational fluency. These were not found to be significant. Inductive and deductive reasoning did correlate, but not significantly, though they did correlate with the reasoning test. Thus the picture

is a bit confused, these kinds of reasoning that are usually considered distinct did not show up in that way. In fact it appears that inductive reasoning involves more than one ability, while deductive reasoning may be unitary. The EFT correlated with the Letter Grouping for inductive reasoning, but the RFT did not. The correlations with the inductive tests were not significant though in the right direction. Therefore it was concluded that attention was required for these in order to separate relevant material from the context.

Factor Analyses. All of the tests were factor analyzed in two ways. First, the two sets of controls vs. abilities were contrasted, then all of the individual tests were factor analyzed. It was expected that a strong field articulation factor would appear as a result of the ego structures governing selective attention. The associative memory tests involve especially the intake of information and should also be influenced by attention. When the controls were factored against the ability tests three factors emerged, I. Field articulation, II, Leveling-sharpening, and III, not named, but one non-unitary factor that includes many abilities as well as relating to field articulation. From these it was observed that "The largest factor provides evidence of the generality of field articulation as a determinant of responses in a group of tasks that are superficially dissimilar but may be generically similar." The second analysis revealed six factors, the strongest being as before I. Field articulation, and II, Leveling-sharpening. Factors II and III include various tests and so were listed as second order factors. III may be a general reasoning factor as it loads on spatial relations,

induction and mathematical aptitude, but IV also includes mathematical aptitude, as well as vocabulary and associative memory tests. Factors V and VI were each limited to one test, V to Object Sorting, the test for equivalence range, and VI to the Thing Category Test, that represents ideational fluency. The only strong factors were field articulation that was related to flexibility of closure, spatial relations and orientation, associative memory, inductive reasoning and equivalence range and associative memory. It was concluded from these findings that controls and abilities are not separate but related aspects of psychological functioning.

Interpretations. One aspect that puzzled the authors in their discussion of the theoretical implications was that aside from most of the tests loading on the FID dimension, there was not the expected consistency. When two tests that earlier studies marked for the same factor were used, they frequently did not share variance in this study. One reason given to explain the situation is that all of the subjects were women, and they do not generally appear to differ on the FID measures as men do. Also the tests may not be sensitive to the abilities they purport to represent. All of this implies the need for rethinking the rationale for ability testing and the need to construct more sensitive tests. The FID may be linked to a number of special aspects that represent together the ability as exhibited on a test. They conclude that the usual definition of field articulation as the ability to extract items from context is too limited, for it is involved in so many tasks, and also say that it is concerned with ignoring irrelevant but dominant stimuli in order to attend to

relevant cues. This selectiveness is involved in memory as well as perception, so it is a broader aspect of functioning. From the low factor loadings between many variables, showing they are independent, the authors infer that cognition is multidimensional and complex. Labels like spatial are partial and descriptive of tests, and do not seem to be relevant to psychological functioning or processes and therefore are misleading.

Conclusions. A number of important conclusions result from this study. The authors critique of the tests and the low levels of significance that generally result imply that the theoretical base that provides the rationale for testing is not adequate. The theory on which the tests are based tends to be too coarse, the categories too broad, and this leads to ambiguity both in testing and in the interpretation of the results. By refining the categories and their inter-relationships it should be possible to project testing procedures that are more precise, and that are capable of loading higher on the factors they are built to define.

In line with this problem the authors critize the definition of field articulation as it is traditionally given by Witkin. They conclude from the numerous other abilities for which it is a factor, that field dependence and articulation is too restrictive. Therefore, they define the field articulation dimension in terms of selective attention, which of course would apply to almost any perceptual ability and to many memory and reasoning abilities. This seems to be a legitimate redefinition, for the matter of the FID tests do not really involve so much independence from a field, as the ability to

separate relevant from irrelevant elements, whether these be perceptually dominant or secondary, in the figure or field. The question is not raised with respect to what makes any given stimulus relevant or irrelevant. In some cases as with the EFT there should be no question, for it is defined in the simple figure. When this is presented with a tachistoscope as Gardner and his associates do, the ability to retain the figure would be important. For the RFT and BAT and some other tests the relevant stimulus is not clearly defined, and a confounding variable may well be the lack of understanding of what is involved in the test. This issue appeared when subjects were given instructions in the BAT and consequently improved their performance. The ability was not transferred however, when given the RFT, a fact that needs an explanation in this case. It seems clear however, that if selective attention is the better definition it may explain some of the puzzling results, for instance, the correlation between the Wide Range Vocabulary and the EFT. If knowing what is relevant in problems allows a person to better attend and select the relevant from the irrelevant, it may be that wide range vocabulary exhibits the results of more experience reading and other skills related to paper and pencil tests, and some of these skills may be critical for the EFT as well.

Gardner *et al.* found that there is considerable variation for any person in his ability to attend depending upon his emotional state and immediate circumstances. This fits normal experience, and especially that of teachers with students. All are aware of the extreme differences in the power of students to control their

attention when they are excited, fearful or have suffered some strong emotional experience outside of class that cannot be set aside in the classroom. Is it possible that one sample of a subject's ability to attend can provide an accurate picture of his style? For instance, what does a field dependent adolescent boy perceive when a new model car passes in the street? Does he just see a shining global object, or does he take note of the many details that make the vehicle distinct from last year's model and from other makes? Issues such as personal interest and involvement might well alter the pervasive style. Certainly one sample taken from all the possible levels of attention any individual might experience does not clarify the picture. This style may not be as constant and pervasive as the definition implies.

The findings regarding sex differences are not clear. Some evidence from this study seem to contradict the data presented by Witkin and his colleagues. Usually men are more variable than women on field articulation, but in this study, women appear to be. The issue will be raised again with respect to cross-cultural studies.

Conceptual Style Study

The work done by Kagan, Moss and Sigel (1963) extends the work on styles by relating them to three dimensions, not just one. The styles are designated styles of conceptualization, and are named analytic-descriptive, relational, and inferential-categorical. A question is raised by Witkin in his reaction to this paper regarding the meaning of the terms in relation to his use of the word analytic in his studies (Witkin 1963). It is questionable whether the two studies use the term in the same way, though they do attempt to relate their

uses in the discussion. The issue is involved in the comparability of the testing procedures, and the validity of the interpretations made of the results. The tests used in the Kagan *et al.* study are of interest since they make use of more complex stimuli than the Witkin FID studies, and so though the results tend to confirm the previous studies, the problem of interpretation again arises. For instance, in the principal test of the present study, pictures of people are exhibited, and the S responds. The figures can be responded to singly, in groups, on the basis of attribute similarity, of functional groupings, or of event oriented groupings. In this case the testing procedures themselves are important for the study of cognitive processes. One implication that the studies bring to the fore is the complexity of cognitive processes, and the need to have fine grain analyses and testing programs if results are to explain the cognitive processes.

Developmental Focus. The focus of the study is on the development of concepts and it is assumed that the child begins with global and generalized perceptions, and gradually these are refined into more specific, attribute defined concepts. From previous studies it was observed that some children tend to be splitters and others lumpers. The splitters were considered to be analytic in attitude, and similar to the analytic, or independent in the FID dimension of Witkin. Both with children and adults, figures were related in different ways. From this, two orientations were defined, and three categorical styles. The orientations were egocentric and stimulus centered. The styles have been noted above. For the egocentric the stimuli were related

to the self, they were individualized, and personalized, affective. For the stimulus centered, there were third person references, with no affective expressions. The analytic-descriptive category is described on the basis of the similarity of parts or elements within a complex stimulus of two or more persons. The inferential-categorical involves an inference about the people involved, what they do, and the category to which they belong, as "professional people," or "poor people." The relational concepts are based on functional relations between individuals that are grouped together. The relational person sees no stimulus as independent, group membership depends on a relationship between two or more figures as "murder scene, he shot this man," or a "married couple." Regarding the relational, the authors say "We viewed the relational response as requiring the least amount of analysis of the stimulus array." The analytic attitude is considered to be an active intervention of the subject, while the relational is a passive acceptance of the overall meaning. It is questionable whether these definitions can be considered contrastive, and mutually exclusive. Is there really much difference between "people with no shoes on," and "poor people" as a category? Or between the perception of "soldiers" and "a family," does not the subject have to observe elements that relate in some way in order to form these groupings? While in one case there is a similar set of features that distinguish the individuals, as uniforms, in the other the individuals must be classified as parents, children, etc. in order to be grouped. It would appear that these definitions, and the classification of test responses on the basis of them involve complex

processes, and can not simply be designated global-articulate, active-passive.

Style Studies. A series of eight studies follow the definition of the categories to be studied. The first of these involved adults for whom there were long term protocols available. The subjects had been followed from infancy to their age of 20 to 29 years when the testing was carried out. A sort task was administered of 44 human figures in different dress, posture, and with different objects (chairs, knives, etc.). The responses were judged either analytic or non-analytic (relational). The individuals were also interviewed and rated. The ratings for achievement orientation and persistence at tasks correlated with the figure sorting test at the $p < 0.05$ level for men, who tended to be analytic, but were not significant for women. On the other hand, those classified as more dependent on their families correlated with the figure sorting test as relational at the $p < 0.05$ level and as less concerned with acquisition of recognition goals at the $p < 0.10$ level. These were in the same direction but not significant for women. Another test with male undergraduates involved a monotonous tasks of watching for interval markings on a clock for 92 minutes. When other signals were given the display light was turned off, and the S had to respond to keep it illuminated. It was hypothesized that the analytic would be more perceptive of the change, and could respond more quickly. The rank order correlation between analytic responses on the Figure Sort test and the accurate detections was significant at the $p < 0.05$ level, but the accuracy of illuminating the clock was not significant.

Tests of Children. The next series of tests related to children. A number of tests were used to find the correlates of analytical style. A Conceptual Test was constructed with three figures per frame that could be classified in more than one way. For instance, two chairs and a table. One of the chairs and the table were missing a leg, and so could be classed as similar, or the two chairs could be classed as similar. Another frame has a man and a woman standing, each with a gun, and a man lying on the ground with outstretched arms. Of an original 44 cards, 14 were eliminated for they cued inferential judgements, and the authors were interested in the analytic-relational contrast. However, they make an interesting statement in this connection, "We attempted, therefore, to prevent the child from using inferential categorical responses, for these are typically more popular with both school age children and adults" (1963:212). While it is quite legitimate to limit tests to responses for the variables being studied, it is curious that the inferential category is not studied further, if in fact it is the preferred style, and it is the typical mode of thought that is being examined. The authors observe also that the conceptual style exhibited by this test does not indicate that the child is incapable of classifying the stimulus in other ways, but that the categorization made is the preferred style. Children were examined, and could easily produce alternate groupings. They also say that it is probable that the test does not sample exactly the same processes in the child that the figure sorting test does for the adult.

Extended Series of Children's Tests. Other tests for this series were the Word Association Test that contained a list of words, 20 count nouns, 10 adjectives and 10 verbs in order to see how they would be paired, either in a noun-noun sequence, noun-adjective, or noun-verb sequence. It was expected that the more analytic person would choose the noun-noun sequence, and the relational the noun-verb as a more natural relation. A Serial Learning Test was used where lists of 12 words were read, and the S was to recall as many as possible. The words chosen formed naturally groups of six, either through functional relationships, inferential relationships, or common sounds. When recalled, those that appeared together of the same category were counted as a score for that style. The last of the tests of this group was a Figure Sort Test using most of the same figures as the adult test, but the nude figures were replaced with figures with blank faces. The IQ scores were also available from the California Test of Mental Maturity, and correlations were calculated betweeen the subtest sections relating to the verbal and non-verbal portions of the test.

Results of Children's Tests. The results were quite mixed. Of 100 coefficients calculated, 20 were significant, 8 of these relating IQ scores to the Conceptual Style Test. The authors find the following: for the Sort Tests, that the analytical and inferential styles are inversely correlated with the relational for both boys and girls. The analytic scores were orthogonal with the inferential scores for boys, but negatively correlated for girls. The noun-noun sequence correlated significantly with the analytical scores, while the inferential score was unrelated to the Serial Test score. The

inferential score did however, correlate with the overall IQ score at the p 0.001 level. The non-analytic boys performed in the opposite direction on the Conceptual Style Test, and recalled more functionally related words on the Serial Learning Task, significant at the p 0.05 level. The results for girls were not as consistent on the tests as the boys were, and the authors suggest that analytic responses may signify something different for boys than for girls, and possibly the two tests do not measure the same processes. There was no relation between the verbal portion of the IQ test and the boys' analytical scores, though there was a moderate relationship between the non-verbal portions and the Sort Test, at the $p < 0.05$ level of significance. In the discussion following the presentation of this paper, Riley Gardner (1973) questions the assumption of the authors on these tests with respect to their interpretation of the processes being tested. Gardner says that the process of inference is more abstract than that of analytic-descriptive, and so represents a more mature response. One might raise the same question regarding the relational, for usually a relation between two or more objects is considered to be more difficult to understand than a similarity of concrete attributes, thus number is a more difficult relation to acquire than, for example, the similarities of dress of two persons.

Relations with Previous Tests. When the sixth grade children of the previous study were in third grade, the Conceptual Style Test and the Serial Words were administered. The Serial Word Test contained a different series of words, with the first and last words of the groups unrelated to the others. The results of these tests correlated for

the non-analytical boys with the scores on the Conceptual Style Test at the $p < 0.01$ level and the $p < 0.05$ level respectively. Neither correlated for the girls.

Stability. A study was made of stability of styles between the first and sixth grades. For one group the Conceptual Style Scores from the third to fourth grade were very stable for girls, both for analytical and relational responses (0.70 and 0.64, at $p < 0.001$). For boys there was a more limited stability, they changed some toward being more analytic, but the stability coeficient was at $p < 0.05$ for analytic boys, and $p < 0.06$ for relational ones. The increase in the boys was statistically significant at the $p < 0.05$ level. The Word Association tasks of noun-noun and noun-verb reflected the same stability for these students. Other data that surveys the first to sixth grades shows that analytical responses continue to increase in a linear fashion while relational responses decrease, both for boys and girls. Where there was data regarding the inferential-categorical responses, the boys were relatively stable, while the girls increased notably.

Projective Tests. It was expected also that there would be a difference in the way analytic and relational persons would respond to the Rorschach and TAT tests, that the analytical would notice and respond to details of the ink blots, and would have more specific responses on the TAT. Those subjects who scored in the upper half as analytic were contrasted with the non-analytic and these stores were found to correlate with the ratings for their Rorschach responses at the $p < 0.05$ level. The responses were judged on the basis of criteria

similar to that used on the Sort Tests, a general response as "a rock" or "a cloud" were counted as non-analytic. On the TAT, similar judging procedures were used, and the correlations were at the $p < 0.10$ level. The authors conclude that these tests show that there is some generality of analytic sttitude across ambiguous ink blots and pictures.

Whole-Parts Study. One study related to the application of labels to a stimulus as a whole or the whole and its parts. Two types of displays were presented, one with photographs and the other with geometric patterns and designs. The first presentation of each was with both figure and ground, coupled with a nonsense syllable, selected for lack of semantic associations. After learning with the coupling to criterion, the Figure Sorting Test was administered, and then the ground or figures were presented in random order to see if the nonsense syllable had been transferred to it, or was linked with only one part. The number of errors on the photograph type test was so low that the results were not analyzed, nor given. On the geometric figures, the girls' error rate was significantly higher than the boys'. When the error rates were correlated with the Conceptual Style test scores, there was a significant relationship. When the Sorting Test was compared there was no significant correlation, although the direction was as expected. The conclusion offered was that analytic children have a greater tendency to associate the nonsense syllable with the differentiated parts of a stimulus.

Sex Differences. The finding that the girls made higher error rates than the boys was taken as consistent with Witkin's data on sex differences. From another point of view the authors presented

evidence of sex-linked differences. Using the Wechsler Adult Intelligence Scale (WAIS) the subtest scores were intercorrelated and the males did significantly better on Picture Completion and Block Design, tests require analytic orientation. The females did better on Similarities and Vocabulary, linguistic categories. What the authors fail to note from the data presented is that boys also did significantly better on the Information and Comprehension subtests, that sample semantic information, and also on the Arithmetic test. Three other tests that have been used to test analytic abilities, Digit Span, Picture Arrangement and Object Assembly showed no significant difference between boys and girls, leaving one with the question of the strength of the sex differences for analytic ability, and the significance of the author's conclusion.

Behavior Plasticity. To study what Kagan *et al.* call behavior plasticity, a test was devised to see if non-analytic subjects were more susceptible to the influence of immediate perceptual experience than the analytic subjects, that is, unable to exclude irrelevant proximate cues. A "get ready" signal light was flashed, and after a fore period of 3, 4, or 5 seconds a "go" light came on. The S was to depress a telegraph key on the first signal and release it as rapidly as possible on the second one. The usual tendency is for the subject to have the fastest response for the middle fore period of 4 seconds. It was expected that the non-analytic would be more influenced by the immediately previous for period in a counterbalanced sequence rather than tend toward the average time. The reaction time is also influenced by the stability of cardiac cycle, which was controlled for in the experiment. The Word Association and Ink Blots

tests were used to distinguish the analytic from the non-analytic. The results confirmed the expectation for the Word Association, and the reaction time relative to the fore period length for both third and sixth grade boys was significant ($p < 0.05$ and $p < 0.10$ respectively) and on a retest of the third grade group a year later. The phrase completions of the Word Association Test were independent of the IQ.

Impulsiveness. The last test of the study was based on the time delay of the subjects in responding to the Conceptual Style Test. It was hypothesized that the more analytic person would be slower, for he would take more time to scan the display before responding than the non-analytic. On the Conceptual Style Test this was confirmed ($p < 0.10$ for the TAT and $p < 0.15$ for the Rorschach). The conclusion reached was that the non-analytic were more impulsive. From the long term reports from the Fels Research Institute (where the work was carried out), 21 boys were judged and rated with respect to their style. The analytic were associated with a reflective attitude, a tendency to differentiate and to resist distraction. The non-analytic tended to be more impulsive, reactive to external stimuli, and less likely to differentiate in complex stimulus situations. The non-analytic tends to be unable to play alone, to be hyperkinetic, and unwilling to get involved in tasks that involve mastery. The analytic tend to be more sedentary, to be involved in tasks and be oblivious of the external circumstances. The tendency toward hyperkinesis as a child correlated negatively with involvement for intellectual mastery as adults ($p < 0.05$ for man, but was not significant for females on the samples of children from age 6 to 10. It was significant

for both males and females at the $p < 0.05$ level for those sampled when from 3 to 6 years of age. The results were interpreted to mean that impulsivity and the capacity for sustained attention are antecedents to the analytic style of young boys.

Conclusion. The authors conclude that there is some degree of consistency for boys across different stimulus situations. The possibility that the ability to inhibit motor discharge is a determinant of analytical functioning is considered most likely. This is important for school work, especially the ability to learn to read which requires sustained attention. The sex differences are difficult to explain, except that it is noted that there is very little hyperkinesis among girls, and the authors suggest that there may be different mechanisms at work for boys and girls with respect to the analytic dimension.

Developmental Concept. One of the assumptions stated at the beginning of this study corresponds to the Witkin study, the concept of development. It was stated that "current theory holds that the child's initial perceptions of the world are global, but with time, become more articulated and differentiated." The authors go on to say that concepts or labels are at first over generalized, but with maturation and experience, become more differentiated and specific. Is this the way perception relates to maturation? It would seem questionable that it should follow this pattern, which will be examined more in a later section.

Conceptual Style and Culture Conflict

The article by Rosalie Cohen summarizes a number of studies made to understand the learning problems in certain inner city communities.

In this sense it is a cross-cultural study, for it contrasts the cognitive and conceptual forms common among the middle class American culture and the schools that are largely oriented toward that culture, with thinking styles common to lower income and ethnic communities, and the problems these groups have in school. The earlier work examined the cognitive requirements of schools, the language styles of low income groups and the relation between styles of conceptualization and ego development. The basic definition that has evolved from these studies and the literature is that cognitive or conceptual styles are "essentially integrated rule sets for the selection and organization of sense data" (Cohen 1969:841).

School Problems and the Inner City. In light of the difficulties that poorer children have encountered in the school environment, Cohen saw the importance of confronting the cognitive requirements of school with the learning characteristics that children bring to the situation, and to study the social and psychological behavior patterns that accompany these characteristics. In order to do this, the first stage was to understand the expectations of the educational institution. Educational materials and tests were reviewed, especially standardized tests. The authors of the standardized testing programs were interviewed in order to find their criteria for testing programs. Three criteria were named, the tests were to sample 1) breadth and depth of general information repertoire of the students, 2) their ability at analytical abstraction, and 3) their skill at field articulation. It was expected that as students progressed through school, these three would increase together. The skills of analytical abstraction and

field articulation are considered to be primarily the difference between selection as compared with classification, generalization or organization of information. The analytic abstraction relates to specific attributes as having importance within themselves. These two types or processes are regarded as being similar to logical operations. Each dimension has two extremes, the analytical contrasts with relational, the field articulation contrasts with field independence and dependence. In this sense the Witkin dimension (1962) is divided into two, and the contrast used by Kagan, Moss and Sigel (1963) between analytic and non-analytic is changed to analytic-relationsl. The concept of styles is principally that of the Kagan, Moss and Sigel article, except that the inferential-categorical is not discussed, and their two basic orientations of egocentric and stimulus centered are assigned to the relational dimensions respectively. So the one extreme of style is the analytic mode of abstraction of information, coupled with the stimulus centered orientation to reality, as against the relational-descriptive mode of abstraction with an egocentered orientation to reality.

School Environment as Analytical. Of particular interest were the sociological and psychological correlates of these conceptual orientations. As has been mentioned, the overall ideology and learning requirements of the school were found to be analytic. This includes not only the academic requirements but the general environment favors the cool, impersonal and outer oriented individual who can sit quietly for long periods, who is well ordered, and can follow time schedules. These attributes are rewarded, while the relational ones are not. The

author criticizes the usual orientation of the literature on styles as regarding their origin, either as predetermined by the nature of the organism or due to idiosyncratic early experiences that have developed into certain learning modes through solving problems in ways encountered at random and reinforced. She says that this does not explain why the relational is found principally among low income groups, and the analytic mode among middle class people. In a note she says that the relational is also found among the families of old wealth. The lack of a normal distribution of these traits indicates that the systematic variations that occur may be due to the social environments that reinforce, stimulate or oppose one or the other style. Since some analytic persons also appear in the low income group, a search was made for the factors that would discriminate between the two. Low income neighborhoods of Pittsburgh were studied with respect to the primary groups to which people related. Marked differences appeared with respect to the functioning of groups, some were highly structured, with formal organization, role assignments and status, while others were largely involved in shared functions, constantly changing leadership and membership. These differences were found to be so, irrespective of the ethnic status.

Testing Program. A number of tests were used in order to understand the factors that go together. The Sigel Conceptual Style Test was used to differentiate analytic from relational individuals. The Witkin EFT with modifications was used to distinguish graphic field articulation. For linguistic measures, a 25 word Synonym Test was used and scored for the number of synonyms mentioned in the response,

as well as the percent of these that were abstracted descriptively. A Tell-a-Story Test was also used to judge whether the person was egocentered or stimulus centered, and whether the person was oriented to reality and achievement or toward luck and fantasy. A special Project Talent achievement inventory was administered and the items scored on a Guttman scale for four types of characteristics, mode of abstraction, field embeddedness, difference variation and luck-achievement. The response style was also scored on these inventories, whether the answers were extreme or in the middle of the scale. Other information regarding the organization and functioning of the primary reference groups for the individuals were also correlated, whether they were formal or shared group oriented. Finally the achievement orientation was noted for each.

Results. From this information a bimodal distribution appeared, along the two dimensions, analytical-relational and field independence-dependence. Four groups were identified, two polor groups (1) polar analytic of high achievers, and (2) polar relational of low achievers. Two mixed groups were isolated in the middle of the distribution. One of these groups (3) was subdivided into a group that had been socialized in one type of group and then related to a peer group of the opposite type, thus one subgroup came from shared-group families, but had become part of formal peer groups, while the others were from formally oriented families, but participated in share-function groups, both of these were middle range achievers. The fourth group (4) was a conflict group, also of middle range achievers, but these were high on analytic abstraction and also relational orientation. Their

socialization and participation were both mixed. The polar groups were socialized and participated in the same type of groups. Most of the females were in the two middle achieving groups, and 75% of the conflict group were girls. This sex segregation pattern was attributed to a differential role definition for girls that cut across all social classes and group functions. It was further concluded that these differences in responses favored the belief that identifiable subgroup interaction webs can exist within groups as small as the family to produce the different conceptual patterning. If this is the case, and overall cultural typologies are to be accepted, it must be shown that there is some modal type of socialization pattern for the culture.

Relation of Style to School Success and IQ. From these studies, conceptual styles were concluded to be integrated rule sets that serve to select and organize sense data. They are memory structures, stored with the contexts in which they function, and are subtle and subliminal characteristics, thus are not immediately obvious, but nevertheless real. They encounter in school either reinforcement or conflict, the analytic mode of the school tends to have a disorganizing effect on the relational person. The author states that when information regarding style of conceptualization is combined with the IQ, the combination forms a good predictor of school success. Most of the unexplained variance of the IQ achievement correlation is attributable to the style dimension. One issue is not clear, and that is whether in the composite style score, the achievement information is included when it is used to explain the variance of the IQ-achievement correlation, for if it does, the data used to predict achievement

would be based on the achievement score, which would easily reduce the variance.

Ability and Styles. The author discusses the concept of native ability and finds it to be the capacity to absorb large quantities of information and to code it at a high level of abstraction, whether using a relational or analytic mode. She reaches this conclusion due to the fact that the polar relational children may score between the 90th and 95th percentile on the concrete parts of the achievement test, but from the 15th to 20th percentile on those parts requiring high analytic ability. It seems that these children can accumulate information adequately, but that they have problems with information and exercises that require logical analysis, thus there seem to be relational pathways by which information can be integrated, organized and related, and that on the practical level these children can function on a par with equally intelligent analytic students.

Cognitive Deprivation. There were certain areas that could be called deprivation, and these were classified in two categories, quantitative, and qualitative. The quantitative refers to the lack of variety in the environment, be it of books, exposure to issues of the general culture, magazines, etc. as well as the stimulus deprivation experienced by children in institutions. The qualitative deprivation refers not to the difference in repertoire of information but to the type of information in it, for example, the child from the lower income group may know very little about refrigerators, but a great deal about rats, in other words, he or she knows what is important for their life. Schools should be responsive to both types in the

view of the author. What she calls conflict involves not this deprivation of information content, but the conflict due to different rule-sets or styles. From the linguistic feature analysis three areas of contrast and incompatability appear between the analytic school environment and the relational student. The perception of time is a continuum for the analytic, while it is a series of discrete points for the relational. The self is perceived as one among and in relation to others in social space for the analytic, but is egocentered for the relational. Linked to these two the analytic can conceive of multiple causality, while the relational can only conceive of simple causes.

Culture Free Tests. In the critique of the so-called culture free tests, the author finds that far from being culture free, they are even more bound to the school mode than the ordinary tests. This is because in the attempt to make tests culture free, and with the realization that much of ordinary intelligence testing is a function of a person's ability to read, the informational aspects of the tests have been stripped off, leaving only abstract geometrical figures. The subject has to perceive and relate elements that are almost purely logical. Thus what begins as an attempt to relieve the students who have poor linguistic achievement of their handicap, ends by taking away the only part that the relational subjects can adequately manage, leaving them in a worse state. Thus the culture free tests end being more culture bound than the ordinary tests.

Conclusions. In conclusion Cohen makes a case for abandoning the assumptions that there is a single way of knowing, and for developing

measurement methods that can be more accurate in revealing the type of learning problems that exist, and for developing materials and methods for allowing children to learn in the mode that fits their cognitive capacities.

Critique. This paper presents considerable information, and conclusions with a limited amount of data from which to judge their validity. There are some basic problems involved. For instance, the concept of analytic mode of abstraction is rather clear from the examples given for extracting details from a display, but what is not clear at all is the nature of a relation. At the beginning of the paper it appears that the selection process is the analytic abstraction, and that the process of synthesis, of putting things in the same category, of generalizing or of organizing data into concepts is relational. Further along, the relational seems to become the type of interaction a person enters with the primary reference group to which he belongs. From the tests, analytic abstraction seems to relate to identifying details of a display and to relate them, one to one, as similar or the same. Relational (as in the Kagan, Moss and Sigel Tests) is taken to mean that two pictures of individuals are related because both people are dressed the same, while to be analytical means that the subject identifies them as similar because they both have their arms in the same positions. This problem relates to Witkin *et al.*'s (1962) consideration that a relation is inferior and easier to identify than an attribute. Generally a relation is more difficult to perceive. For instance, is it easier to identify two red objects as the same, or to conceive of the relation of the

number two, a relation that has no concrete referent? Cohen does not fall into this error, for she considers the relational person to have as much native ability as the analytic. The semantic problem is profund and confused in the literature.

Impulsiveness. In this study a number of dimensions that are identified as separate factors in factor analyses are placed together as either relational or analytic characteristics. For instance, it is said that the relational person is impulsive, has a narrow equivalence range, does not scan widely, but impulsive tendency has been related to the ability to inhibit or not inhibit motor discharges, and Gardner *et al.* (1959) identify the other two as separate factors. While these factors may go together in certain configurations, they apparently do not in all. Again there is the need for a theory that can relate these different aspects of cognitive functioning in an ordered whole.

Contrast with the Differentiation Hypothesis. The implications of the findings regarding socialization and reference group impact are at variance with Witkin *et al.* (1962). For Witkin the cognitive style is a function of socialization in infancy, whether discipline has been strict or lenient, whether norms of conduct are rigid and enforced, or easy free. Following the early years, not much change is possible, style is persistent. Here, however, we see that in the middle achievement group all are moving, either from being socialized in a formal group mode and then belonging to a peer group that is shared-function, or vice versa. In either case, it is the peer group of the later period whose influence becomes dominant. If this is the

case, style is not only subject to modification, but change is relatively easy. At the same time, the question arises, if this is so, why does not school function to change the relational to conform to its analytic pattern? One possibility might be suggested by Cohen's term, primary group. This is to say, the school is always peripheral for these individuals, never primary, therefore it does not change them. Nevertheless, the issue of stability of style is challenged. At the same time, the observation of Witkin, and also of Kagan, Moss and Sigel is again confirmed, that girls are less variable than boys, and tend more toward the relational or global, whatever that may mean.

Egocentered vs. Stimulus Oriented. With respect to the psychological correlates to the relational-analytic style dimension, there is another area of ambiguity. The dependent are listed as egocentric, the analytic, as stimulus oriented. This is not a true contrast. The opposite of egocentered would ordinarily be centered in the other person, as for instance, in Riesman's contrast (1961). But the inner directed for Riesman is the cool, impersonal one, while the other directed is the dependent, the person who is dominated by the primary reference group. Also, what would be the contrast for stimulus directed, directed more by one's own internal information? In this case it is conceivable that the stimulus centered person might be egocentric, relating all perceived stimuli to his or her own self and use, while the person who is controlled more by the information in his or her own memory might be more oriented to and sensitive of others.

Various Recent Studies

Cognitive style has been a continued focus of studies down to the present. Many of these have been quite limited, small in scope, examining one or another of the assumptions, implications, tests or interpretations of the original work. A number of replications have been made. In the section following many of these studies are considered briefly in order to understand the present status of the work. It should be noted that only a relatively small number of the writings in the field have been sampled, due in part to the extremely numerous publications and studies that have been made, and at times due to the wide distribution of these, especially in regards to dissertations that have not been published.

Theoretical Studies

Kagan and Kogan. The majority of studies published recount and comment on some aspect of the theoretical foundations of styles, either reinforcing them, or calling certain aspects into question. Kagan and Kogan (1970) published a rather detailed summary of the work done to that time. They point out the relatively high and consistent intertest correlations for the EFT, RFT and BAT. On this basis they conclude that combining the three tests into the perceptual index is admissible, though possibly not for cross-cultural samples, citing Wober (1966, 1967) for this caveat. The alternative explanatory constructs of perceptual accuracy and body sensitivity have been examined and discounted by Witkin on empirical evidence, though more recent information will pose the problem in a different way. On developmental changes,

the long term stability is noted and attention is called to Zigler's objections (1963 a and b) that Witkin's information appears in conflict with both Werner's and Piaget's. The authors consider this difference chiefly one of semantics. The more disturbing issue for them is the relation between the FID and IQ dimensions, where a number of investigators have found a significant correlation, one denied by Witkin. The Witkin group has tried to show a difference by partialing out the verbal sections of the WISC. But others find correlations even with this. The contention that FID is an issue of disembedding has not held up for the verbal domain. Zigler's contention that verbal ability is a prime indicator of differentiation was the basis of his attack on Witkin, which proposes that FID is "spatial decontextualization" a lower level of abstraction from a more general high level attribute called differentiation. For the body concept Kagan and Kogan reiterate the Witkin hypothesis as demonstrated on the Draw a Person Test as used by Machover (1949). While the results were interpreted as confirming the hypothesis, they point out that as yet there is no evidence to "support the claim that the child's figure drawings actually reflect his concept of his own body" (1970:1328). With respect to personality correlates, it is pointed out that the earlier formulation of activity-passivity dimension has not held up. The results of the projective tests seem to support the hypothesis that the dependent are more aggressive; but this is questionable, for it is not known if these tests in fact reflect a person's defensive structure, and the hypothesis that this linkage exists is not explored. Regarding the hypothesized social relations and FID, Crandall and

Sinkeldam (1964) explored the relation with age and intelligence controlled, and found only minimal relations existing between social behavior and the FID dimension. With respect to the relation between parents and children, the extremely high correlations Witkin reports "arouse suspicion that the relationship noted may have some spurious basis." Kagan and Kogan consider the high interrater correlations to be due to the use of professional raters who become sensitive to the investigator's bias and rate accordingly. The existance of sex difference that are indicative of cognitive differences has been questioned by Sherman (1967) and is emphasized here. In the light of the apparent genetic bias in visualization for the male over the female, and the sex role types that further emphasize this, there is a valid question as to whether this sex difference relates to differentiation or not. The relation between sex, spatial abilities and social relations is treated at length, with a number of studies cited. High spatial and low number and verbal ability for boys correlated with low aggression, low masculinity, low mastery, and high withdrawal (Ferguson and Maccoby 1966). On the other hand girls high on spatial were judged more aggressive and more masculine, and more resented by the peer group. The cross-sex parent-child relation might explain this, or that high spatial with low number and verbal may only be a contrast for which the individual compensates, while ordinarily high number and spatial go with high independence on EFT and RFT. If numerical ability is separate from spatial ability, then Sherman's argument may not be valid, but no judgment can be made without further information. The cross-cultural studies reviewed are those

by Dawson (1967 a and b) and Berry (1966) which confirm generally the FID hypothesis. In summary Kagan and Kogan cite the positive support for the differentiation hypothesis and the value it has had in stimulating research. On the negative side, the decision to use the word "differentiation" is criticized for leading to the problem of overgeneralization. Recognizing the clear spatial character of the tests, and the extension of the concept into other areas of personal functioning, they again raise the issue that "perhaps the link between the wide variety of processes examined and the construct of differentiation was largely metaphorical, as Zigler has claimed" (1970:1341). However it is necessary to have some organizing principle, and there is some merit in the term, though others might have been more appropriate. The different meanings of the term as used by Witkin and Werner are noted where for the latter it is a heuristic principle rather than an explanatory construct. The basic value dilemma is raised, of placing the independent on the scale as mature, the dependent as immature, and it is suggested that the social value of people who are sensitive to interpersonal cues is as important as the analytic and differentiation abilities, a position Witkin has come to adopt more recently (Witkin *et al.* 1977).

Studies of Tests and Testing

Sherman. The study by Sherman was discussed by Kagan and Kogan as noted above. The main thrust of this study (1967) relates to the issue of women being found consistently less adept at spatial or visualization tasks, and that this may well be partly a function of a recessive gene on the x chromosome. It may also relate to the

dominant hemisphere of the brain. The contention however, is that unless this issue is controlled for in experiments, it is unclear to what extent the tests are measuring differentiation and to what extent spatial perception is being measured. She also notes the evolution of Witkin's terminology from visual independence (1948) to field independence (1954) to cognitive style and analytical approach to differntiation (1962) to analytical ability (1966) and the tendency to overgeneralize the construct. There are a number of studies cited that training does produce notable change in the spatial visualization ability, one of which Witkin himself reported (1948). Another illustration is the significant gains in the ability to visualize after only one year of engineering studies. The differences in sex role assignments and activities are also cited as a reason for the sex difference, especially considering the many hours spent by boys on hobbies that are highly spatial by nature in contrast to the girls' hobbies.

Arbuthnot. Arbuthnot (1972) reviews a large segment of the studies done to that date, comparing the correlations between the principle tests for cognitive style. The tests compared are the EFT and RFT as used by Witkin (WEFT and WRFT), Oltman's Portable Rod and Frame Test (PRFT), Jackson's Embedded Figures Test (JEFT), Kohs Blocks Designs (KBD) subtest of the WISC, the Draw-a-Person Test (DAP), the group administered EFT (GEFT), Thurstone's adaptation of Gottschaldt's test (TEFT), a booklet form of the EFT (BEFT), in different versions, with or without color, and for different time allowances, Karp and Konstadt's children's version (CEFT), and the questionaire from Evans

constructed (QEFT). He notes that at the time of writing there were more than 2,000 studies on the FID styles listed in Witkin's bibliography, of which he sampled between 350 and 400. Of these, 122 provided sufficient information to compare the variances shared between tests. For equivalence he set a criterion of an $r = 0.80$ and $N = 100$. The r's were transformed to z's, weighted with respect to N, averaged and reconverted to r's. Table 1 summarizes the results. Arbuthnot concludes that, due to the low shared variance, the tests lack equivalent form validity, so that what any one test measures is to a great extent not what the other tests measure, contrary to the assumptions of most experimenters. The conclusion is that 1) no one test can be used to measure differentiation, and 2) only the combination of WRFT and either the WEFT or JEFT correlate sufficiently to consider them tests of FID. The GEFT, KBD and DAP are rejected as measures of FID, the others are highly questionable. This study throws a shadow over many findings reported, especially cross-cultural where only one tracer test was administered.

Wachtel. Wachtel (1972 a and b) calls attention to the different assumptions underlying the studies of cognitive controls, and those of differentiation, for the controls as factor studies allow for complex combinations of attributes, while Witkin's cognitive style attempts to "offer a fairly comprehensive characterization of people who show a typical field dependent orientation on the RFT" (1972a:180). Since the EFT and RFT do not offer choices, there is no question of preferred or typical mode, therefore the tests are of abilities, the person who does not disembed can not, it is not that he chooses not to.

Table I

SHARED VARIANCE AMONG TESTS

Tests	Mean r	Shared Variance
WRFT & WEFT	0.54	29%
" & JEFT	0.37	14%
" & Other short forms	0.39	15%
" & TEFT	0.39	15%
" & GEFT	0.23	5%
All RFT & All EFT w/o GEFT	0.44	19%
WRFT & KBD	0.36	13%
" & DAP	0.40	16%
WEFT & "	0.34	12%
KBD & "	0.33	11%
Perceptual Index & DAP	0.59	35% (Very small N's)
WEFT & KBD	0.60	36%
" & JEFT	0.97	94%
" /JEFT & GEFT	0.55	30%
" & QEFT	0.57	32%

He points out that, in line with, but independent of Wachtel, the measures have an upper limit of about 0.60 shared variance, meaning that about "two-thirds of the variance in any of the measures is due to something other than field dependence" (1972a: 182). For this reason when only one measure of FID is used, there is no basis for assuming that the correlation has anything to do with field dependence. He also points out that insufficient control of IQ is made by most experimenters.

> But equating groups of scores on verbal subtests, while distinguishing them on scores of analytic subtests is *guranteed* to yield groups different in overall IQ. Thus, in such a situation, one cannot be certain that personality differences between 'field dependent' and 'field indpendent' groups are due specifically to their differing in analytic ability rather than to their having a greater total stockpile of intellectual resources (1972a:183).

Attention is drawn to the assertion that the FID dimension exhibits a high level of coherence over a broad range of different areas of personality, but that due to the low shared variance of the typical measures, that most studies are of little value. Specifically, he notes the studies that examine the Draw-a-Person Test, and shows that it is chiefly a matter of the individual's ability to draw, not of the sophistication of the body concept. The author contends that it is difficult to construct a developmental theory around one dimension, since there are such great differences in other domains that do not correlate. All subjects with one FID score are not the same, but may develop principally along very distinct lines. In the end, Wachtel points out the need to distinguish the consistencies between limitations and choices or strategies. He says,

> Nevertheless, it is clarifying to make the distinction, and somewhat confusing to see the consistency described sometimes as a *style* of life, *preferred mode*, or *direction* of psychological development, and sometimes as a difference in how capable an individual is in functioning at a high level, how much *progress* he has made in some general aspect of psychological development, etc. (1972a:188, italics his).

Berent. Berent (1976) found a close relation between calculating ability and RFT. If the logic of Kagan and Kogan (1970:1337) is followed, this would imply that the FID tests involve more than spatial ability, and therefore are multifactorial.

Pitblado. Pitblado (1977) tested the RFT across sex and found that there is a significant sex bias. Males showed a counterclockwise orientation bias of 7^{o} while the female average was not significantly different from zero. This indicates another source of variance that needs to be controlled in cross-sex studies.

Reinking. Reinking (1977) examined the RFT using the standard instructions, additional instructions to attend the visual cues, and/or kinesthetic cues. The varied instructions produced significantly varied behavior on the test. Test groups were matched with the standard instructions, then given different treatment. The instructions to attend the kinesthetic cues was most accurate, the control group intermediate, and the group with visual instructions the least accurate. All results were significant at the $p < 0.01$ level. In light of this and a number of other studies cited, the author concludes "the sum total of this research indicates that the Rod-andFrame Test can no longer be viewed as exclusively a measure of 'field dependence'" (1977:443). Further, citing the results of Fine and Danforth (1975) and their conclusion that the idea of "embeddedness" has been extrapolated

from the EFT to cover the RFT and other tests on a dubious basis, Reinking concludes that "it is becoming increasingly difficult to know where construct begins and test leaves off." So he suggests that the test only be used with a multiple regression model to be able to sort out the situational factors and the multiple loadings the RFT has on different factors. This concurs with Gardner *et al.* (1960) where the RFT is fround to load differentially on several factors.

Hoffman and Kagan. Hoffman and Kagan (1977) tested the Group EFT, the portable RFT and facial recognition. The facial recognition test consisted of an initial presentation of six standard size photographs of people not known by the subjects. This was followed by a display of 20 faces, and the subject had to identify the faces he had seen previously. The GEFT and PRFT scores did not correlate highly for males, but was significant for females. The PRFT correlated significantly with facial recognition for boys, but only slightly for girls, and the between group correlations were not significant. The interesting thing is that the field independent or analytical boys and girls scored higher than the dependent ones. This finding calls into question the Witkin hypothesis that field dependent people are more senstitive to facial characteristics than field independent. Three other studies are cited that corroborate this one. In an analysis of the Crutchfield *et al.* (1958) study on which Witkin based his conclusion, the Air Force Captains involved were from the same base as those of the photographs, and the uncontrolled factor of familiarity for some of the subjects was not controlled, and could

be a contaminating factor. The other study (Messick and Damarin 1964) did find a low level correlation favoring field dependent people identifying photographs. A replication found a significant correlation in the opposite direction.

Cross-Cultural Studies

Dawson. Witkin has not done cross-cultural studies directly but has written, integrating the work done by others with his own studies, most notably in two article, Witkin (1967) and Witkin and Berry (1975). The first study appears to have been Dawson's work among the Temne and Mende of Sierra Leone, reported in 1963. Further studies were reported in 1967. Field independence-dependence was tested by the EFT and Kohs Blocks Designs. Dawson cites previous work that shows the difficulties Africans have had with two dimensional displays of three dimensional material, the problems with visualization and with spatial problems generally. Tests were used for three dimensional perception, the EFT, Kohs Blocks, and these were correlated with the level of intelligence, level of education, strictness of mother and father and intercorrelations were made between the Temne, a more restrictive and aggressive group in their socialization practices than the neighboring Mende. The EFT and Kohs Blocks correlated to a rather high degree with three dimensional perception, less with intelligence, and slightly less still for schooling. A slight interaction with Kwashiorkor and feminization were found. A relation was found between the strictness of socialization of Temne mothers, and Mende fathers with the EFT, the relation was in the same direction for Temne fathers, and Mende mothers, but was not significant. This is a curious finding in light

of the fact that there was a higher rate of polygyny among the Mende than the Temne, a factor presumed to affect the role of father in socialization. The high correlations between the EFT, KBD and 3-D tests was attributed to the fact that all are visual-spatial problems.

Dawson (1972). In this more recent study, Dawson focuses on the issue of lateralization and it's relation to cognitive style, contrasting two groups, the agricultural Temne of Sierra Leone and the nomadic hunters of central Austrialia, the Arunta. Laterality is considered to be genetically related to the dominant hemisphere of the brain, and has been proposed to be the result of a recessive gene for left orientation. There is very strong cultural pressure in many societies to use the right hand, and it is hypothesized that this will produce more conformity in either heterozygotes or recessive homozygotes for left-handedness. Miller (1971) presents evidence that mixed dominance impairs spatial performance more than verbal. It is also expected that agriculturalists impose more cultural constraints on people than nomadic hunters, so over the years it is expected that right handedness in agricultural societies will be greater than for nomadic groups like the Arunta or Eskimo. The tests were Matrices and SL_3 for intelligence; EFT and KBD and another spatial test for cognitive style, a 3-D perception test, two sexual identification tasks from the Franck Sexual Bias Test, and the DAP. Modernity was measured on the T-M scale, and the somato-type was registered. Eye dominance and laterality were assessed. The data of a number of societies are examined for handedness, besides the two selected for this study. These represent hunting and fishing societies (permissive), the

Arunta, Eskimo and the Hong Kong boat people. The agriculturalists (harsh) are the Temne, Hakka Chinese, and Katanga of Zaire. Three western samples are included. The pressures on conforming behavior are consistent with the expectation, as well as the incidence of left handedness, with the Western samples midway between the others. The results show that the Arunta have significantly more left handed members than the Temne, and are also significantly more independent in cognitive style. Sex differences were too small to be significant, but in the direction of females being more dependent. A curious line of reasoning occurs where the reference to the Temne and the need for conformity is made,

> Any deviance, whether a physical handicap, social, psychological, or in this case left-handedness, must be sanctioned in order to ensure the survival of the group in such an extreme environment.

In the next paragraph, regarding the Arunta he says,

> Thus these extremely permissive Aboriginal child-rearing processes confirm Barry *et al.* (1959) findings that permissive socialization is more adaptive in hunting societies, as it develops independent attitudes and spatial orientation skills needed for survival in harsh semi-desert and snow ecological systems.

In this form the issue of extreme environment can be used to explain anything. Otherwise, the information presented tends to support the hypothesis that those who suffer pressure to change from a left handed dominance to right in conformance with cultural pressures, are more field dependent.

Berry. Berry (1967) focused on the ecological determinants of the FID dimension among the Temne of Sierra Leone, the Eskimos of Baffin Island, and a Scottish sample for a Western control. The EFT,

KBD, Morrisby Shapes and Raven's Matrices were administered in order to compare them with socialization practices, ecological setting and influences, rural-urban, years of education, and spatial-linguistic categories. Generally the Scottish and Eskimo samples were very similar, whether traditional or transitional, while the Temne sample was quite different. There was a rather strong relation between education, EFT, KBD, and general Westernization. The relation of the EFT and KBD to the strict-lenient socialization practices was also evident, but not strong, only seven of 20 relations examined were significant. With respect to sex differences, four of eight tests were significant for the Temne, indicating more independence for the males, similar to the Scottish sample, while no difference was evident for the Eskimos. Age trends were also studied and independence tended to increase until late adolescence, stay nearly the same until the 30-40 year age bracket, and then fall to near or below the levels for the 10-15 year group. There was much less variation among the Temne, probably due to the very low scores generally. The culture and ecology are interpreted as being influential but neither necessary nor sufficient conditions in themselves for developing independence. MacArthur (1967) used Vernon's EFT with two groups of Western Eskimos and confirmed Berry's findings with respect to the lack of sex differences among them.

Wober. Wober (1967) studied the FID style among male employees of a large company in southern Nigeria. He used the RFT and EFT to examine the relation with educational level and most particularly, the relation to a culture where proprioceptive skills are more

elaborated than visual. Care was taken to assure that the S's understood the testing procedures. It was found that the Nigerians were significantly better on the RFT than Witkin's American sample where the body position was such (tilted) that proprioceptive cues were important. Education correlated significantly with the EFT but not the RFT. Wober cites Beveridge (1939) regarding similar tests conducted with Ghanaian students which confirm these findings. Witkin (1967:241 note) disputes these findings saying they are interesting, but yet to be confirmed, and more recently discusses in detail his reasons for rejecting Wober's findings (Witkin and Berry 1975:25). The reasons are that Wober's apparatus for the RFT was only one third the size of the one used with the American subjects, and as the frame size diminishes, so does the effect. He cites the "E-effect" noted by Muller (1916) where an upright appears tilted when the body is tilted, for this reason, Witkin says, the tilted position for the body was eliminated from the tests. He further says that it is important to distinguish how differential sensory experiences affect perceptual development due to 1) sensitivities in different modalities, 2) the sheer attention to areas important to the person, 3) the act of discriminating information through selective attention and 4) how items are disembedded from an organized context. Witkin sees differentiation as a higher order processing, and therefore characteristic of broader aspects of an individuals mental processes. In the end, he states that it will have to be resolved empirically.

Siann. Siann (1972) investigated the relation of the EFT and RFT, the sex differences, Wober's hypothesis of intercultural differences

and whether or not the intersex differences could be modified in two groups of Zambians and Non-Zambians, ages 12 1/2 years to 17 years for the Zambians, and the Non-Zambians with a mean age of 13 years. The results showed no significant correlation between the EFT and RFT for the non-Zambians. The finding is not consistent with Witkin's statements regarding the correlation being positive. (In Witkin's data, two of three female samples were not significant.) For the Zambians a $_{X}^{2}$ coeficient is not significant but if the correlation is calculated with non-parametric methods the correlations becomes significant at the $p < 0.05$ level. This correlation is lower than that between the EFT or RFT and a verbal test. This latter correlation is significantly higher than the correlation with the RFT, indicating a stronger relation with education. No intersex differences were found significant. When tested with respect to the type of items to be extracted from a context, boys did better on items familiar to them, while girls did better on items familiar to them. The hypothesis that the Zambians would score better than the Non-Zambians on the RFT with the chair tilted, requiring the use of proprioceptive cues, did not prove out, so that Wober's hypothesis was not sustained. The higher correlation between the EFT and verbal test than the EFT-RFT is interpreted as indicating that education is sampled by the EFT, not analytical functioning. However, in view of Cohen's study of school materials and procedures (1969) this is not necessarily a contrast, for school may enhance analyticity.

Dershowitz. Dershowitz (1966 and 1971) tested three groups of New Yorkers, a group of ethic Jews, recent immigrants who were

compared with a group of acculturated Jews and a group of American WASPs. The study focused on the relation between the FID measures and the body concept or sense of separate identity. The testing procedure made use of the BAT and EFT, the WAIS subtests of Block Designs, Object Assembly and Picture Compeltion. For the body concept, Human Figure Drawing and the Marlen's Sophistication of Body Concept Scale was used to rate the drawings. It was expected that due to the strict discipline during childhood the traditional Jewish sample (TJ) would be more dependent. All were boys, born in the U. S. A. but half had at least one parent born in Eastern Europe, all were from observing orthodox homes. The Westernized group were non-observant Jewish homes and were from Witkin's original sample. The WASP children were from private sectarian schools in the city. All groups were middle class. The between-group difference of means for the BAT when the body and room were tilted in the same direction were significant, but the results when tilted in opposite directions were significant only between the extreme groups. The EFT did not show significant differences. On the other hand, when the perceptual index was calculated it did reach levels of significance for all three comparisons. The figure drawing ratings were correlated with the perceptual index and also were significant at the $p < 0.01$ level, thus confirming the hypothesis of the study, that the more strict socialization practices tend to produce more field dependence.

Handel. Handel (1973) studied a sample of 557 boys, grades 7 through 11 in Israel. They were tested on the EFT of French, Ekstrom and Price (1963), the PRFT, with the rod and frame, and with the rod

only, Raven's Matrices, Vocabulary (Hebrew) Junior Eysenck Personality Inventory, Internal-External Control Scale and a Q-Sort. The correlation between the PRFT and the EFT was low with a shared variance of 13%. A non-metric analysis of the correlation matrix called the "Smallest Space Analysis" was produced. It showed that even with this low correlation the PRFT and EFT were the closest of any two measures, though the Matrices were only slightly more distant. This lends convergent validity to the two principal measures of field dependence. The personality dimensions represented by the scales of neuroticism, extraversion and internal control showed no relation with either measure of field dependence, though the measures of self image did. However, when the age related variance was factored out the results were not significant. The developmental trends were not unique to the FID measures, but were evident in the personality measures also. Handel points out the

> major difficulty in evaluating the incisiveness and plausibility of Witkin *et al.*'s (1962) interpretation stems from the vague delineation of the capacity to overcome an embedding context and of its defining properties. This vagueness precludes an unequivocal, preconceived circumscription of the particular group of ability tests which fall in, or outside of this category (1973:264).

The relatively same degree of similarity between the EFT, PRFT and Matrices is interpreted as resulting from the common spatial character of the tests. The developmental changes can be accounted for by an ability conception of the tests. While these results reduce the viability of the construct, the author still feels the tests have value in larger studies similar to Cattell's personality studies.

Okonji. Okonji (1969) studied the differences in cognitive style contrasting rural and urban child rearing practices in Nigeria. The rural or village Ibo child is in close contact with the mother for a long period, and according to the differentiation hypothesis should be slow in developing a separate identity and body concept. The urban pattern is more Westernized, the mother maintaining a more distant relationship with the child, thereby tending to produce a more field independent individual. There were approximately 300 subjects who were tested with the RFT, EFT or CEFT, and the results were compared with age, number of father's wives, number of siblings, social class, sex and rural or urban setting. The results were compared with data from Witkin's sample for undergraduates in New York City. The RFT and CEFT correlated but were not significant. The U. S. male sample performed higher than either of the Nigerian samples, though the rural subjects were more dependent than the urban Nigerians. However, the difference for U. S. and Nigerian urban males was not significant, and the Nigerian males were somewhat more dependent than the New York females on the EFT, but more independent on the RFT. The correlation between the CEFT and the RFT was not significant for the rural sample. The results are consistent with Wober's, though Okonji warns of a problem with the EFT that caused it to fail on one occasion. He observed that the more simplified version of Wober might not be valid, for due to this simplicity he did not get the same results as other experimenters. Okonji also points out two other problems that could well influence the results in cross-cultural trials. The first is the lack of understanding of the task by the

subject. It is quite probable that many people will not understand the standardized instructions used to make the test situation consistent, especially if the experimenter does not understand the language, and must depend on translation. A subject will say that he understands in order not to embarrass the experimenter nor to look ignorant. The other problem is uncertainty regarding the test. The RFT administered in a dark room could well produce this uncertainty, especially when the administrator is of one sex, and the subject is of another sex and lineage group, a potential marriage partner. The most significant interaction effect observed by Okonji was between the CEFT and education, an effect not expected in the differentiation hypothesis.

Gruenfeld and MacEachron. Gruenfeld and MacEachron (1975) report on a study made with 329 managers and technicians from 22 non-Western countries who were studying in the U. S. A. The principal focus of the work was the relationship between socioeconomic levels and their ratings on the FID dimension as assessed by the PRFT and GEFT. The study also controlled individual variables of rural-urban rearing, education, father's education and profession and the more general comparative countrywide levels of economic development, cultural development, health care, educational level, nutrition and mortality rate. As the study involved managers, there is extensive citation of the literature regarding cognitive styles and management as well as the general literature on styles. There were significant correlations at the $p < 0.01$ level between all of the variables. The theoretical assumption is that "conditions of 'poverty' are not conducive to the development of high levels of analytical thinking because more urgent

and basic needs for survival must be first satisfied (1975:36)." On this basis it is expected that FID will correlate with indices of a country's development. As indicated, the correlations did appear. The best "predictor" of the high GEFT was urban socialization and level of education, the best for the PRFT was the father's educational level. All indicators were highly interdependent. The interpretation is that, while the usual explanation is that authoritarian child rearing practices produce dependent people, that it is now possible to advance the hypothesis that "these types of practices are most likely to occur in economically deprived and hazardous environments." This of course, is a statement that can never be substantiated or demonstrated to be false, so it is quite safe. If one points out that the traditional Eskimo are articulated according to the literature, and also live in a hazardous and economically deprived environment, the challange can be met by observing that the phrase "most likely" is inserted. If, as appears, most engineers are highly articulated, but live in a very precarious world of dead end jobs for the most part, it can be pointed out that the style was developed earlier in life, under more secure conditions. That technical subjects require a certain type of mentality or mental abilities, all might agree, the problem is how did they get that way. The authors follows Vernon (1972) in saying that too much emphasis is placed on socialization and too little on subsequent education, for as seen, education has the highest correlation with the GEFT. One interesting fact that emerges from the correlation matrices presented is that all of the socioeconomic indicators correlate from 0.70 to 0.95, with an average

of 0.82, while the correlations with cognitive style range from 0.34 to 0.64, with an average of 0.44. The difference is notable. The highest correlation between the PRFT except for the GEFT, is for mortality rate. The economic development index shared 20% of variance with the GEFT, and 15% with the PRFT. Thus while there is a correlation, the explanation is far from clear, and the level of generality is so high that its value is questionable.

Maccoby and Modiano. A number of studies have been made comparing Mexicans, Mexican-Americans, and Anglo-Americans with respect to the FID cognitive style. The first of these to consider is by Maccoby and Modiano (1969) a related study, though not using the same tests as Witkin, nevertheless, there are some important points of contact. The work relates to classification and differentiation, reasoning and moral judgments among rural and urban Mexican children. The thesis is that cognitive style, the interrelations between cognition and the requirements of society, develop according to the demands of the culture and the mode of reasoning most functional in that society. The dimension examined is from concrete to abstract, defined quite specifically in terms of the uses of differences or equivalences in thinking. The equivalence type tends toward hierarchical or super-ordinate classifications, the functional responses can tend toward either abstract or concrete references, depending on the level of inference involved. For moral judgments, five of Piaget's stories were used, and, in addition, a story pitting loyalty to mother against peer group loyalty was included to assess the attitude toward traditional authority figures. Raven's Matrices were used to assess IQ due to its

being a good indicator of school performance. As has been seen it is also used at times to test for FID styles, which presumably are not related to IQ. Three types were found, a concrete type or style, very dominant in the rural context, transition types who shift from concrete to abstract, and an abstract type, found in about a third of the urban sample, almost completely absent in the rural group. The concrete reject equivalence judgments (though they can handle them), but make very highly refined differentiated judgments. The abstract urban style emphasizes equivalences, even to the point where

> they become lost in formal concepts, and lose flexibility. They sometimes fail to see differences because of their dependence on nominal classifications, and have lost the ability to see perceptible or concrete functional distinctions (1969:27).

This was completely absent in the village. The village children could classify formal and nominal concepts, but do not choose to do so. The type of moral jugments made also correlated with the concrete-abstract dimension. Reciprocity developed slower in the village than in the city, possibly due to the more authoritarian tradition. However, one very important fact was revealed by the item pitting the mother's judgment against reciprocity with the peer group, the mother's judgment overwhelmed all, city and village. Thus, a cultural factor was capable of dominating all jugments in a specific situation. From this study a number of things is evident. If differentiation is defined in the sense that a person is perceptually able to distinguish and to make discriminations, this characteristic is found to be related to village or rural society with a more authoritarian structure for moral judgments, then the tendency to combine individual cases in generalized

(might we say global?) concepts is more a function of technological and industrialized society, where joining items into equivalence classes is the norm. These classes are then used in formal logical operations in the highly rationalized industrial community for which the peasant is ill equipped. Regarding the social correlates, it is interesting that the authors point out the identity of the person in the village as clear, as each person knows the life history of all others in the community, each has a sense of belonging and relatedness. Thus it would appear that there is more of a sense of individual distinctiveness, uniqueness in the village than in the regimented urban life.

Hoppe, Kagan and Zahn. The work of Hoppe, Kagan and Zahn (1977) focused on the issue of conflict resolution and FID style among Anglo and Mexican Americans in the Los Angeles area. To assess the conflict resolution tendencies between mothers and children role play was used in which the mother and child faced each other in a realistic situation, e. g. they wanted to see different TV programs at the same time. The aggressiveness, dependence, use of pronouns, length of utterances, elaborated dissent, etc., were used to rate the protocols. The FID style was measured on the "Man-in-the-Frame" RFT. In this experiment, in which the participants said they felt comfortable, or, as one mother remarked "We go through this every evening," there seems to be a high level of reality and face validity. A number of interesting things emerged. While Mexican American mothers engaged in more assertive behavior than Anglos, and the Mexican American children were less assertive toward their mothers than Anglos, no significant

differences appeared on the factor analysis of the results. The only significant difference between mothers of dependent and field-independent children was the mothers of field independent boys and the dependent girls. In this case, extreme dependent and independent children were chosen for the study to maximize the differences. No main effects were found, so the authors conclude that "In the main, however, the present study does not support Witkin's (1969) theory of antecedents of field dependence." Another study of Anglo and Mexican American children done by Sanders, Scholz, Jans and Kagan (1977) correlated the "Man-in-the-Frame" RFT with the coefficient for affiliation which measures the sensitivities to social cues. This study found the RFT not significantly related with social sensitivity. A number of other studies have been published regarding either Mexicans, or Mexican Americans, most of which consistently reveal a significant difference in the FID variable with respect to rural, less acculturated Mexicans being more dependent, and the more acculturated, urban being essentally like the Anglos.

Berry. A more recent major cross-cultural study by Berry (1976) has been published where cognitive styles are studied in relation to ecology, culture and acculturation. In a sense the present study is the accumulation of three previous studies with the cross-cultural and ecological focus. The first, reviewed earlier, contrasted an agricultural with a hunting society and used a western community as a control. The second study, reported in Berry and Annis (1974) related to a number of hunting and gathering groups in North America. The third study related to a single culture within the hunting-gathering

category. In these samples, more or less traditional and acculturated groups were identified. The hypotheses examined were 1) that the nomadic (loose) will be more highly differentiated, 2) the more acculturated will be more similar to the Western samples on FID, and 3) acculturative stress will be highest for those at the nomadic end of the ecocultural dimension. These were elaborated into a number of discrete statements but summarized here. An ecological index was calculated using information from the Human Relations Area Files, this index combined information regarding exploitive pattern (animal husbandry, agriculture, gathering, hunting) which also gives an index of "food accumulation." Settlement pattern ranged from sedentary to nomadic, and mean size of the community, and was factored in with the exploitive pattern. A cultural index was calculated which combined degrees of political stratification, social stratification and family organization. Socialization was scored for strictness by parents and self-rating on three values, with a compliance-assertiveness rating for each culture. All of these correlated to a relatively high degree (0.84) and so were combined in the ecocultural index. An acculturation index was also calculated using levels of western education, wage employment and urbanization. These indices were then correlated with the FID measures, in this case the KBD was used for all groups. The EFT for one, and the PRFT for one. Raven's Matrices was also used for all groups, and the Morrisby Shapes for one group. The EFT was abandoned for the second and third groups due to the low level of interest in doing it, and the KBD became the criterion test, for the people considered it to be a game. The EFT and Kohs Blocks

Designs correlated on the average at 0.68 where they both were used, so they share about 46% variance. One of these correlations was especially low, the Temne Traditional sample was 0.45, where only 20% of the variance was shared. The average correlation between the EFT and Matrices was 0.49 and between the KBD and Matrices was 0.58. The correlations between these tests and years of education are interesting, KBD-education was 0.43, EFT-education was 0.49, and Matrices-education was 0.45, nearly as high as the intertest correlations. The PRFT did not correlate with education. As different measures were used to assess the FID dimension and the shared variance was not high, the degree to which the style is measured might be called into question. The correlations with the indices for ecology, culture, acculturation and socialization were significant, though marginally so for some. The ANOVA variances were significant for all the cognitive measures and the two indices for the first group, also between the KBD and indices for the second group. The acculturation index and the KBD, Matrices and PRFT did not reach significance for the third group. With respect to acculturative stress, two unexpected findings emerged. It was found that the more differentiated individuals exhibit less stress, while the groups at the nomadic end (loose) of the scale experience more. This was explained as a difference between the way the correlation was calculated, once on the individual level, and the other as groups. The other is that as acculturation progresses, the stress is less. This is taken to indicate that as the differential between the community and the source of acculturation is reduced, the stress becomes less. Socialization was not found to be as strong as

usually appears. So the ecological and cultural elements are considered to be important determinants in the FID styles. It is understood that styles are adaptive to the requirements of the culture and ecology. As a large amount of data is presented, this is clearly a very summary resumé. One or two comments, however, are pertinent. For the cultural index, political and social stratification are highly interdependent, and should not be given separate treatment. Obviously in a society that organizes 50,000 or 50,000,000 people, a more complex political structure will be required to coordinate the population than for groups of from 100 to 200 persons. At the same time, as social stratification is coordinate with the economic levels, and the political levels, all make up various aspects of one continuum. However, in the process of placing values on them, most of the specific and critical differences disappear, for instance is it culturally equivalent to place the U. S. stratification system in the same category as the caste system of India? In fact even the degree to which extended families exist is in inverse proportion to the complexity of the socio-economic system. As with the three valued socialization dimension, little is revealed even though complex measures and calculations are employed. Of note also is that years of education correlate with the FID tests almost as highly as they correlate among themselves.

Summary

In conclusion, the literature on cognitive styles is extensive, especially for the FID dimension. At the same time serious questions are posed with respect to the background assumptions regarding

cognitive development, the assertion that the strictness of socialization practices determines the degree of independence as analytical abilities, the definition of terms, the validity of the testing procedures and their interpretation. These issues will now be examined.

CHAPTER III

METHOD AND ORDER OF STUDY

Theoretical Formulation

The work on cognitive styles doen by Witkin and his colleagues comes from the background of work chiefly in Gestalt psychology, and especially from the work of Werner (1948) and Lewin (1935). The statements setting forth the theoretical foundations of the work are scattered, and nowhere brought into a concise and ordered system. The following quotations and paraphrases appear to provide the principal statements containing the definitions and hypotheses from which the testing programs are taken.

Differentiation

"Differentiation refers to the complexity of a system's structure", therefore the contrast is between a relatively homogeneous vs. a relatively heterogeneous structural state (Witkin 1962:9). In a highly differentiated system, functions are specialized, in a relatively undifferentiated state, the functions are performed by the system as a whole (1962:9). In reference to psychological systems, the degree of specialization refers to the "degree of separation of psychological areas as feeling from perceiving, thinking from acting". This assertion means that the organism makes specific reactions to specific stimuli as opposed to diffuse reactions

to any variety of stimuli (1962:10). With this understanding a high level of differentiation means that a "clear separation is made between what is identified as self, and what is identified as external to the self" (1962:10).

Integration

Integration refers to the form of relationships among system components and has two characteristics, effectiveness (harmonious working), and complexity (elaborate) which is determined in part by the level of differentiation (1962:10).

Development of Differentiation

The psychological system is "in its most undifferentiated state early in development, and becomes more differentiated as development progresses" (1962:11). This implies "that very early in development the child experiences himself and his environment as a more or less amorphous, continuous mass" (1962:12). A growing awareness of the difference between the inner and outer within the body-field matrix takes place. The self is defined as "the systematized awareness the person has of activities and qualities he identifies as his own" (1962:12 note 3). The degree of the sense of separation from the mother indicates the degree of development of the sense of a separate identity. For the differentiated self, experience is relatively articulated--analyzed and structured--rather than global (1962:13). Thus the perception of objects becomes more discrete and more highly articulated, i.e. organized, so the differentiated person is able to impose structure or organize a field

(1962:14). For the field-independent person, objects are experienced as discrete from their backgrounds, the more field dependent person tends to experience his surroundings in a relatively global fashion, "passively conforming to the influence of the prevailing field or context" (1962:35). During development, controls and defenses become more structured, making it possible to channel impulses, delay expression and protect itself against disturbing effects. Standards and controls are internalized (1962:14-15).

Value Assignment

"The differentiated person has richer, more diversified resources for coping, and is therefore to be more highly valued" (1962:21).

Differentiation Hypothesis

The differentiation hypothesis is:

> Specifically, the differentiation hypothesis proposes an association among the characteristics of greater or more limited differentiation, identified in the comparison of early and later functioning in each of several psychological areas: degree of articulation of experience of the world; degree of articulation of experience of the self, reflected particularly in nature of the body concept and extent of development of a sense of separate identity; and extent of development of specialized structured controls and defenses. Implicit in this hypothesis is the view that greater inner differentiation is associated with greater articulation of experience of the world (Witkin *et al*, 1962:16).

It is expected that there will be self-consistency, which means that "the indicators of differentiation are expected to be significantly interrelated" (1962:25-26). "The core of the field dependence dimension is the capacity for analysis of experience", therefore the hypothesis is that people will be consistent in their performance of

cognitive tasks--perceptual and intellectual--which require analytic functioning (1962:27). The capacity for the analysis of experience (parts of a field are apprehended as discrete from their backgrounds) is studied in relation to the capacity for structuring experience (organization is imposed on a field lacking it).

> During the growth years there is a general trend toward differentiation, but it is possible that as a child grows he may maintain his position on the differentiation dimension relative to his age group (1962:31).

Cognitive Style

Cognitive style is defined as

> the characteristic, self-consistent modes of functioning found pervasively throughout an individual's cognitive, that is, perceptual and intellectual activities (1967: 234).

Further, the characteristics of styles are 1) concerned with the form rather than the content, referring to individual differences in how we perceive, think, solve problems, learn, relate to others, etc. 2) They are pervasive dimensions. 3) They are stable over time, this is not to deny that they do change, some may be easily altered. 4) They are bipolar with respect to values, each pole has adaptive value, therefore they are different from intelligence and other ability dimensions (1977:15-16).

Provisos

Two provisos are stated as being understood. The first is that any behavior is the result of many determinants, therefore any evidence for differentiation will reflect the influences of other determinants as well. The second is that "This is a way of

describing a particular kind of psychological consistency, questions of causal relations remain to be answered" (1962:16-17).

Issues Raised By The Literature

From the review of the literature a number of the above statements were questioned. These might be classed as theoretical issues, ones regarding testing, issues that conflict with postulated relations among the different variables, and finally, interpretations that are at variance with the above formations, and the interpretations that are made in the writings of Witkin and others.

Theoretical Problems

A number of authors, as they have analyzed the terms and sought to test different aspects have found that there is a lack of clarity in the theoretical statements. There is a tendency to overgeneralize, and to make unwarranted extensions into many areas of functioning where the terms do not appear to apply. There is a continual shift from more limited and circumscribed attribution to more general and less specific attribution in more recent years. A number have stated that the whole theory has not been well analyzed.

Another major area, related to the previous one, is that the definitional basis is not adequate. The contention is that there is considerable variability in the use of terms, that they have been defined in one form, and then the meanings extended to cover other areas. Also it has been pointed out, that many of the definitions are sufficiently vague that it is difficult to define equivalences, especially in cross cultural contexts.

Testing

In the area of testing, there is the question as to whether operationalizing the concepts is justified in the form in which it has taken. This of course, raises the whole question of validity. Again it is said that the use of the tests is not consistent, nor clear. For instance, is the dimension defined as the intersection or the union of the set of characteristics that the tests sample? Do the tests pertain to one, or a multiplicity of factors? Due to the lack of definition on this question, there is the question as to whether the set of tests must be used as a whole, or whether they can be legitimately used individually to indicate the presence of a particular style. It has been pointed out that the shared variance between the criteria tests is low, over the replications examined. This is even more critical when other tests, not in the original set, are used to test the style, and are of even lower levels of shared variance. The conclusion to which some students have come is that we do not know what is being tested. It is necessary to evaluate this assertion. There is the question of the relation of these tests to ability measures, for many see them as just that, is this position justified? Finally, with the use of projective tests, and especially the Draw-a-Person, the question again is raised with respect to what is measured, is it true that the self concept is being sampled?

Relations with Other Areas

Within the work on styles, there are a number of relations that have been proposed, and evidence of one sort or another examined

to substantiate or disconfirm the relation. For instance, it is said that cognitive style is unrelated to intelligence as tested by certain parts of the intelligence batteries, and is not related to the concept when taken as a whole. Yet certain correlations indicate that the relation exists. Another is with education, it is stated that cognitive style is not a function of education, yet in many observations, there is a relation that appears in the data, what does it mean? Again a relationship is proposed between socialization and cognitive style, the way children are reared, is postulated to control the development of a differentiated style, the evidence is conflicting.

Interpretations

From the evidence of the tests many and varied interpretations have been made, not only by Witkin and his associates, but by other investigators. For instance, there is the question of whether the FID tests are spatial tests, and whether the kinesthetic aspects of certain ones of them do correlate with the other criteria tests. Does the contention that the ecology is a determinant in the formation of differentiation hold up, and how can it be interpreted? In what way is FID related to impulsiveness in people, or assertiveness? Some would link them. How is FID to be interpreted cross-culturally?

The Philosophical Basis for Evaluating Styles

From the foregoing questions raised by the literature, it is evident that serious challenges have been mounted with respect to the concept of cognitive style, and the differentiation hypothesis.

In light of these challenges, how can an evaluation be made that will allow their credibility, and what consequences do they have for the whole concept? In order to establish some basis for this step, we turn to the philosophy of social science.

Goals of Science

The goals of science are to explain the phenomena that are observed in the world, and to predict outcomes of particular conjunctions of events, or properties. The goal of social science is no different. Theories provide these explanations. A theory is "a systematically related set of statements, including some lawlike generalizations, that is empirically testable" (Rudner 1966:10). In the process of formulation and testing theoretical statements, some methodology must be used. As Kaplan points out,

> methods includes such procedures as forming concepts and hypotheses, making observations and measurements, performing experiments, building models and theories, providing explanations and making predictions (1964:23).

It is the contention here that there has been a vast amount of observation and numerous measurements regarding style, but that little has been done to refine and organize the information on any adequate foundation of theory and set of concepts. In order to correct this tendency, it is vital to analyze the most critical aspects of the work done on styles, and from this basis, project new hypotheses, and observations that will advance the understanding of cognitive processes. Thus, the focus will be on theory, refining hypotheses and concepts in order to enhance the understanding of cognitive processes.

Theory

Kaplan defines a theory as "a system of laws....the theory explains the laws....in the same sense that a law explains a fact, by relating it, not to an abstract entity, but to other facts" (1964:297). Again he states that a

> theory will appear as a device for interpreting, criticizing, and unifying established laws, modifying them to fit data unanticipated in their formulation, and guiding the enterprise of discovering new and more powerful generalizations (1964:295).

Rudner points out that most theories in the behavioral sciences are not theories in this sense, but definitional systems. From this standpoint they can be neither confirmed nor disconfirmed, for the simple reason that the work consists of a series of definitions, placing names on certain observed entities. As long as the entity is observed, the naming process is purely arbitrary. On the other hand, the lawlike generalizations, what Kaplan calls "nomic generalizations" are the statements that are organized into a system that is the theory. These statements must meet certain minimal requirements: 1) be truly universal, unrestricted with respect to time or space; 2) not vacuously true, unless derivable from other laws; 3) the evidence must not coincide with the range of application, thus the range should not be closed; 4) they should be derivable from other laws, i.e., play a part in a scientific theory; 5) they must be true. As the differentiation hypothesis is examined, and the generalizations derived from it are considered, these criteria will be helpful in judging the adequacy of the statements.

Assessing the Differentiation Hypothesis

The differentiation hypothesis then is considered to be a series of statements affirming certain things with respect to the development of cognition in the human. The statements declare that certain actions produce certain results, and these can be measured with a particular set of instruments. As has been shown, there are a number of challenges that have been made to the statements, one of the chief ones relates to ambiguity in the definition of terms, and in their use within the theory. The attempt is made to specify the theoretical assertions made in the theory, and examine the terms as defined in the literature. One important issue with respect to this problem is that which Kaplan refers to as "systemic meaning". He says

> the systemic quality is what makes the analysis of theoretical terms so difficult. What begins as an effort to fix the content of a single concept ends as the task of assessing the truth of the whole theory (1964:57).

Due to this fact, what began as an enterprise to understand and evaluate the term "cognitive style" in the framework of the differentiation hypothesis, must end with an evaluation of the whole theory.

Systemic Meaning

"Systemic meaning is always open, for the set of propositions making up a theory is never complete" (Kaplan 1964:65). Consequently as the search is made to understand and define the terms of the theory, there are inherent two types of problems regarding ambiguity and indefiniteness of definition that must be taken into account. First, in some sense, the terms used in a theory are ambiguous since

theoretical terms are defined in part by their position in the system, and if the system is open, and the set of propositions never complete, the definition can never be completely free of ambiguity. However, one of the activities of scientific investigation is precisely this, to reduce the ambiguity, and thereby contribute to the clarity of the theory. The second problem, on the other hand, is the ambiguity and confusion due to importing natural concept connotations into a theory when the words used have meaning, not only in the theory, but also from extensive use outside. The first of these problems can not be completely solved, for it is inherent in the nature of theory that some indeterminateness will always remain. The second problem, however, is more troublesome, but in some degree it is possible to control. It is the case where unexamined premises slip into and alter the course of scientific discourse so that the meaning of terms does not remain constant. This is particularly troublesome in psychology.

Criteria of Utility

A further criticism must be used in this study. The purpose of a psychological investigation, as is the case of most that will be examined, is to understand human cognition, and to develop a theory that will describe and explain its functioning. The present study has another focus, it relates to the value of the concepts and theory in the practical problem of teaching in a cross-cultural situation.

> Whether a concept is useful depends on the use to which we desire to put it; but there is always the additional questions whether things so conceptualized will lend

> themselves to that use. And that is the scientific question (Kaplan 1964:51).

So while the formation of a theory or a concept may be valid and useful for one purpose, it may not be for another for the simple reason that it does not provide a useful way to construe differences that lead to practical applications in a given field of concern. A very simple example is the scale of measurements of energy. For instance, food values could be specified in calories, but the numbers are of such a magnitude that they would be inconvenient to use, so they are listed in terms of kilocalories, though in common discourse these are designated "calories." Another way to state this criterion is that a statement is meaningful if it makes a difference in a decision. It is then analyzable in terms of the difference it makes (Kaplan 1964:43). This sense of the criterion is valuable in the present context, for though a variable may be distinguishable, and be statistically significant, and it may be important in an explanatory theory of mental functions, if the difference is very small, or if it cannot be influenced by techniques within the capabilities of the teaching situation, the concept or theory may be of no value in making a decision.

Grounded Theory

As has been mentioned, part of the scientific enterprise is the elaboration of concepts, laws, and theory. Glaser and Strauss (1967) propose what they call "grounded theory" as an important, but frequently neglected area of research. By grounded theory they mean one that has the following qualities: it is integrated,

consistent, plausible, close to the data, clear enough to be operationalized--at least partially--and saturated. Integrated refers to the same idea that Kaplan calls "systemic," that is, the statements link one another to form a set of relationships, a network, an interlocking system. Consistency, of course, refers to the issue that the statements not only be linked, but also not contradict each other. The issue of plausibility means that the theory sould make sense conceptually. This point may be disputed due to the fact that what may seem plausible for common conceptualizations may be completely erroneous. While this is true, concepts and constructs usually do make sense, and only in rare instances are they completely contrary to what independent analyses by thoughtful and knowledgeable people would consider conceivable. The quality that the theory be close to the data is assumed. The danger of spinning off theories with little reference to cases can, of course, be disastrous. A major problem is with the attribute that the theory be clear enough to be operationalized, at least in part. Much theoretical work is at a sufficiently high level of generality that it can not be directly related to specific facts. Yet if the link between theory and evidence is not clear, there may be good reason to question whether the hypothesized relation exists. The quality of saturated refers to the idea that all points of the theory should be related to evidence, each part supported as much as possible. The authors point out that to be saturated does not imply exhaustive, for there is much information that can only be brought to bear fruitfully once the general outlines of the theory are

delineated. These criteria will serve to assess the value of the work on cognitive styles.

Order of Investigation

In order to understand the theory, a brief discussion of the antecedent concepts and history will be introduced. Following this the statements regarding psychological differentiation will be listed in order so that they may be examined in detail. It will be seen that when this is done, certain problems of internal consistency emerge. Also, there is a very limited number of theoretical statements, so that most of the assertions are definitional. In this sense they are not susceptible to confirmation or disconfirmation.

Testing

The largest number of challenges to the theory have been made in this area. First there is the issue as to whether the operations used to test the theory are in fact ones that display what the theory purports to examine. The use of the tests themselves must be examined, for the issue of how the tests are used together to define the scale of differentiation is not clear. This is to say, is differentiation the factor that is tested by the three criteria tests in common, is it what any one of them test, or is it what they all test together? The conflicting reports on replications will be examined in order to see what this implies for the validity and reliability of the tests. The relation between ability tests and the FID dimension will be examined and the relations between the criteria tests and other tests used in the study of the implications of cognitive style will be examined.

Relations and Interpretations

The relations that are stated to exist between the FID dimension and other variables will be examined next. There is conflicting evidence, as seen in the last chapter, which must be reconciled. Interpretations have been made in a wide range, and these also will be examined to understand how they fit into the theory and how they hold up in light of the criteria discussed above.

Conclusions and Implications

The results of the study of the thory, and the evaluation will lead to conclusions with respect to the viability of the theory and how it might be modified or altered to resolve the conflicts that have arisen in the course of replications and extensions of the testing program. It will be proposed that certain major changes need to be made in the formulation of the hypothesis in order to account for the conflicting data. This will involve more exact definition of terms, recasting the developmental process in more precise and in process terms, and suggesting that the differentiation studies to date are in a static framework, and would better be organized in an information processing model.

Implications for Cross-cultural Education

From the evaluation and reformulation of the theory, the implications will be drawn for the use of these studies in further investigation of cross-cultural psychology, and also for the area of cross-cultural education.

CHAPTER IV

COGNITIVE STYLES AND COGNITIVE DEVELOPMENT

Background of Cognitive Styles

The word style has a long history, the word coming from the Greek and Latin. The Latin is of most interest for it referred to the stylus, the instrument of writing, and also the manner of writing. This second sense comes into the English as, for instance, when Webster defines style as:

> Mode of expressing thought in language; especially such use of language as exhibits the spirit and personality of the artist: characteristic mode of expression; as a terse style. Distinctive or characteristic mode of presentation, construction or execution of any art, employment, or product, especially in any fine art; also distinctive manner or mode of singing, playing, behaving, etc. The quality which gives distinctive character and excellence to artistic expression; as his writing lacks style. Status or character of being in vogue or in accord with the accepted standard of elegance; fashionable mode...(1961:842).

As will become apparent, most of these meanings appear at some point in the study of psychological styles. Literary, musical and artistic styles are, of course, the most prevalent usages. A curious thing about them however is, that in each field, style refers to something so distinctive and subtle that sensitive and knowledgeable people can distinguish the author or artist who produced the work, yet all efforts to verbally express what is

distinctive are extremely difficult, and tend to leave one feeling that the essence has not been captured nor expressed (Allport, Walker and Lathers 1934)69). Allport has further said,

> One concludes that style is not a manner of mechanical arrangement of grammatical and rhetorical figures. It is simply the personality expressed in writing. *Le style est l'homme même.*

He continues, "Style is a characteristic not only of any verbal expression, but of any articulate, complex-level of activity as well." He then quotes Katzenstein (1932:41) regarding a study he made, saying "In no two cases were the styles of work the same, and in no instance did any standard test, or combination of tests reveal the style" (Allport 1937:492-493).

Styles and Types

Vernon (1973) identifies styles with types in psychology and traces their history to the Greeks and Romans, but finds the earliest uses of the word style in its present sense to be in the early fifties, and generally equivalent to attitudes, dispositions, orientations and ways of coping with conflict. To show how varied the term is, and where it appears, Kaplan in his work on inquiry into the behavioral sciences (1964:259) identifies a series of "cognitive styles" in science. They are literary style, academic style, eristic style, symbolic style, postulational style and formal style. As a search is made of the literature, many such uses appear for the term style and not infrequently the exact expression, "cognitive style."

Purpose of Styles

In light of the difficulty of finding something so elusive and subtle, and the lack of previous success with style studies and typologies in other areas such as linguistics and anthropology, what reason is there for pursuing them further? The most cogent reason is as an attempt to bring order into the complex field of perception, cognition and personality. Due to the complexity of the field, any technique that can serve to increase our understanding of mental processes, anything that will aid in predicting human behavior should be explored. Of course, the term style in this sense is not to search out the elusive but to focus on major variables. In the end it is an heuristic for simplifying information in order to understand it. The question that must be asked is, does the concept of style provide any structure and organization that can not be found in the other conceptualizations? In other words, does the theory presented in style studies provide more clarity and understanding than other approaches? One problem that is of particular importance arises concerning this term. As "scientific theories are to be construed as artificial or constructed language systems, not as natural language systems," (Rudner 1966:12) there is the continual tendency of using the term *style* as a technical term, and then reverting to natural language connotations in its subsequent use. We now turn to the term as used in psychology.

Derivation from Gestalt Psychology

Witkin's cognitive style is derived from Lewin and Werner's concept of cognitive and personality development. This concept is

an analogue of the biological concept of development, specifically, that of the theory of evolution, i.e. that higher organisms are more highly differentiated, and have a more complex integration of fuction, which in lower organisms are managed by less specialized structures. This is to say that in more developed organisms, there are specialized subsystems, organized into larger systems to respond to the demands of the environment. The developmental hypothesis basically is the recapitulation theory transferred to the field of individual development, "ontogeny recapitulates phylogeny." Thus cognitive development in the individual is conceived initially to be global and diffuse, unorganized, with no specialized cognitive structure. In this sense a child responds with non-specialized responses "globally", while as he grows, the cognitive structure becomes more complex, differentiated, and finally integrated into adaptive structures that then remain basically unchanged for the remainder of life. The hypothesis rests to a good degree on the observation that the neonate responds to any stimulus with movements of the whole body, while later, specific organs and specialized responses are used to react to specific stimuli. Note that complexity of response, or of response to complex displays is interpreted to directly imply complexity of cognitive structures within the individual.

Resumé of Theory

If the theoretical statements made by Witkin and his associates as summarized in Chapter III are collected and reduced to their basic

meaning, the following represents the fundamental statements of what is known as the differentiation hypothesis.

1. Greater differentiation is associated with greater maturity.
2. People will be consistent in their performance of cognitive tasks (perceptual and intellectual) that require analytical functioning.
3. Indicators of differentiation will be correlated significantly, i.e., there will be self consistency in the individuals' responses.
4. Greater inner differentiation is associated with greater articulation of experience of the world and of the self.

In line with these four assertions that are designated as the differentiation hypothesis, the following definitions are given:

1. Differentiation means that:
   a. A system's structure is highly complex.
   b. The state of the system is heterogeneous, rather than homogeneous.
   c. Specialized subsystems carry out specific functions.
   d. There is a high degree of separation of "feeling from perceiving, thinking from acting." This implies that there will be a specific reaction to a specific stimulus in contrast to a diffuse reaction to any specific stimulus. It also implies that there will be a perceived separation of the self from the non-self, especially from the mother.
2. Articulated means to be analyzed and structured.

3. Global refers to the opposite of differentiated.
4. Integrated means to have differentiated parts organized into higher systems that function as a unit.

As the first assertion of the differentiation hypothesis is that the individual becomes more differentiated as he or she matures, the following changes take place with differentiation. Differentiation implies:

1. Awareness of inner-outer contrast
2. Awareness of the body-field matrix
3. Awareness of the difference between the self and the mother
4. Awareness of the self as articulated (analyzed and structured)
5. Awareness of objects as discrete, and organized
6. The ability to impose structure, or organize a relatively unstructured field.

Theoretical Issues

The challenges to the cognitive style theory of Witkin are of two kinds. One relates to the assertions of the theory itself, the other relates to the definitions of the terms themselves.

Theoretical Assertions

As listed, there are four assertions that are stated to be the "differentiation hypothesis." It should be noted that none of these statements is "lawlike", none relate cause to effect, but each affirm an association. This is in line with Witkin's caveat that the theory makes no statements about causes. These four statements are integrated in the sense that they all refer to the same concept,

differentiation. The first statement is generally accepted by psychologists at present, at least if Kagan, Moss and Sigel (1963:73) are correct, though they relate it only to perceptions and concepts, not to other cognitive processes. Later Witkin does specify a causal relation, though it is not specifically called the differentiation hypothesis. This assertion is that:

> children who differentiation is limited have had relations with their mothers of such a nature as to interfere with the opportunities for psychological differentiation: and that highly differentiated children have had relations with their mothers of a nature that permitted or even fostered progress toward differentiation.

The subsidiary hypothesis is that more differentiated mothers tend to have more differentiated children (1962:273). It will be noted that though the first of these statements does make causal references, such as "interfere with," "permitted or even fostered," that they are very weak, and a further association is the assertion in the subsidiary hypothesis. This, however, is made more explicit by Dawson (1967) and accepted by Witkin (1967) in the sense that strict child rearing practices produce a more dependent style in the child. It is evident that the statements of expected associations depend on the meaning assigned to the terms. Therefore it is necessary to examine the definitions in order to understand the implications of the theoretical statements.

Definitions of Terms

The terms of the theoretical statements are frequently only assigned meaning indirectly or parenthetically. The most important terms, cognitive style and differentiation, however, are given a series of definitions. The principal terms will be considered in order.

Cognitive Style. For Witkin, cognitive style is one of two types, variously named differentiated/undifferentiated, field independent/dependent, or articulated/global. The term is defined as

> characteristic, self-consistent modes of functioning found pervasively throughout an individual's cognitive, that is perceptual and intellectual, activities (1967: 234).

The term is used in various ways in the literature. Some refer to it as a factor, and do factor analyses of the tests to identify it (Kagan *et al.* 1963; Gardner *et al.* 1959, 1960; Vernon, 1973). Others see it as habits of perceptual inference (Segall *et al.* 1963), others as a way of judging, deciding or categorizing (Johnson, D.M. 1972: Kagan *et al.* 1963; Cohen 1969; Schroder, Driver and Streufert 1967), as modes of perceiving according to the senses, as aural, visual (McClelland 1951; Horowitz 1970), or as modes of thinking or coding information, process variables (Cohen 1969; Horowitz 1970; Hettema 1968). Additional different definitions could be cited. The issue of importance is that each represents something different, though the interpretations overlap. Most refer to a variety of rules, factors, processes which are in contrast to the single FID dimension. For psychological differentiation, the individual's place on the dimension is said to be his cognitive style. Therefore, for Witkin, cognitive style is almost synonomous with being either global or articulate. The issue raised by Wachtel (1972a) is whether it is possible to characterize individuals along any one dimension, and expect that that will be a key to the person's personality and the many complex relations that exist between

different aspects of cognitive functioning. Of course the answer is that it is not possible. While it is legitimate to measure any one dimension, the problem is when that dimension is extended and over-generalized, it includes many aspects of cognition that are only very peripherally related.

Differentiation. Differentiation is, in Werner's theory, a state of the cognitive structure in the individual who is mature. As mentioned earlier, it appears that the concept is derived from the quasi-biological model, in which higher organisms have a more differentiated structure. The same presuppositions seem to provide the background for Witkin's use. For instance, it is stated that differentiation means that a system has a high level of complexity, that it is heterogeneous rather than homogeneous, that there are specialized subsystems, and a high degree of separation between feeling and perceiving, or between thinking and acting. At this point, however, the biological analogy breaks down, for presumably there has to be something that is structured, and what this something is, is never made clear. Reference is made to complex cognitive structures, but what is structured? For others a psyche, a soul, or memory might serve, but here there is no indication given as to what this might be. For Piaget, for many cognitive psychologists and for those who use an information processing model of mental processes, it is clear that the memory is what is structured. When others refer to cognitive complexity, they generally are referring to the complexity of concepts, the complexity of the interrelations between them, and the ability to keep these separate or to combine

them. In any case, Witkin's reference seems to be to something internal, for the fourth theoretical statement is that greater internal differentiation is associated with greater articulation of experience of the world and of the self. The only indication of what type of separation this might be is that perceiving would be distinguished by the individual from feeling, and thinking from acting. In this context Kagan and Kogan remark that:

> On the one hand, differentiation was originally defined by Werner as a heuristic principle that does not lend itself to experimental acceptance or refutation; its value lies in the network of constructs generated by it. For Witkin, on the other hand, differentiation has become an explanatory, higher-order construct capable of tying together a diverse set of lower level dimension (1970: 1341).

Differentiated Structure. In natural language, differentiation has two basic referents. One refers to making a distinction, discriminating a difference between two things. The other refers to being differentiated, or divided into parts. Witkin appears to combine the two in the sense that the differentiated person, the one with a complex internal structure (whatever that may be) can make fine external discriminations. On the level of conceptualization this would be supported by other psychologists. For instance Saltz (1971:66) discussing the conceptual structure, which refers to the organization of concepts in memory, remarks that when there is a greater correlation between attribute dimensions, a person can make fewer distinctions, and therefore has an impoverished cognitive space. That is, if concepts are loosely defined, many instances can be included, and the clear distinctions are not made. This is similar to what Bruner and Tajfel (1961) designate as narrow vs.

broad categorizers, or Gardner *et al.* (1959) find as equivalence range, a factor that did not load on any FID tests. In this sense, the complex person would make many discriminations and the less complex person would make few. The same appears to be the meaning of differentiation for Kagan, Moss and Sigel (1963:73) where they say that a four year old reacts to a stimulus-as-a-whole, taking a label or name and overgeneralizing its use, thus the attribute named is "global." There is a question regarding whether a child does over-generalize or not, which will be discussed later, but the thrust of the argument is the same as Witkin's, that the more complex person will be able to make finer discriminations. But this does not seem to be the type of complexity to which Witkin refers, for he refers to the internal divisions, not within a conceptual space or structure, but between "perceiving and feeling, thinking and acting." This does not appear plausible. For instance, the temperamental artist does not appear to separate feeling from perceiving, yet is capable of making exceedingly fine discriminations in his field, be it music, painting or writing (Johnson, D.M. 1972: 348). The other definitional statements are quite clear for systems in general as being simple or complex, homogeneous or heterogeneous, specialized or unspecialized with respect to function. However, the way these relate to a person is not made clear. As Rudner says (1966:30) "Obscurity of the primitive basis is ground for rejection of definitional schemata."

Global. The term global is only defined negatively by Witkin (1962:13 note) where it is used as the opposite of "analytical,

structured, articulated." These three words are used to define differentiated, so global is the other end of the continuum. A person can be unanalytical, not given to analyzing perceptions and concepts. Structured and articulated presumably refer to an organization of parts, though what parts are organized, or how is nowhere clear. Cohen makes use of the term saying that for the relational person "only global characteristics have meaning" (1969:830). Apparently an effort is being made to assign a specific meaning to the term. However, if there is a characteristic, it must be discriminable, if this is so, in what sense is it global? As with the term differentation, global is not related to a person's structure, nor to attributes in stimuli in any understandable way. It would be possible to assign it meaning in the context of conceptual structure. For instance, a term that is more general, that is, of an hierarchically higher level, is more global, for it ignores the differences in the subsidiary categories, in placing them in the higher level one (Bower 1975:46). This would be the sense in which a person could be a broad categorizer, or who has what Saltz refers to as weak boundary strength between concepts in conceptual space (Saltz 1971:447). As Biggs points out, this may be the case of the person who is freed from ikonic thinking which is rich in detail and more concept oriented (1968:70), but this would ordinarily be understood as the more mature person in Bruner's understanding of development. Inhelder and Piaget (1958:9-10) use the term global in a slightly different sense, and for them it does refer to the less developed person. Discussing the way a concerete

operational child thinks (not perceives) about the billiard ball problem, they say he is still "too global to lead to an analytic breakdown of the observed angels." Here the maturational sequence is similar to Witkin and global refers to the lack of analysis, but it is the situation that is not analyzed, not the person himself.

Integration. While global is the opposite end of the continuum from differentiation, integration is the opposite process. Differentiation is breaking up a whole into its consituent parts (analysis) and integration is reassembling them into the whole (synthesis). In this sense differentiation is similar to articulated. Witkin states that integration has two aspects, effectiveness and complexity. Complexity refers to the product of differentiation, in that only highly differentiated structures can reach high levels of integration, or articulation of parts. Effectiveness refers to the degree to which the parts function together harmoniously. Witkin states that it is possible for a person to be highly differentiated, overintellectualized, and not adequately integrated so that a pathological situation exists. A curious reversal may appear in the interpretation of tests when considering integration. For instance, a person may perceive an entity as a whole; is he global or highly integrated? The integrated person presumably can make the analysis and discriminations of reducing a stimulus to its parts, and then put them together again, so that he responds to the whole. At this point there would be no way to judge whether the person was global or integrated without a detailed analysis of each individual response. Therefore with this concept it is possible to interpret any test

according to the desired outsome. Thus if a mature subject responds to a whole, he is highly integrated, if a less mature person responds, he is responding globally. Integration is defined as the combining of structures into larger wholes. As Allport (1937:138) says regarding those who postulate integration as a principle, they

> never doubt that integration is an unalloyed good, and disintegration is an incarnation of evil. But it is not always clear to what psychological process all this incantation refers.

Again the biological analogy is called in, but fails to provide an analogue in the psychological field that corresponds to the integration of, for example, the respiratory system. In the end not much is made of integration, the emphasis is on differentiation.

Development

The principal assertion that Witkin makes is that development proceeds from a more global or undifferentiated state to a more differentiated or articulated state. This is conceived as a change in the perception of the self as distinct from the mother, the self as aware of its own properties in contrast to the environment, and also the ability to make discriminations of objects and other stimuli external to the self. He says

> it is difficult to imagine rapid progress in development of an articulated way of experiencing the world without accompanying development of self-differentiation (1962: 17).

Thus the basis for testing is that the level of internal organization in the individual is reflected in the capacity to discriminate, analyze and structure the environment. The terms field-dependence and field-independence (or just dependence) are used to describe

the relation with the mother, the child becoming more independent as he grows. This is interpreted then in terms of field and figure in Gestalt terminology, so that as a person grows, he becomes more able to separate figure from ground, or context. One of the problems with the theory is this tendency to allow terms to wander, gradually moving from one meaning to another closely associated, using different connotations of each word. It should be noted that all of the testing involves figural material, none is semantic. In more recent writings the term "disembed" takes the place of differentiate, or analyze. It is this that increases with age.

Resumé

Reviewing the theoretical aspects to this point, first there is no theory in the sense of a set of integrated, lawlike statements that can be empirically tested. Except for one causal sequence of socialization influencing the development of differentiation, no other theoretical statements are made. The other statements are primarily definitional, or assertions of possible associations. Since definitional statements can neither be confirmed nor disconfirmed, the only test for their adequacy is consistency of use and clarity. The definition of terms has been seen to be ambiguous and not well specified. The subsequent use of terms has varied, tending to migrate with the connotations of various words that were initially considered to be synonomous within the theory. In this sense the examination of the theory of cognitive styles confirms what others have said, that it is not clear to what the theory refers and has

not been adequately analyzed (Cattell 1965:141; Sherman 1967:297; Vernon 1973:139; Handel 1973:264; Wachtel 1972a:188).

Tests and Testing

Operational Definitions

As Witkin has explained, the theory of cognitive style and psychological differentiation grew out of a testing program for perception. The criteria tests were used, and over the years re-interpreted in terms of a successively more general view of their implications. As Kaplan points out, validity can be established in two ways; by selecting tests that measure the defined variables, or by using the tests to define the variables; "intelligence is what IQ tests measure." The second of these criteria has been used to define cognitive style. Kaplan calls attention to the danger of this approach in the same passage, saying:

> A measurement may succeed in measuring what it purports to measure because the procedure itself plays an important part in specifying the meaning of the term naming the magnitude in question . . . . Unfortunately, it often happens that what is claimed to be a specification of meaning does not in fact perform that role. What we are given is a pseudo definition: the term is not always used subsequently in ways that are fixed by what is claimed to be its definition (Kaplan 1964:198-199).

As has already become clear, the cognitive style approach has fallen into this trap, by extending the use of the names assigned in ways the tests do not define. As Guilford points out, the only way to control this "naming fallacy" is to use other tests with face validity as controls, so that the mutual relationships will support each other (1967:161). In the defining statements of the hypothesis,

as listed previously, numbers 2 and 3 state that people will be consistent across analytical tasks, and that the indicators of differentiation will be correlated, that is, the FID tests will correlate with one another. With the statement that there will be intercorrelations there can be no question, the data settle the issue. Since it was already known from previous tests that they did, however, the statement carries no new information. The other assertion, that people will be consistent across tasks requiring analysis requires an examination of the tasks to see if they do require analysis.

Analysis

Analysis in the usual sense of the word is to subdivide an entity into its significant constituent parts. It is an attempt to break a whole into parts in such a way that the whole can be understood in a way not possible before analysis. If the EFT is examined in this light (Figure 2) and the initial figure is considered the significant part, then it appears that the test is valid, for it requires the identification of this part within the larger figure. However, it is only one part that is being examined, and the other constituents are considered to be field and suppressed. At least there appears to be an element of analysis, though limited. The other two tests, the RFT and BAT do not seem to present any case for analysis, for the display is so simple and obvious that it requires no separation of parts. In these two tests the visual field as a whole, or some major part of it must be suppressed, attention being focused on the proprioceptive field,

in order to bring the rod or the body to the vertical. It appears to be more of a case of deciding on which cues to attend, rather than an analysis. The more recent and preferred definition of the task is not analysis, but to disembed the figure. In the case of the EFT this is clear if disembed is taken to locate the figure. For the other two tests again it is not clear that the word disembed applies to the process that takes place. In the end, either word, disembed or analysis, seems to express processes that are only congruent with the tests to a very limited extent.

FID as Factor or Set of Factors

For the cognitive style studies a "perceptual index" (PI) is calculated and used as the principal measure of field independence-dependence. On factorial studies these tests load on more than one factor as would be expected, since very infrequently would a test be expected to be pure. More than one mental process is involved in almost any task. In this way cognitive style as calculated with the PI might be conceived as the union of all factors involved in all of the tests. A factor analysis on the other hand could be defined as the intersection of the sets on a given factor. In this sense the FID dimension as a cognitive style is much broader than that identified by Gardner and his associates (1959; 1960). Figures 3 and 4 indicate something of the differences. Figure 3a represents the factor space of the three tests, if they are highly intercorrelated. If the intercorrelation is low, the factor space might be represented by either 3b or 3c. Figure 4 presents another model. If all three tests are used, each of the factors represented

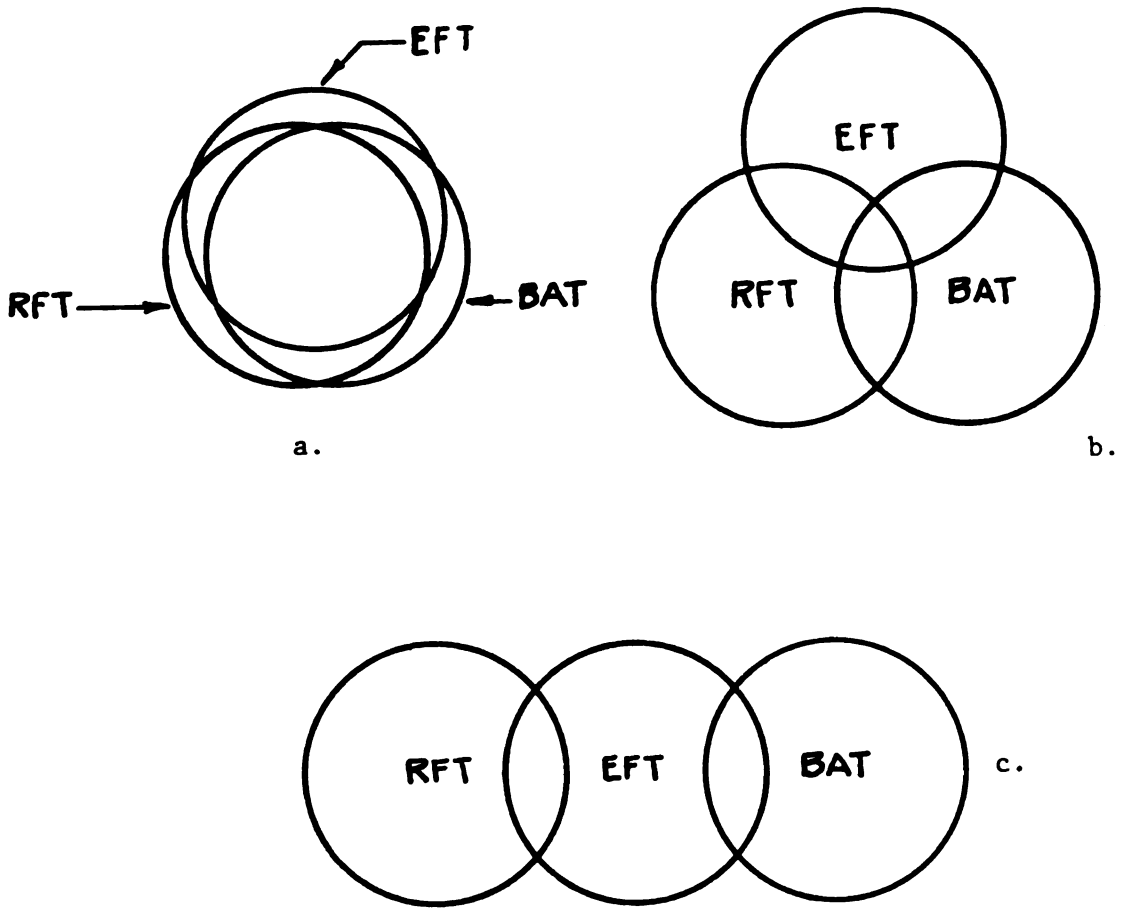


Figure 3

SHARED VARIANCE

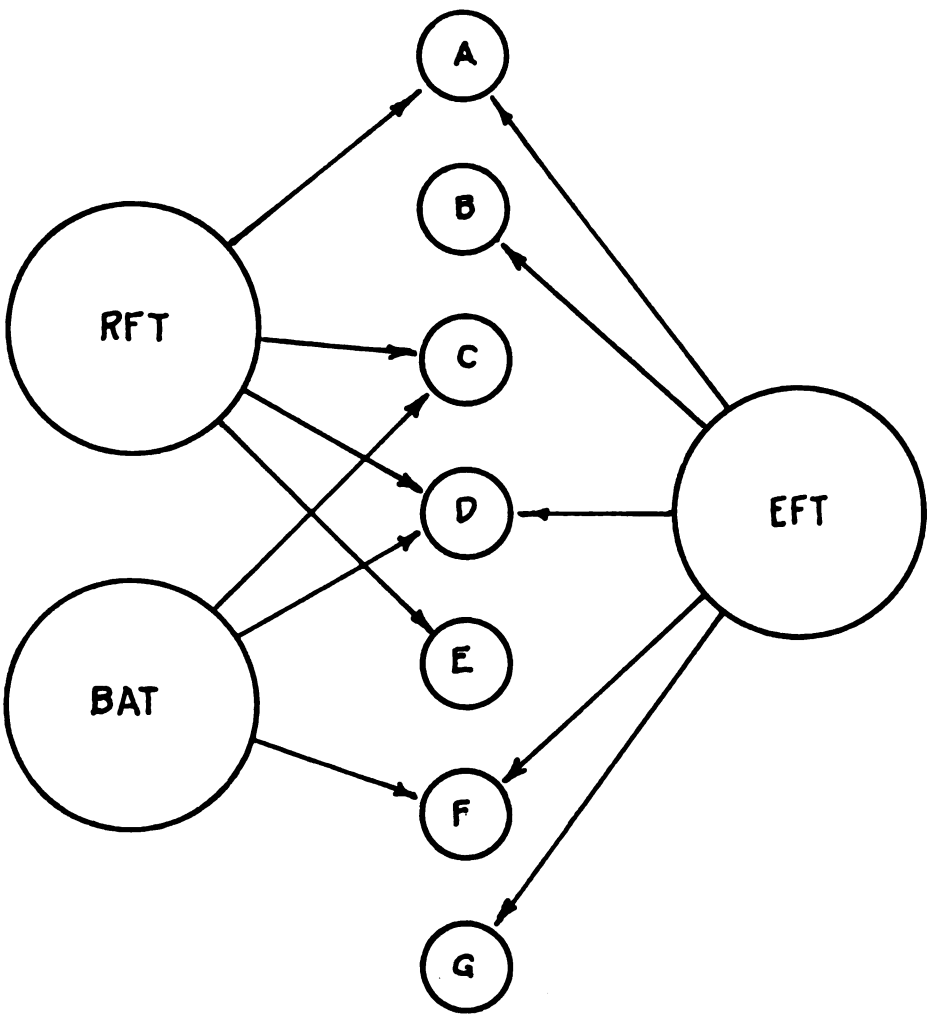


Figure 4

FACTOR SHARING FOR DEFINING COGNITIVE STYLE

by any one, A to G, will be included in the perceptual index. Of course, any other test that loaded on any one of these factors would also correlate with the perceptual index. On the other hand, if a factor analysis is done, only the factor D would define the dimension. As is evident, only a factor-analyzed study would be capable of showing if other tests of psychological functioning were correlated, and then all three tests would have to be administered each time. Also, as Arbuthnot points out (1972) due to the fact that different factors are involved to some extent in each test, at least two, the EFT and RFT would have to be given if the perceptual index is to be considered the measure for FID. In any case it is apparent that no single test can be administered and expected to serve as the measure of cognitive style. Until the issue is resolved by defining whether cognitive style is represented by the union or intersection of factors, no interpretation can be made regarding a correlation between the FID style and styles as defined in other studies.

Analysis of Tests and Results

In the previous paragraphs some problems related to the tests themselves were mentioned in relation to the operational definitions of cognitive styles. Now it is of importance to examine the tests themselves and the relations between the tests.

EFT. This test is probably the most critical of all for it is frequently used as the sole means of assessing the FID dimension. From the standpoint of Gestalt psychology, does the EFT require a person to separate a figure from the ground, or does something else

happen? It is the contention here that in contrast to the Hidden Figures Test where faces and animals are located within a larger picture, where the figure is "seen" as a whole, or not seen at all, that for the EFT, the figure usually is not separated from the ground as a whole, but is identified by tracing it. On some of the more complex figures one finds oneself following a line, coming to an intersection and either checking in memory, or with the adjacent criterion figure in order to know along which line to proceed. When people can do this they use the finger or a pencil; when not, they trace it with their eyes (Berry 1976:142). Thus Gardner *et al.* (1960:31) report that it was the selectiveness and direction of attention that was critical in doing the EFT. This is consistent with what is known of pattern recognition, where the most important information arises from the intersections or where one surface meets another (Bower 1975:41). Bartlett (1958:17) relates a very similar pattern in time-motion studies. When a worker moves a piece to a new location, the action is very rapid until a point is reached when it is necessary to pay exact attention to the position, size, etc. At this point the person hovers for a moment to perceive the exact qualities of the situation, then decides and locates it. Thus, in doing the EFT, the movement is rapid until the next decision point is reached, then slows, while a decision is made. In this connection Sieber and Lanzetta (1966) found that cognitively complex persons require more information before reaching a decision, and so could conceivably take longer to decide and move on. Thus, it could be that the person who is in fact more mature and articulated would be

slower doing this test, while the less complex, impulsive person might be more rapid. Witkin's EFT is a modification of Gottschaldt's figures, having added color in order to increase the embeddedness. Leo (1977:1258) reports that in tests comparing chromatic versions with the achromatic versions, like Thurstone's Gottschaldt, there was no significant difference. Arbuthnot, however, found that most of the alternative versions that have been made of the EFT do not correlate highly. Therefore he recommends that only Witkin's original EFT, or Jackson's shorter form be used. These two inter-correlate at r = 0.97 on replications. He compares the validation tests with replications for the group EFT and the booklet form and finds only 25 to 30% shared variance. There is also some evidence that discernment of forms on patterned backgrounds does not load on the FID factors (Messick and Fritzky 1963). The relation between the EFT and ability measures has also been questioned. Vernon (1973) considers that there is nothing that style studies do that cannot be done just as well as ability studies. At times reference is made to these tests as measures of the preferred mode of perceiving or thinking. It has been pointed out that due to the constraints of time and the lack of alternatives, the subject has no choice to exercise a preference on the EFT, and therefore it can not measure preference, but only the ability to do the task (Wachtel 1972a). For this reason the test can be nothing more than an ability measure. The debate is probably largely semantic, for if the same test is given at one time to measure styles, at another to measure abilities, and again to assess personality, is there

any justification to say that the scores are measures of different things?

RFT and BAT. The RFT and BAT represent a different type of test, for here there are two sense modes pitted one against the other. In both of these the proprioceptive sense of the vertical is challenged by a visual frame of reference. The two are in conflict, and the person must either adjust a rod, or his own body to the vertical, while the visual context is tilted. The BAT was used in the early testing programs, but has not been used on most recent published studies. The RFT has been modified to a portable form so that it can be more easily transported, and this form has been used in cross-cultural studies, as well as in many studies in the West. Many studies report significant correlations between the RFT and the EFT. Arbuthnot found that with replications, the RFT and EFT of Witkin shared only 29% variance, and with Jackson's shortened form only 14% (1972). Wachtel (1972a and b) found similar amounts of shared variance. It therefore appears that RFT measures something beside the factors of EFT. This was found to be the case in Gardner's studies (1960). Adams (1974) reports that by eliminating duplications, and factor analyzing the RFT that it loaded on three factors.

RFT and Kinesthetic Sensitivity. One obvious choice for what the RFT and BAT might measure aside from a spatial ability, is the kinesthetic. Witkin rejected the idea that people with special training in areas involving kinesthetic cues do better on the BAT (1962:43). Reviewing a study of dancers by Gruen (1955) it was found that they did better on the BAT but not the RFT nor EFT

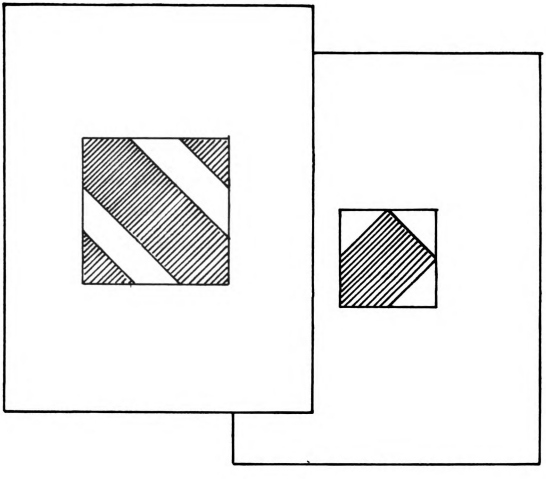
(Witkin 1962:373). This position has been contested by Wober (1967) in his studies in Nigeria, where he found that the Africans, where dance is a cultural mode of expression, were much more adept at the RFT. Witkin at that time remarked that it was interesting but not confirmed. Since then there have been studies that appear to both confirm and disconfirm each position. Guildord (1967)39) reported that Michael (1949) in studies of black pilot trainees found a factor that did not appear in a corresponding group of white West Point cadets, it was identified as "kinesthetic sensitivity." Dershowitz (1971:230) found no difference among immigrant eastern European Jews who traditionally dance. Siann (1972) did not find differences in Zambia to support Wober, though as the EFT and RFT did not correlate significantly, Witkin's position was not supported either. There are a number of confounding factors related to the use of the RFT. It appears that frequently the subjects do not understand the task at least in cross-cultural situations. They do what they think is wanted, for instance, line up the rod so that it is symmetrical within the frame. The feeling that this may be significant is supported to some extent by the results Gardner reports regarding the effect of a short training period on the BAT that improved performance (Gardner *et al.* 1960:130). It was not transferred to the RFT however. One would expect some notable differences of ability between people on these tasks. There appear to be memory stores and buffers for all the sense modes (Guilford 1967; Bower 1975:39). There are differences in intersensory coordination. Kessler (1970:137-138) reports that any mode paired with the

kinesthetic is more difficult. Travers (1965) says that there are probably one channel receivers, so that whichever sense mode is focused, all others are blocked. In extreme cases as Luria's *Mind of a Mnemonist* (1968) the subject had to convert all perception and cognition to a dominant modality before responding. Thus different modalities can be important, there are undoubtedly individual differences, and the ability to coordinate any sense modality with the kinesthetic is difficult. Therefore many people may simply ignore it. As Wachtel (1972b) notes, it is very difficult to say at this point what the RFT tests, but it is clearly not congruent with the EFT in all respects.

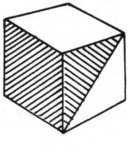
Other Tests. At times other tests are used to diagnose cognitive style. The most frequent of these are Kohs Blocks Designs (KBD), Raven's Progressive Matrices, and the Draw-a-Person (DAP) test. Berry (1976) used the KBD for all three studies, and only used the EFT and PRFT for one study each. The KBD therefore became the principal measurement for FID. Arbuthnot (1972) found that the KBD correlated with the EFT with a shared variance of 36%. He also found that the KBD and RFT shared 13% variance. Guilford (1967:180) reports that the KBD loads on two factors, visualization (CFT) and perceptual speed (EFU). From this evidence it appears that the KBD is as good as the other tests, but again the problem is that when used by itself and not factor analyzed, it probably does not represent the whole perceptual index. Raven's Matrices are used along with other tests, but usually are not considered to be diagnostic of cognitive style. They correlate with the FID tests, but not

highly. Three projective tests are used, the Rorschach, the Thematic Apperception Test (TAT) and the DAP. These tests are used to study the personality correlates. The major criticism of them all is the degree to which the interpreter can find what he wants to find, the uncontrolled source of error. Even when anonymity is maintained the process is highly subjective. For the DAP, other criticisms have been made. Mayo and Bell (1972) found that it correlated to a high degree with the ability to draw. Havighurst, Gunther and Pratt (1966) say that previous experience in painting or drawing controlled the test. The major problem is with the assertion that the way a person makes a drawing represents his own "body concept." For instance it was found that subjects could learn to classify complex figures without being able to reproduce them, a marked difference existing between the mental construct and the physical process of reproducing them (Johnson 1972:41). Also it was found that when students had finished an anthropology course, their drawings showed many more "novel" features when compared with a control group of psychology students, for they had been sensitized to the novel. Therefore it seems that self-perception is not the controlling factor in DAP (Dmituk 1972). The DAP shared 16% variance with the RFT, and 12% with the EFT (Arbuthnot 1972). In reviewing the literature a great number of other tests have been used to correlate with the tests mentioned here, but they are not considered to be indicators of FID.

Cross-Cultural Testing. The results of cross-cultural testing have not been consistent overall. As already has been pointed out,



KOHS DESIGNS



KOHS BLOCK : Shading indicates color.

Figure 5

KOHS BLOCK DESIGNS

From Wechsler (1941:93)

in a number of cases the FID test correlated significantly, in others they did not. Usually the whole battery is not administered, so other tests are compared with one of the FID series, and the problem of which factors define FID is again raised. One major problem centers around the meaning of tests for people of other cultures. Cohen (1969) points out that by removing the language parts of a test, only the more abstract, logical structure is left, the most completely unfamiliar portion for unschooled people. This is borne out by McFie (1961) who found the non-language parts to be the most difficult. He says they (Ganda boys, Uganda) had apparently no experience with blocks, bricks, etc., before school. Within two years this had changed significantly, while the verbal had remained stable. Another major problem is the testing situation, which is far from a normal situation for most people. Shapiro (1960) reports that the Nyasa did poorly on the KBD due to

> gross disorganization of attention in the testing situation as a result of wild fears about the purpose of the experiment, and extreme unfamiliarity with many aspects of the task.

Okonji (1969) reports similar problems, especially with the RFT where girls went into a dark room with a male of a different lineage group, a potential marriage partner. The translation problems for many situations are great. People will say they understand just to please, and then do what they think is expected, or they will say it just to avoid appearing ignorant. Some observers have taken pains to assure full understanding, but hints of difficulties appear in the reports; for instance, the problem of getting people to understand what is meant by vertical when they

have no word in their language for it (Okonji 1969). These problems are not limited to cross-cultural work, though undoubtedly aggravated by it. Johnson (1972:105) calls attention to cases in the U.S. where inadequate responses were made due to a failure to understand instructions, or simply forgetting instructions during testing.

Familiarity. The issue of being familiar with tests and testing procedures is also of great importance for the style tests. It has been consistently found that non-Western populations have difficulty with tasks requiring visualization, geometric and spatial manipulation. This has been discussed in terms of a "carpentered world", of genetic differences, but due to the consistent effect of education and training programs designed to teach spatial visualization it would appear that familiarity and practice are the crucial factors (Campbell 1964; Segall *et al.* 1966; Hudson 1960, 1967). Bruner calls attention to the fact that to adapt the EFT to younger children, Witkin's group had to modify the test in two ways, make the figures meaningful and capable of being manipulated (Bruner *et al.* 1966:22). Heron, reviewing research in Africa noted particularly the importance of unfamiliar material being used, and the consequences in low scores (Heron 1968). Siann (1969) presented an abstract HFT, as well as one with figures familiar to either boys or girls. In each case they did much better with the familiar figures. On the other hand, when given the opportunity, significant changes can be made in a short time. Le Vine (1970) cites the work of D'Andrade (1967) who used programmed instruction to bring students in northern Nigeria up to western standards on the KBD. Dawson

(1967a) reported dramatic changes in 3-D perception of two dimensional displays among the Temne of Sierra Leone with a series of eight one-hour instruction sessions. In the U.S. Guilford cites a study of children from six to eight years of age who were taught to identify figures of the Hidden Figures Test, and who approximately doubled their scores. It would appear then that a major factor in confounding cognitive style measures in cross-cultural situations is a lack of familiarity with spatial and geometric designs, and the kind of manipulation required to solve the problems presented in these modes.

Spatial Factor. Throughout the discussion of the FID tests, reference has continually been made to a spatial factor. Of all the factors that seem to be common among the tests this stands out. It is the reason Guilford considers them to be tests of CFT, cognition or awareness of figural transformations. Witkin (1967) cites Vernon to the effect that after a general factor is removed from intelligence tests, two residual sets of factors continually appear, one verbal and educational, the other spatial-mechanical-practical, and Witkin assigns the FID to this latter set. It seems to involve visualization, is frequently more prominent in male samples, at least in the West, but as we have seen is subject to instruction (Sherman 1974). This may be related to the lateralization of brain function, and may be partly genetic (Bock 1973). In any case, cognitive style studies tap this ability. As the evidence has made clear, special training on these factors does not necessarily mean that something general is learned, for instance the 3-D training of

Dawson did not transfer to the scores on the KBD, so it must be concluded that the content of the test is important as well as the form, a conclusion Guilford reports from many factor tests (Dawson 1967; Guilford 1967:61).

Intelligence. Witkin (1962:64) cited factorial studies relating the FID measures to the WAIS subtests. The spatial subtests loaded on the FID style, but the verbal and mathematical did not. He generally states that intelligence and FID are not related, but that between them most of the variance of tests is accounted for (1967, 1977). Some tests confirm this statement (Walsh 1974). Others find a positive correlation (Vernon 1973; Kagan and Kogan 1970; Dawson 1967; Handel 1973; Okonji 1969). Vernon (1973) states that whether the FID measure is independent of intelligence depends mainly on the heterogeneity of the sample. A correlation would be expected, for in the intercorrelations between all the WAIS subtests cited by Berelson and Steiner (1964) all correlate with one another in the range between 0.43 and 0.67. Whitman found that cognitive style, using the Sigel tests, related to intelligence but in a special way (1966). The person with high intelligence could shift according to the need of the situation and so function in an appropriate manner. This same conclusion was reached by Cohen (1969). It is interesting in this context, that Thurstone called the factor revealed by the Gottschaldt figures (flexibility of closure." Johnson (1972) finds these differences in the ability to handle different representational systems. With respect to using advanced organizers to structure material, Ausubel (1968) says that they were

of most help to those with poor verbal ability, for they tend to be less effective in spontaneously structuring material. Layzer (1975) in his review of Kamin's book, *The Science and Politics of IQ*, points out that the most distinctive characteristic of intelligence is its plasticity, and that it is the result of an exceedingly complex interaction between heredity and an environmentally complex personal history. This plasticity seems to be related to the ability to shift, and adapt to the situation in which intelligence is exercised. One conclusion Layzer comes to is due to the plasticity and the complexity of interactions, any search for culture free tests is chimerical. Cole basically concurs, saying that

> Data from these tests (IQ) are of extremely limited value for our purposes because there is so little agreement about what kinds of cognitive processes are being tested (Cole *et al.* 1971:15).

Since intelligence tests were originally elaborated to predict school success, there should be a relation there.

Schooling and Age. Field independence in the Western world increases with age, which of course means also with years of school for most people. Cross-culturally it is also correlated (Dawson 1967; Berry 1966; Siann 1972; Gruenfeld and MacEachron 1975). The more interesting question is what happens due to school attendance? Cohen (1969) concluded that schooling is basically analytical and orients those of this style toward higher levels, but is disorganizing for the relational person. Gay and Cole (1967:54) found that there was a large change in the identification of geometric figures, and in learning logical rules. Bruner concludes that school teaches European ways of thinking, for instance, learning to categorize by

form rather than by color (Bruner *et al.* 1966:315). Obviously literacy is important. Goodnow, however, relates that one important thing is that children learn to make transformations in the head, but possibly more important, they learn that it is expected to combine all kinds of material, even if, by their standards, it does not make a great amount of sense (Goodnow 1969:450; 1970:252). Could it be that this sense of the absurd is necessary to succeed in the testing situation? This concept fits with the fear and uncertainty related to testing mentioned earlier. Two things then occur in school that could well increase the ability to respond better on the FID measures, the increase in understanding of spatial representation, and of the rather strange conjunction of requirements of the test situation.

Sex. Sex differences have been found frequently, females generally not doing as well as males on the FID in Western samples. The difference is statistically significant, but the range of within group variation for either group is much greater than the difference of means (Witkin *et al.* 1962; Witkin 1977; Sherman 1967; Cohen 1969). Kagan and Kogan (1970) have a detailed discussion of the complex relations said to exist between sex and the influence of the same and opposite sex parent on development of the FID. Cohen found most of those in the center of the distribution to be girls, especially in both groups that were transitional. Kogan and Wallach (1964) feel that the measures have different meanings for the sexes. Sherman (1967) points to the influence of sex role assignments to find the difference, though she also notes the possible genetic

difference. On cross-cultural samples the picture is more complex. Among the Eskimo, the Arunta and Zambians no difference was found (Dawson 1967; 1972; MacArthur 1967: Siann 1972). Among the Temne and Mende there were differences in that the tests correlated significantly for males but not for females. Okonji on the other hand found no differences in Nigeria. Gardner found that there were differences in that tests loaded on some factors for men, and others for women (Gardner *et al.* 1959). The picture is not clear, but given the possibility of a genetic difference, and the power of role assignments over differential experience and practice, it seems strange that the difference is so small.

Socialization. The cornerstone of the differentiation hypothesis is that the development of a global or analytic style is a result of socialization, strict child rearing practices resulting in global and tolerant practices producing independent children. A number of studies have found correlations, including the original studies in 1962. Cohen (1969) found that the primary reference group was more important than socialization practices in the home. Gruenfeld, Weissenberg and Loh (1973) report that for a Peruvian sample, with strong family ties, strong tradition, and passive children who were more attached to their parents, that the FID did not correlate significantly. This group was compared with a group from the U.S. What was significant was the relation to social class. Berry (1967), MacArthur (1967), Dawson (1972) and Dershowitz (1971) found significant correlations. Okonji (1968) did not, and Dawson (1967) reported a moderate association as did Siann (1972). However, Siann finds

it a minor matter, not related to personality, but more to individual practices. Gruenfeld and MacEachron (1975) find little support for a relation with child rearing practices, but a clear relation with socio-economic status. A major problem with this type of study is pointed out by Mead (1963:186-187). At issue is the point that some culture trait is selected from a society, and related to a psychological variable without making any effort to be sure that this trait is a modal practice or merely the impression of one investigator's observation of a few families. In the present case, there is a serious question as to what it signifies to ask the question "Were your parents very strict, strict or lenient with you as a child." Berry (1976) for instance gets a correlation of 0.89 between these answers and Barry's ratings (Barry *et al.* 1959). In another context, but referring to ratings of this type Dunlap says:

> The reports on fatigue conditons are correspondingly intermediate in reliability. Yet no statement as to relative degree of fatigue is to be trusted. If one man says that he feels 'very tired' and another says he does not feel 'tired' there is no way in which we can tell how the feelings of these two men actually compare Dunlap 1949:247).

Cohen (1969) tells of major differences that occur within subgroups as small as the family, therefore to classify a total society on the basis of a categorization of this type appears to be unfounded. Cohen also criticizes another aspect, that the patterns are relatively fixed in childhood and do not alter greatly later. Kagan and Klein (1973) criticize this severely on the basis of observations of children who were retarded, lethargic, passive due to malnutrition, and culturally deprived, yet who by age 10 to 12 achieved parity

in school with a middle class peer group. As has become evident, if school and training are able to change the results on style tests so dramatically, the probability is very low that a measure as crude as those used to measure socialization could be used to confirm a causal hypothesis of this nature. On the basis of similar global statistics Berry finds that not only is socialization a determinant but also that ecology, culture defined in terms of hunting or agriculture, extended family, polygyny and hierarchical organization of political systems are determinants of cognitive style (Berry 1976). The proviso is included that it is a determinant in a weak sense.

Social Aptitude. In the earlier statements, Witkin defined the articulate as more mature, and called attention to two related aspects. Field dependent people were more other-directed and therefore more sensitive to other people's moods, needs, etc. Also, curiously, they were better able to discriminate and remember faces. More recently the value judgment has been replaced, and the dependent are found to be mature but in a different way, socially sensitive (1962:148; 1977:19). The dependent are more sensitive to faces, less aggressive, and therefore in areas of life where these attributes are valuable, well adjusted. Hoffman and Kagan (1977) have examined this thesis regarding the perception of faces and find that contrary to Witkin's conclusion, the independent have significantly higher scores than dependent males, females were very slightly better than males. For perception of social cues, Ruble and Nakamura report that field dependent subjects may be

more effective in tasks requiring socially relevant cues, but the results were of very low statistical significance (1972).

Self-Image. The differentiation hypothesis expects that the more independent will have a clearer self-image, and this will be more stable over time. As Allport points out (1937:160) it appears that the newborn has no awareness of himself as a self. This is similar to Piaget and Inhelder's concept that as the sensori-motor stage the self is not distinguished from the exterior world, but progressively achieves this realization. This is frequently attributed to adults of tribal and peasant societies (Greenfield and Bruner 1969:373). The problem is, what does it mean to perceive one's self as a self? Piaget's idea is that the self continues to be transformed, altered, reorganized as the individual passes through the operational stages toward maturity (Piaget 1972:343-344). For Witkin the self gradually emerges or is defined, clearly for the independent, blurred for the dependent. What does it mean to be a self? It is doubtful that the dependent person would not sense himself as separate from another person or from objects. Witkin defines this in one way by saying the self is a network of attributes separate from others with an inner frame of reference. The dependent is sensitive to social content of the surround, the independent more impersonal (Witkin and Berry 1975:9-10). Looking at the cross-cultural situation two things must be considered. First, the concept of primitive culture may be a figment of Western man's imagination for as Weber says:

> Modern man as part of a mass and without individuality-as described in so many Western books-is (as yet) unknown

> in primitive society. On the contrary, one is struck by the great number of 'characters'. Every single individual has a certain place in the community: he is the eldest brother of A, the younger brother of B . . . As such, every individual is known and has his definite task in the community . . . Furthermore, in the Central Celebes at least, 'education' tends to make children strongly egocentric, and thus people of pronounced individual character make up the community . . . (Weber 1957:47).

Nakamura finds that in India there is not the same sense of self, "With the Indian people, self-conscious reflection on the impact of oneself against other selves is not clearly evidenced" (1964:19). Wober also found the concept to be variable with culture and cannot be equated across cultures (1971). If then the sense of self is so poorly defined, what validity do the assertions about it have, expecially in the cross-cultural context?

Evaluation

From the foregoing analysis of the differentiation hypothesis, definitions and testing program the following conclusions can be drawn. The formulation of the theoretical statements are largely definitional, but not explicated so that it is impossible to draw precise implications and deductions for the development of valid testing programs. The one causal statement is interpreted as an expected association, in the same manner as the other assertions, therefore no lawlike statements are included. The transition to operational definitions is by fiat, with no convincing evidence that the tests assess what the theoretical definitions declare. There is some face validity for the EFT as analysis and disembedding, very little for the RFT and BAT. No clear definition is made

regarding whether style should include all of the factors of all of the tests, or the conjunction of those factors that coincide on the three criteria tests. From intercorrelations between the tests with relatively low shared variance, there is no way to know whether the same factors are being sampled. Under no circumstance, if the perceptual index is considered the measure of cognitive style, can any one, test by itself diagnose a person's style. There are many uncontrolled problems in the testing situation, especially with respect to the projective and interview programs. More critically the tests present problems in the cross-cultural situation. Due to these factors, the relations found with other variables, especially socialization and ecology are extremely dubious. The style tests also assess an individual's ability, not a preference. The scores can be changed radically by short periods of instruction, which is not transferred to other tasks, so that cognitive style is neither necessarily stable nor pervasive. There are probably no psychological variables that are purely formal, unaffected by content, and this has been seen to be very important for cross-cultural work where equivalence is usually not achieved. The implication is that the whole hypothesis needs to be thought through, and new more precise formulations projected that do have validity in testing programs. This needs to be in terms of process variables, that propose causal relations which coordinate the complex relations that exist for any mental act.

What Does FID Measure?

The tests of the FID dimension clearly measure something, what is it? The proposal made by Gardner and associates, and similar to ones proposed by Guilford and others appear to offer a viable alternative. The style tests relate to a) the increasing dexterity in perception and manipulation of spatial displays with increasing age, b) the increasing practice with non-meaningful test situations, i.e., the ability to conform to artificial test situations, and make decisions on the basis of a limited set of conditions, c) attention and memory practice along with the ability to shift the focus of attention flexibly, and d) intersense coordination of perceptions. Of these attention and the ability to shift attention seem to be the most important. As has been pointed out, it is attention to the details of intersecting lines that is the key to solving the EFT. For the BAT and RFT it is an issue of where the attention is focused, and whether it can be shifted to another sense mode. This could conceivably explain the perception of faces and other socially important cues, if in fact these do turn out to be confirmed. The socially sensitive person would direct his attention to what he considers important, or has learned that is important, the social context. On the other hand, the analytic person would be more oriented to impersonal cues, therefore the inanimate might be considered of more interest and importance, people getting in the way. The same construct fits the cross-cultural situation, for a culture (and especially the language) point to what is considered important. This is learned, and it is

what one pays attention to. In this sense, socialization and child rearing practices could influence what one pays attention to, but it would be necessary for a much more detailed examination of the cultural practices to understand the influence, and the connections. The flexibility to shift attention includes what attention is focused on. An understanding of flexibility would throw light on why some people are able to break set more easily than others, and the relations to creative activities could be explored. Thus attention is not only a formal feature, that can be studied separately from culture, but what is focused and what causes a shift are specific content matters. It is proposed that attention and flexibility to shift attention is the major factor tapped by the FID cognitive style tests.

Data Collection and Management

In light of the problems of vagueness, lack of specificity and the way in which the individual is not characterized in a form that seems to correspond to his inner working, Hunt and Lansman (1975), discussing the problem of ordinary factor analytical models ask "Why then, has the psychometric approach to individual differences been predominant?" Tylor has pointed out that classification measures are quite adequate predictive tools as long as one does not care why the prediction works. Newell and Simon refuse to accept this mode.

> With this approach it does not seem natural to assume that human behavior is fundamentally stochastic, its regularities showing up only with averaging (as in statistical learning theory); rather Freud's dictum that all behavior is caused seems the natural one, and only

> reluctantly do we assign some aspects to probabalistic generators.
>
> This aspect of theory, highly visible against the background of experimental psychology, is really just the consequence of viewing the human as a complex mechanism (of whatever kind) whose parts and connections can ultimately be deciphered. This point of view is accepted in most science outside psychology without question or comment (Newell and Simon 1972:10).

In the process of categorizing, most of the information that could answer the question why is discarded. People answer the same question for different reasons. It was for this reason that Piaget is said to have left Binet to pursue his studies using a more "clinical method." Wason and Johnson-Laird (1972:24-25) found the same in studying student strategies of answering in concept formation tasks. It is the contention here that statistical manipulation is of little value until precise definitions have been made, and other methods are needed to achieve the information necessary to formulate plausible hypotheses about human action. Therefore more detailed examination of individual perception, thinking habits, customs, problem solving techniques must be undertaken before statistical averages are meaningful.

Conclusion

Therefore it is proposed that the basic developmental theory behind cognitive styles be reformulated and that a more precise process model of information processing be substituted for the present approach to style studies. In view of the present theoretical and methodological weaknesses, it does not appear promising to further pursue the style model as presently formulated.

Alternative Theory

Two modifications of theory are proposed to provide a more satisfactory interpretation of the available information. First is a refinement of the developmental model that has been generally accepted, and then some elaboration of an information processing model, directed toward cross-cultural problems.

Developmental Model

Fundamental to the whole is the understanding of how development proceeds, and how concepts are formed. An alternative suggestion is made by Saltz (1971) and passing note is made of it by Allport (1937) and Kagan and Kogan (1970), but it is not followed up (Kendler and Kendler 1967). The concept is that development proceeds along two lines that are generally contrary, one is perceptual development, and the other relates to skills in the linguistic, cognitive and sensori-motor areas. The linguistic ability of the individual and the cognitive development of concepts generally proceeds from the less precise to the more precise, while the perceptual development begins by being highly differentiated, and becomes less so as concepts are formed, organized and symbolized. This contrasts with the usual theory that for the neonate the world is, in the words of William James a "big, booming, buzzing confusion" which progressively becomes more highly differentiated, and that concepts grow along with this (1890:488). It would be better to contrast the two processes; perceptual growth and response ability. From this standpoint, Saltz' contention is that at first perception

of the world is highly specific, detailed and differentiated, so that each perception is unique. Since concepts are generalizations across cases, where the non-similar attributes are discounted; as relations between objects are made, perception is continually limited to the pertinent attributes of the concept. In the adult, perception is very highly controlled by feedback from the conceptual system, and in this sense an adult might be said to perceive "globally" since many attributes that are present are not taken into account. An example of this process is seen in the way a child learns language. For instance, in English there is no phonemic difference between the /p/ of pin, and of spin, though there is the phonetic difference between the aspirated /p^h/ and the unaspirated /p/, which English speakers ignore, but Hindi speakers learn to distinguish. How can a Hindi child learn to distinguish this difference and an American not, if they perceive "globally" and can not differentiate very subtle sounds that adult English speakers generally cannot distinguish. As Maccoby and Modiano relate:

> In fact a few of the older children (U.S.) completely lose the ability to analyze, because the concrete attributes of objects become buried beneath formal and abstract notions (Maccoby and Modiano 1966:261).

On the other hand it is clear that the precision with which the child can pronounce the sounds increases with practice, so that the early attempts may not be very precise, while later the distinctions are made with no sign of an accent? From this standpoint, it is clear that a less differentiated person is the more mature, but the less mature perceives more accurately. The ability to relate, to

generalize, typifies the adult's symbolic functioning, but this contrasts with Witkin's interpretation, where the relational is the less mature.

Connotation and Denotation

This concept of development is very similar to Piaget's and seems to integrate many observations well. For instance, the relation between the connotative meanings of words and the denotative becomes clear. The myriad idiosyncratic experiences that are collected into a concept by any individual provide numerous connections with other experiences and other concepts, the commonly understood notion of connotation. When the concept becomes highly defined, refined so that a very limited definition can be made, a dictionary definition, then the denotation is available. Of course, for the individual the denotative meaning is always colored by the idiosyncratic experience. A scientific term, then, is one that has much of the idiosyncratic stripped away, and a very limited, socially accepted definition, is all that remains. Thus concept formation is not one of building up of various elements into a unit, but the stripping down of many experiences to a few common elements, so images are much richer than concepts, and there is no concept that is not abstract. As Biggs points out,

> Concept formation is, then, largely a matter of paring away noise, bearing in mind that the definition of what is noisy and what is information-giving varies with the context (1968:71).

Confirmation

As Piaget has pointed out, children establish relations that seemingly have no basis, arbitrarily, by chance (1958). In the view presented here, this is part of the process of concept formation, for bit by bit, with conflicting experience, the non-pertinent relations are dropped, and the remaining ones then form the stable concept for the adult. Of course, there are many relationships that can be imagined, that can never be established, nor dis-established. In these cases, or in cases where it is very difficult to have sufficient experience to decide, the connections are taken on "faith". Many of these issues form the set of assumptions that are considered to be the culture of a people. Most religious notions are of this nature, most philosophic ones, and most of the assumptions that form the basis of everyday decisions. For instance, the idea of progress, of the origin of mankind, of in-group superiority, of the potential spouses in a community, represent beliefs and expectations that are accepted, but which have no experienced events that would either prove or disprove them.

Language and Perception

Thus, while the adult's cognitive structure is more highly differentiated and integrated in the sense that his symbolic and conceptual structures are more complex and adaptive, his perception is less differentiated and less precise. Language then develops in a coordinate fashion with concepts and experience, and is affected by the individual experience, which in turn affects the development of concepts. As the person becomes more adept at communication it

would appear that he or she becomes more highly differentiated in perception, but in reality, the opposite occurs. Due to the fact that the language and concepts of a given culture are integrated into that context, the things that are important in that society will be different from those that are important for another society, and so the conceptual domains of one language will not be congruent with those of another. It is this lack of similarity, the contrast between the etic and the emic, that has been one of the limiting conditions on the ability to use test procedures cross-culturally.

Information Processing Model

A number of authors have suggested the use of an information processing model. A variety of information processing models have been worked out in greater or lesser detail; for our purpose a very simple one can be used. There are a few processes that take place, with which all agree. There is the process of sensory reception, for visual, auditory, olfactory, tactile and proprioceptive stimuli. The information gained through these sense modes is stored and encoded into memory. There is considerable debate regarding the existence of short term memory (STM), intermediate term memory store (IMS) and long term memory store (LMS), but some features are clear. There are different levels of memory, and memory of some sort for images, sounds, and probably the other sense modes, as well as a verbal or symbolic memory. Also there is a feedback link between the memory stores and the processes for receiving and coding information, for sensory material is filtered before it reaches the memory. Beyond

these, there are processes where information is retrieved, a process by which information from various sources, memory, sensory inputs, etc. is combined, where decisions are made, and responses formulated and initiated. The processes are probably much more complex, but at this stage, these all exist in some form.

Objections to the Model

Objections might be raised regarding the information processing model similar to those raised for the Lewin-Werner biological model. In the information processing model the objection is that using the computer as an analogy for the mind is not valid. Any analogy used as a model is open to this objection. Nevertheless, whereas there is no psychological structure that can be conceived that corresponds to the cell, and the structures formed from cells, in the biological model there is a central nervous system that can be conceived of as a system for processing information. There is enough information involving the transmission of nerve impulses from the sensory organs to the brain to at least lend partial support to the analogy. The computer model shows that extremely complex processes can be broken into lower level primary processes, and that a type of physical equipment can be built to process information. The computer analogy is also susceptible to more precise definition, with the corresponding advantage of more consistent interpretations when compared with the corresponding tendency of the FID definitions to extend themselves amoebalike in all directions. Clearly, as an analogy, the information processing similarities to the computer cannot be pressed too far,

but the few processes under discussion here are certainly well documented, and do not require any particular type of "hardware."

Reduction in Ambiguity

By describing information processing in terms of these stages it is possible to reduce the ambiguity that presently exists. For instance, what does perception include, is it limited to the sensory input and sensitivity to external stimuli, or also cognition, ordering of information, organizing it into patterns, or as with some authors, does it include world view (Segall, Campbell and Herskovits 1966:24)? Does cognition mean awareness as Guilford would define it (1967) or does it include coding, storage and combination of information for decision making and the formulation of responses? Since cognition is frequently taken to be equivalent to thinking, and by others to refer to less encompassing activities, it would seem better to avoid these traditional terms, and to try by this means to avoid some of the misunderstanding that surrounds the conventional terminology.

Processes Examined

The processes that would seem to be most germane to the discussion of cross-cultural learning would be those of coding, memory, retrieval and the combinatorial processes that produce conclusions and responses. There are certainly variations between individuals in such areas with respect to speed, accuracy and sensitivity for these processes, and they can significantly affect learning. Other areas such as the ability to direct and focus

attention and the ability to avoid distraction also influence how well people can learn. Basic to all learning, and therefore teaching, is the process of concept formation, and this is related to the way information is stored in the memory. Information is filtered and selected as it is received, some is stored and some forgotten. Some that appears to be forgotten is also stored at a subliminal level so that it is not immediately accessible to consciousness, but can be called up under special circumstances, under hypnosis, in semi-conscious states or in dreams.

Images

There seems to be a memory for images, highly developed in some, and not so much in others. Though there is no clear picture as yet of the way the process takes place, certain things are clear. The "photographic" memory of some people that allows them to recall exact images, and allows them to scan these and to "see" detail that they had not been conscious of before seems to indicate such a memory. Also, the vividness and detail of dreams, and the ability of a person to recognize faces and other visual presentations with only subtle differences, seem to argue for an image memory of high complexity. Probably there are also memory stores for the other sense modalities. An STM for sense modalities is accepted by many, and an IMS by some psychologists. A LMS would seem to be implied at least for visual memory, but is not generally included in the literature (Bower 1975:39).

Lateralization

Another question that is open relates to the visual abilities and the lateralization of the brain, the left hemisphere specializing in verbal and semantic processes, and the right side more for visual and spatial activities. There may be some genetic differences here, but there is also much difference between individuals with respect to the practice they have. Those who are artists, architects, and other working in the visual media are clearly more aware of visual effects and detail than the layman, and undoubtedly the effect of practice in observation in order to reproduce displays has refined this awareness. Thus some of the results of style studies might be the effects of differential practice in certain artistic modes. Especially of note would be the contrast between the Eskimo and the Temne or Mende of Sierra Leone. The Eskimo have highly refined and detailed art forms, while the Africans have much less, and those tested have relatively crude ones. Those who have well developed abilities along these lines can do things that others have great difficulty with, such as imagining the rotation of displays, the placement of forms that are out of the visual field, for instance, in engineering drawing.

Symbolic Function

On the other hand, there is clearly a memory related to symbols, especially to linquistic symbols, a semantic memory. The process of conceptualization is the most important one with respect to this memory. Information that is coded for the semantic memory is reduced, so that only a limited amount is stored, all of the "unimportant"

detail is eliminated (Biggs 1968:71). Thus the non-significant phonetic elements are disregarded in a stream of speech sounds. At a higher level, when words are called up, only the general aspects of the concept are available. Undoubtedly this varies greatly, for if the concept does have many concrete and idiosyncratic referents, then an image of what is considered the classical type might be called up, or it may be a special case that has become the sterotype for that individual. For instance, the mention of dog might call to mind a special pet that the person has had for years. Again, the concept may be shorn of all the connotative material, and represent only a high level of abstraction. In any case concept formation calls for generalization, and information loss.

Concept Formation

It appears that a concept is formed first by generalizing a specific case, and then refining it as other cases appear, taking away the nonpertinent characteristics. In this sense, concept formation is a function of conflict, posing contrasts between essential and non-essential characteristics, and also placing negative cases in contrast, so that the positive elements are emphasized. We might express this by saying that a concept A in the first instance appears as $A_1 = a_1 + a_2 + a_3 + \ldots + a_n$, where the small a's are the attributes and relationships that combine to make up the instance A_1. Another instance of A, A_2 might combine a_1 through a_6, but neglect the other attributes, in this case a_1 to a_6 become the defining attributes. Further refinement might reduce the concept even more, or redefine some of the attributes and

relationships at another level. From this definition, it also appears clear how stereotypes occur, for the individual observes a case with attributes a_1 to a_3 and concludes that all the other attributes must follow, and so places the instance in that category. The problem with stereotypes is not in the process, but relates to the fact that a) the assignment may be wrong, or b) the assignment may include for a given individual a series of ascribed attributes that in fact do not correspond in reality. Thus if children are asked whether a father can also be a thief, they answer no, for the class of father and the class of theif are mutually exclusive. Of course many stereotypes do not characterize any group or individual, for they suffer the same problems that races do.

Child-Adult Difference

Concept formation then may be different for the child and for the adult. Due to the fact that the adult already has a concept structure formed, and well defined concepts, while the child is still in the process of forming them, the adult will move from existing concepts to new ones, while the child will move more from direct experience to concepts. This may be one of the major shifts in Piaget's process of accommodation. For instance, the child might originally identify "father" with one specific individual, which later is generalized to other fathers, first as a category of "all men" which is then corrected to specify the relation between a male individual and his offspring. Thus the concept moves from a 1:1 relationship to a 1:n, or one to many relationships, and from

a concerete referent to a relation. In any case, most of the idiosyncratic associations of the individual are probably never lost.

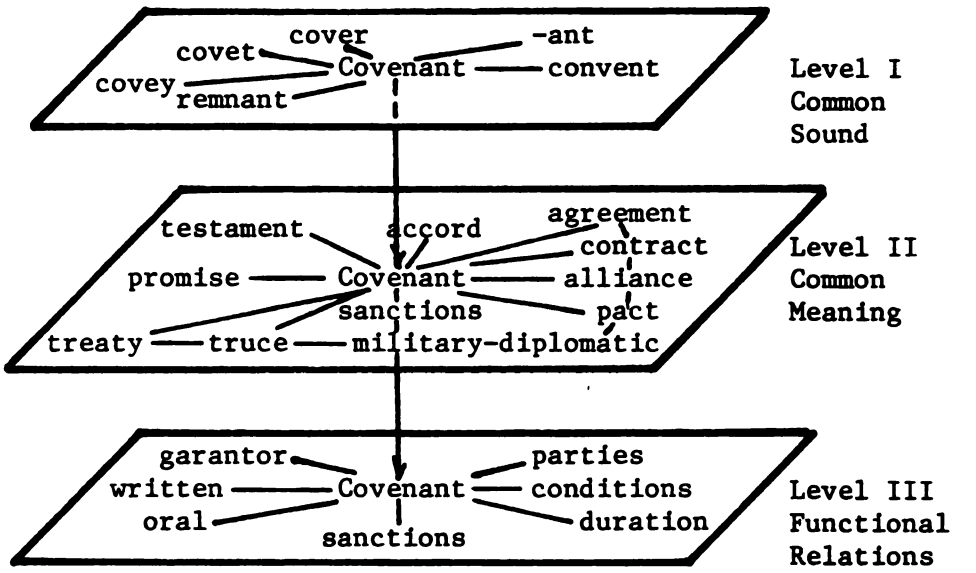
Memory Organization

The concepts that are formed are related in certain ways, forming a complex web of associations. In the following diagram (Figure 6) three levels are identified, that of sound, that of semantics, and that of function. At the level of sound, similar sounds call up associations, the basis for puns and for rhymes. At times this basis is used for associations at the semantic level. For instance, in religious discussions the term "modernism" was bandied about, and as village people who have no knowledge of the theological and philosophical conflicts that gave rise to the term, the word was attached to the only thing in their experience that had meaning, anything modern. So anything of recent origin was to be condemned, television, miniskirts, movies which had only recently been introduced.

Functional-Thematic Level

The most extensive set of relationships is to be found at the functional level. Here all types of correspondences appear, table-chair, bacon-eggs, knife-fork, etc. These can form endless chains, as the play on ideas used in the riddle "Why are fire engines red?" The importance of this level has not been understood, and very little research has been done on it, especially in the cross-cultural context. This may be due in part to the fact that the possibilities

A. Covenant



B. Hound

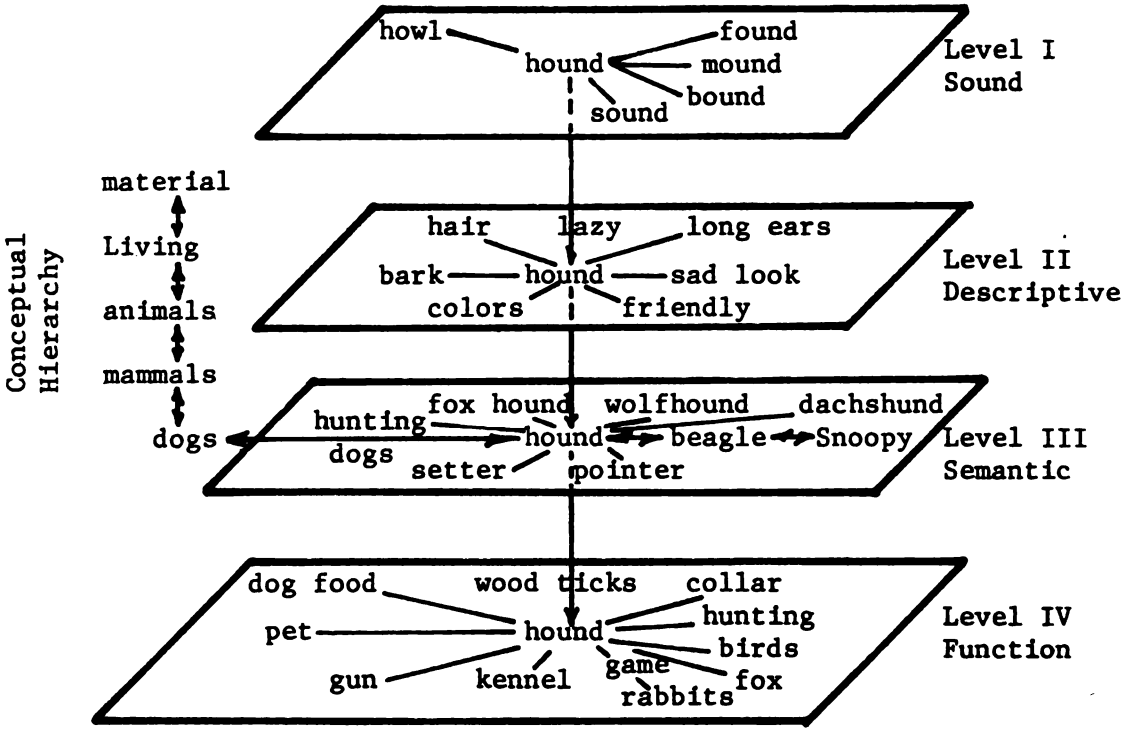


Figure 6

LEVELS OF ASSOCIATION IN MEMORY ORGANIZATION

are so numerous, complex and extensive. In the Kagan, Moss and Sigel (1963) study, most of the information regarding these relationships was discarded, they stated that at all ages the individuals tested preferred to make inferential responses, which belong to this level of functional associations, these responses were not accepted.

Semantic Level

The third level, the semantic, is one that has been most extensively studied, but even here, only one aspect of it, that of hierarchical organization of concepts. The cognitive anthropologists have studied this to a considerable extent, and in some sense, the semantic differential method of Osgood fits here (Osgood, Suci and Tannenbaum 1957). If a concept has a 1:n relationship, it is possible that any or all of the n's are also concepts in their own right, thus leading to a tree organization for a hierarchy of concepts. Gagne's (1962) differentiation between principles and concepts actually identifies two levels of concept organization. As can be seen from the diagrm, at the semantic level a concept shares areas of its domain with a few, or many other concepts, that are thus synonyms. While many of the associated concepts at this level do not form hierarchies, some do. If, as some say, "science is classification", it may be that modern Western thought is closely tied to this issue of hierarchical organization of concepts.

Cross-cultural Hierarchies

Cognitive anthropologists have observed that most traditional cultures have a very low degree of hierarchical organization of

concepts. Cole *et al.* (1971) studied the categories of things represented by the morpheme /seŋ/, and it appears that basically there were only two subclasses, forest things and village things. Some items belong to both classes, so they are not exclusive. This seems to be the extent of levels, three. In many areas that have been studied, there are only one or two levels. For instance in the Mayan languages of Mam and Quiché, there are no terms for color for form, one only asks how things appear. The lack of an Eskimo term for snow, while having many very specific terms for particular kinds of snow has been discussed, as well as the number of terms for horse in Arabic, with no generic term. Is the case of extended hierarchies of semantic relations peculiar to Western scientific culture? Clearly in some areas of science, very elaborate hierarchies have been elaborated, for instance, the Linneus taxonomy, and the organization of terms in chemistry and physics.

Analysis Within Hierarchies

Does the process of analysis relate to this hierarchy of classification, moving from a higher to a lower level? Does this process involve the detailed observation and breaking up into parts a higher level concept into its lower level constituent parts? Guilford (1967:180) discusses analysis in this sense, to divide up a whole into significant parts in order to understand the totality, and he contrasts this with Witkin's concept where "the emphasis is on a *breakup*; even *destruction* would be a better word to describe what happen..." (Italics his). At the same time, synthesis which is the formation of higher levels of categories by combining and

relating two or more lower level instances or concepts, is the reverse. If this is the case, it might well be that one of the reasons why analysis and synthesis are not common processes in many cultures is that their languages do not have many levels of hierarchy, and so do not lend themselves to these processes. Even in the West, most of the extended hierarchies are not common language ones, but those that have been artificially produced as the product of scientific endeavour. Another observation that should be made with respect to scientific contrasted with natural concepts is that scientific concepts are very much reduced, they have very few connotations or experiential associations, and therefore are more easily related, categorized and organized. As terms become more highly refined, they become so abstracted from the usual understanding of experience that they have no referents that can be imagined, and become purely mathematical functions, e.g., the subatomic particles. Part of the problem of teaching cross-culturally must reside in this area of the artificiality of scientific thought, and the high degree of restriction of the semantic relations of the terms. The restrictedness is borne out by the observation that school tends to teach children to think in terms of matters that are not physically present, the first stage of the abstraction process (Bruner *et al.* 1971). Another aspect of the same problem may be that school teaches the learner to work with problems that operate within well defined, circumscribed limits. In traditional cultures the tendency is to bring in many other conditions, making the situation in which a

problem is posed a real life one, and not working strictly within the limits of the problem as stated (Cole *et al.* 1971).

Compartmentalization

A further aspect of the process of concept formation has to do with the way concepts are isolated. Material that is learned in isolation frequently is not related to other information though there may be important potential connections. This compartmentalization may be quite natural, as when a person learns one series of concepts in one module of programmed instruction, then goes to another, where the relationships are not taught. If later these are to be related, and the cues of one are presented, the other concept will not be called up, and the whole process of integrating a series of concepts will fail. At the same time there may be strong emotional barriers that accompany compartmentalization. This appears to be the attribute that the studies of rigid or domatic personality were to isolate. If the two sets of concepts are juxtaposed, one of two things may happen. A new relation may be established, and a higher level of integration achieved, or the relationship may be rejected. If the relationship is rejected, the two concepts become polarized, and there may be very strong barriers against establishing the relationship. A good example of this is exhibited by the Mayan Indians who have lived for some 500 years in close proximity with the Spanish speaking Ladino culture of southern Mexico and Guatemala, but have not accepted the Ladino culture. Certain of the customs and beliefs do not affect the non-Indian population, beliefs surrounding their own images and religious

practices. When an Indian is confronted with this fact, he will recognize it, but reply that it only affects the Indian, not the Ladino. This conceptual separation seems to have insulated the Indian culture from acculturation, and from facing many situations in which the two are in constant conflict, and the individual is never confronted with a situation which cannot be rationalized (Mendelson 1956). Khokhlov and Gonzalez (1973) found a very different level of need for consistency between American college students and Greek villagers. The Greeks were undisturbed by inconsistencies in cognition, maybe did not even notice them. Thus, what is perceived as conflicting may well be part of culture.

Retrieval

It appears possible to retrieve material from the memory by entering it at almost any point. At the same time, due to the way concept domains can be compartmentalized, by entering at one point, other domains are automatically excluded. It would appear that the issue of "set" is bound up with this. When attention is directed one way, the limitations of that domain enter to keep the individual from shifting to another one, and therefore solving a problem that requires such a shift. The Einstellung problems are of this sort. It is Koestler's contention that creativity in fact consists in the ability to cross over and see new relations between different domains that are fruitful, but have never before been united (1964). Bower sees it as the critical point for learning (1975:70). The positive aspect of set is that as one enters the memory structure at one point, the relevant related material is

within easy access, so that new variations and new information may be related and so be placed in that domain. The process of calling up a particular domain to initiate a line of thought, and then varying it to include new information appears in almost every aspect of life. For instance, at the beginning of a musical work the tempo is marked with the beat, and the tonal scale is set with the first few notes, then as the work continues variations such as syncopation can be introduced. Without initiating a set first, no information could be communicated. Some people are more open to shifts than others, and some can make shifts more rapidly than others. As traditional societies tend to conserve and strive to minimize information loss, they may tend to enhance the ability to maintain set rather than to break it.

Recall as Active

It has also been observed that recall is not a simple process except from the STM and the IMS where information is conscious. Mandler (1967) has shown that it is an active organizational process and that individuals use many different and idiosyncratic strategies to both learn and recall even the simple paired associate lists. Cole *et al.* (1971) have shown some of the strategies in the African context, and ones which schools enhance, as following hierarchical branches, while the more traditional form and trace concepts by means of narratives and proverbs.

Combinatorial Processes

Information is not only acquired, coded and maintained in memory and retrieved, it must also be combined in order to produce decisions

that lead to responses. Bower (1975) maintains that memory is not so much a set of coded facts as it is a series of rules that can be used to reconstruct remembered information. These rules, or basically, subprograms, control the selectivity of attention, or retrieval, of organization and of combination of information. The processes by which this is done are probably very complex patterns of quite simple elements.

Piaget's Operations

Piaget has elaborated the series of operations that make up the formal operational stage of development, and these build on and include the operations used at lower levels, so are exhaustive in that sense. Information is organized by operations of a) similarity, or identity; b) dissimilarity, or negation; c) seriation or logical addition; d) logical multiplication; e) implication, and ; f) hypothetico-deductive reasoning. The basis of all the others is the identification of things that are the same or not the same. Those that are similar can be grouped in series, and if multiple attributes are involved, the series becomes a matrix, and logical multiplication is involved. Implication is a deduction from logical multiplication. The hypothetico-deductive process is the process of extrapolation of a multiplicative set into all the logical permutations of the multiple attributes, and then implications are deduced from these permutations in order to find what properties each will have. These properties can then be confirmed or disconfirmed by comparison with real cases. It is clear that the processes from a) to e) are used by traditional cultures, however there is a question regarding

hypothetico-deductive processes. It may be that these processes are used in certain domains of experience. It also may be the case that the number of contexts where this type of operation is required is so limited that generally there is no elaboration or practice of hypothetico-deductive reasoning.

Hypothetico-Deductive and Literacy

Ong (1969) contends that "writing makes science possible." The reason is that for non-literate societies the only techniques for conserving information are repetition and thematic organization, or by sound similarity. According to Inhelder and Piaget (1958:253) the properties of hypothetico-deductive reasoning involve projecting all of the logical possibilities of what could happen. Even in a simple set of 2 x 2 properties, it is necessary to keep track of the possibilities and examine them in order for their attributes. Then each category must be examined against reality to see if it occurs or not. Even such a simple case as this is quite difficult to manipulate without some means of keeping track. The problem is partly of how to organize information in a systematic way. It is interesting to note that the ancient Greek and Roman teachers of rhetoric taught their students to think of a house, and associate each point of their speech with a room. Then by thinking their way through the house, they could remember in order the points. Again to maintain the possibilities and especially conserve them in order to build on the knowledge once discovered would be nearly impossible without writing. For this reason, the emphasis is on strategies that will rehearse information so it will not be lost, and to this

end information is encoded in poetry, proverbs and narratives, and thus repeated. So creativity and novelty are not of great value, and the tendency would be to not use hypothetico-deductive reasoning nor analysis which are for the purpose of discovering new combinations.

Inductive-Deductive Processes

The much discussed deductive and inductive processes are in fact much the same, and very similar to the process of concept formation that has been discussed. Both are based on analogy which is a 1:1 identification of similarity or sameness. Deduction might be described as finding a case that fits the rule, and so, fits the analogy, and can be extended to n+ cases. Induction is the derivation of the rule from examining a case, and then examining other cases to identify the same characteristics, and through this process refining the definition of the rule, if more than one characteristic is involved in the analogy. Induction then is the assumption of a rule and its refinement, deduction is the application of the rule to identify a case. In both cases, the issue is one of comparison of specific cases with a rule.

Analysis-Synthesis

The processes of analysis and synthesis represent a somewhat different issue, more like that of logical multiplication in the formation of conceptual hierarchies. Analysis is the division of a significant whole into its constituent parts or attributes, and synthesis is the reciprocal process of ordering a set of attributes into a higher level unit. As the properties of the parts are not

similar but coordinate, it is not a problem of identification, but of division or differentiation and then re-integration of meaningful subwholes within a larger unit. As in the case of logical multiplication, there may be very few cases in traditional societies where this type of process is important, and therefore practiced. One might contend that there are in fact very few occasions where the ordinary person in Western society is required to use analysis and synthesis except in academic and theoretical pursuits such as research and engineering.

Cultural Differences

The question is now, which of these processes are influenced by different cultures? The domain of language is certainly one area where cultures differ. It has been mentioned that the number of levels in the hierarchical organization of concepts varies, being quite reduced for most non-Western languages that have been studied. Another area that could be greatly different relates to the activities that might serve to develop the sensitivity of certain sense modes more in one culture than another. This has been the argument relating styles tests to cultural practices as used by Wober (1967) and his conclusion is that there are "sensotypes." That is, in some societies people use certain sense modes and therefore are better able to operate in those than people from different cultures. For instance he cites the case of Africans who use dance extensively and found that they had superior performance on exercises that make use of kinesthetic cues, while Westerners did better on those tests that rely completely on visual cues. There seem to be some tests

that bear this out, and certainly the concept has a long history in psychology. Due to the fact that different things are important to the people of different societies, it would be natural that these aspects of culture and cognition would be more highly elaborated and developed.

Differences and similarities

Maccoby and Modiano (1969) maintain that for agrarian cultures differences are of more importance than similarities. If this is so, then the formation of unified classes would not be a typical approach to problems, for classes are based on similarities. Differences establish separate domains, from which come special sets of relations and inferences that are associated with these differences. The question has been raised by Cohen (1969) regarding the types of materials that are important in western middle class society relating to analytic modes of thinking rather than relational ones. Her thesis is that school learning is almost entirely analytical, and that for this reason all of the tests used in predicting school success are analytical in nature. Since the analytic frame of reference is so pervasive, tests that have been construed to be culture free, and have had all of the content material removed, are therefore so purely analytical in nature that they test only what the middle class values most. For this reason, those who do not share this culture, and certain attributes of it, are at a disadvantage, even the subcultures and minorities in the United States. People from traditional cultures would be at an even greater handicap.

Relevant Information

From these considerations, what a culture teaches people to pay attention to and considers most important is probably the clue to understanding the problem of cross-cultural thinking and teaching.

Over abstraction

Often students from the third world studying in institutions of the West apparently learn well, but on returning there is very little carry-over. This problem, of course, may happen for a number of reasons, for instance, students of agricultural extension programs find on returning that the peasants do not own the land themselves, and have very little control over what happens, so that there is no motivation to improve the land with fertilizer, rotation of crops, etc. On the other hand, it has frequently been observed that some of these students who use English as a second or third language have a very poor grasp of many subject areas. They may be extremely fluent writing term papers, and handle the terminology with considerable facility, but apparently with little understanding. They seem to have learned the terminology with the very limited denotative definitions, and have no connotative experience to use in generalizing the ideas into concrete applications. Having learned terms at a high level of generalization, without the supporting lower levels of experience and concepts, there is no way for them to translate the learned concepts from the high level of generalization to the low level of experience. In the information processing model, it is clear why: the non-existence of all of the foundation levels of cognitive structure based on idiosyncratic experience makes this

transfer impossible. In these cases, the problem for teaching is one of finding ways to fill in these lower levels of the conceptual hierarchy so that the high level generalizations are in fact grounded in concrete experience, and can be related to it. Teachers from the West who go the third world countries experience the same thing. Even if they learn the language, they lack all of the experience of the formative years, so that there are great gaps in their understanding of the concepts that are taught.

Combinatorial Processes

With respect ot the combinatorial processes, there are a few cases in the literature and in personal experience that do open up the question of whether hypothetico-deductive reasoning is used in traditional cultures. For instance Gladwin (1970) discusses the case of navigators of Paluwat in the Caroline Islands of Micronesia. When a seamon is lost, blown off course during a storm, he will observe the wave patterns produced by the wind, the reflections from islands, the influence of submerged shoals on these patterns, etc. in order to project a course which should bring up certain recognizable differences. With this as an hypothesis, he will direct his course to bring up a certain sequence of features in the waves, and should pass over certain shoals. On confirming his thesis, he will know where he is, and can set a course for home. This obviously requires the integration of a number of factors, the projection of an hypothesis, and the use of the hypothesis to find a position and direction. Much of this is coded in mythological stories. While the reasoning does not require the individual to think of all the logical possibilities,

it does require the independent coordination of a number of factors, the development and confirmation of an hypothesis.

Explanation in Traditional Society

Another case is cited by Cole *et al.* (1971) relating to house construction. The villagers discuss the case of building a house on a slope, and reject it, saying that it will not work. They were not able to spontaneously verbalize the relations, but clearly understood them, and the implications. The eaves would not protect the lower part of the wall from blowing rain in a storm, and the wattle and daub construction would be weakened by the moisture, and either the house would fall or slide down the incline. The factors of the kind of weather, the characteristics of the soil, the foundation materials and the protective value of the eaves were all integrated into a conclusion regarding what would happen. It could be that such conclusions could be reached from experience or traditional practice. Nevertheless, it does raise the possibility that when circumstances demand, traditional people can use the same combinatorial strategies that Westerners use for solving problems. Discussions have been observed personally where farmers discuss the effects of wind, water, fertilizer of different types on the corn crop, setting out all the possibilities, and what will happen with too much and too little of each. Are these case of hypothetico-deductive thinking?

Logic in Other Cultures

Chao (1959) pointed out in his study of Chinese logic, that it is not something different from Western logic, but is "logic in

Chinese." The terminology and grammatical organization of the declarations are different, but the way the concepts are combined is the same. It appears then that from the cross-cultural standpoint, the combinatorial processes are the same as in Western thinking, the only real difference might be the degree of practice afforded in certain modes and the difficulties of maintaining all of the logical possibilities in mind without writing. As Herskovits (1962:361) said regarding the way people of other cultures reach conclusions, "Granted the premises, the logic is inescapable."

CHAPTER V

IMPLICATIONS AND CONCLUSIONS

Implications for Research

Theory is the foundation for research, and not the reverse. Zigler aptly puts the problem in the title "A measure in search of a theory." Both the styles of Rokeach and Witkin fit the description. What do these studies say?

Implications for Theory Formulation

Generality

At high levels of generality, everything is related. For instance, the three categories plant, animal, mineral include most of the world. They probably could be shown to correlate to some extent with each other with respect to the number of subcategories each includes, and other trivial characteristics. But this type of correlation tells us very little about the categories. For this reason, a general concept like cognitive style can correlate with education, socio-economic status, ecological categories, culture, almost anything. Therefore, if anything of value is to emerge from cognitive research, it will have to be at a much lower level of generality, and higher specificity.

Specificity

The analysis and evaluation of the cognitive style studies has shown the problem of ill-defined terms to be a major source of difficulty in theoretical formulations. A term such as differentiation should be specified strictly among the possible senses. It can be limited to discrimination between stimuli that differ in certain predicted ways. The term could be limited to a differentiated cognitive structure, as a memory with many discrete domains that can be interrelated. The terms should be specified, the relations hypothesized, and the kinds of mental processes expected then deduced, along with the kinds of activities that will likely exhibit the hypothesized relation. As has become evident, by beginning with the test, and trying to see what cognitive processes or properties are sampled, the investigator can be easily led to ill-defined constructs that then are likely to lead into another type of error. The temptation is to allow the theoretical terms selected to include all of the cloud of subsidiary meanings that the natural language term includes, and then with these ill-defined terms, to seek connections in areas where they do not apply.

Literature

A related problem exists with the literature. The writings in the field of cognition are probably the most extensive in the whole field of psychology. The propensity for each school of thought to define a set of terms for its own use, using words that others define differently only compounds the confusion. Even in the subarea of cognitive style, the number of studies is beyond the

capabilities of any student to assimilate and organize before proceeding with further observation. Therefore, there needs to be some major studies to do nothing more than order and define the literature, so that new people entering the field have some relatively rapid way to come to terms with the state of studies. Probably this should be done from more than one orientation, so that the person entering the field can quickly come to grips with areas of disagreement and challenges to the theory, as well as the main concepts, definitions, arguments, and results made to date. Due to this lack, the present state of things seems to allow a person to review a small segment of the field, possibly not becoming aware of challenges and contrasts, and to begin a new work on this extremely weak foundation. As Arbuthnot and Handel have pointed out, the information given in most studies is not adequate to be able to evaluate them and compare the statistics of one study with another. Of approximately 350 studies, Arbuthnot was able to find adequate information in only 122 to compare. Due to the scattered state of the literature, no real progress can be expected until these diverse sources can be unified and coordinated.

Implications for Cognitive Studies

FID Tests

If the factors sampled by the style tests are interpreted as related to attention, two main aspects are involved. The first is attending, the second is shifting attention. These might be considered as the essential components of establishing set, and the

process of breaking set to establish another. In an information processing model, there is some program that activates the whole system in general, something similar to arousal. In people, this seems to provide an impulse to make the perceptual and cognitive systems active. With deprivation of external stimuli, the individual generates his own internal ones as dreams, illusions and hallucinations. In the presence of external stimuli, for most people there is an impulse to know, to see, to order, and this happens in the very young as Piaget's phrase describes it "making interesting sights last." The person develops the ability to focus attention at a very early age, and this can be conceived of in terms of a program that is elaborated with experience regarding what to attend. These programs are what Piaget refers to as schemata, and not only provide content information, but also process information. The process must include information regarding how to focus attention, what signals to attend (extreme changes of amplitude in some sensory mode, a clap of thunder, or on the back, or the sound of silence), including circumstances when to attend (look for traffic before crossing a street). The source of information must also be specified, whether internal or external, and each of these program aspects can be affected by individual experience. It may be interpersonal experience that communicates expectations and norms, and internal sources in memory where past experience defines and relates what is important. Strategies for information search are undoubtedly also stored. For instance, with the "tip of the tongue" phenomenon, a person might be vaguely aware of the sound

of the first letter of the word, and a search is made by adding all the vowels to see if some combination will lead to the concept, or maybe thinking through the context of the situation where the concept was used will trigger retrieval. We need to know the form, extent and content of each of these.

Constraints

As was considered before, the memory store is exceedingly complex, and appears to accept entry at almost any point for retrieval. The entry point seems also to establish the set for the moment, but as the place of entry is linked with many other hierarchies and individual concepts, the set established can lead in any of these directions as discourse continues. If attention is directed outside the individual, these programs provide orientation for search or scanning, in order to locate the appropriate information. These concepts represent domains of meaning, and not just one unique connection or referent. The domain may be broad or narrow, the borders may be strong or weak with respect to making connections, and they may be interrelated with or isolated from other domains. If the domain is broad, it includes many individual items with limited similarity, if narrow, the concepts are probably much more homogeneous and specific. For instance in two Mayan languages, Mam and Quiché, the color of the sky, water, and trees are designated by the same word. Again, there is no linguistic device to distinguish color from form as categories, in each case the question is "What is its appearance?" This could define the factor found by Gardner and associates called equivalence range. The strength and definition

of borders of domains would be Saltz' boundary strength. If the concepts are isolated, compartmentalization is involved. Since these domains are built through experience and, with the proposed developmental model, gradually gather psychologically similar experiences into categories, and if the experiences involved contain rewarding or hurtful events, these would be connected so that strong emotional ties would be built up which could serve to maintain these domains inviolate. According to Piaget's formulation of accommodation-assimilation, the categories could assimilate new and disparate information until too much strain was produced. At that point a reordering and reorganization would produce new boundries for the domains. This is what Piaget refers to as accommodation. Presumably the individual could preclude the accommodation of new material by assigning new, unassimilated information to a new or different isolated category, thereby avoiding the conflict that would lead to accommodation. If these processes are as described, there are probably individual differences for each. For many concepts it is conceivable that the coding of a given language and culture would maintain them isolated, and therefore no conflict occur, whereas for other cultures, these domains might be juxtaposed, bringing them into conflict.

Culture Conflict

Culture conflict can be understood in terms of this model. A frequent type of conflict occurs when Americans do business in Latin America. For instance, you enter a store to make a purchase and ask for the item. They say, "It is out of stock but we will

have it next week." The local person realizes that this means they never had it, and probably never will, so he continues his search elsewhere. The American will come back next week and the week after until he is convinced that "not yet" means "probably never," gives up, and looks elsewhere, perhaps having made a moral judgment about the people. The custom of "face" is quite similar. The coding for these two people is different regarding the expectations of linguistic events. Similar differences in expectations occur in school environments. The school in Latin America is generally the place a person goes to hear the "right answers" from the teacher. The student's thinking is not involved. If, on the other hand, the teacher does not come forth with the answer, but expects the student to think his way through it, and come to his own conclusions regarding the truth, the student is disoriented, insecure, and will lack confidence in the results because they did not come from the teacher. In each case the meaning of a particular event is assigned to a different domain, and so the interpretations are in conflict. For a particular pair of cultures these differences can be great, and critical, but at present very limited information is available as to what they are.

Flexibility

Chown's article "Rigidity--a Flexible Concept" (1959) points up the problem that there are different kinds of flexibility and rigidity. The EFT was considered by Thurstone as a measure of flexibility of closure. Guilford called it adaptive flexibility. It involves, in their minds, the transformation of one figure to

another. It was pointed out that the EFT involves a process of tracing a pattern. This process requires attention to be transferred from one pattern to another to find similarities. This shift requires the flexibility to transfer the attention from one figure to another, while maintaining the form of the first in mind. The RFT certainly requires this transfer of attention from the visual display to the kinesthetic cues of the body, and the ability to tune out what is irrelevant. The problem is similar to breaking set, for thought is running in one channel and must be transferred to another, for some people this is difficult. For others it is so easy that it is difficult for them to maintain a set.

Intelligence

In a number of cases the meaning of intelligence has arisen with respect to style. Cohen (1969) defines it for the usual tests as the existence of an adequate inventory of information. But highly intelligent people have not only an adequate inventory, but also the ability to shift in the presence of other requirements. The person of lower intelligence is more fixed, and cannot shift according to the requirements of the situation. The interpretation is that some people are oriented toward interpersonal information, while others are more sensitive to impersonal information. The interpretation that the difference is due to one person having been made sensitive to one and, therefore attends it more than the other fits well with the understanding that FID measures attention. That some people would have both sensitivities is only natural. The research question is, do those who are limited to one type of sensitivity

have the ability to become sensitive to the other also, and so be more flexible in facing different situations. It has been stated that teachers who are of one type are more effective with students of this type, while causing other students to be disoriented. The interpretation that some are sensitive to social cues and others to impersonal cues fits here also, for a teacher with sensitivities and interests in one direction would probably emit cues that would be congruent with the needs of students of the same interests, while the cues would not be appropriate for a student whose orientation was toward more impersonal cues. Again the interpretation that the issue is attention is adequate. Humor seems to follow this pattern. The flexible are able to shift, and since humor can be conceived as the juxtaposition of two concepts that are ordinarily isolated, and incongruous, then the ability to shift attention and change set would be required to appreciate it. These lines need to be investigated for more specific delineation of the conditions and the stimuli that produce, maintain and allow the breaking of set.

Relevance

One critical factor with respect to attention is how does person know what is relevant? In the cross-cultural context, it appears that what is relevant is included in custom and language. What constitutes an insult in one language and culture may arouse no feelings at all in another. Clearly there are many commonalities, but even among these, there are some differences. This is the thesis of Maccoby and Modiano in their contrast of Mexicans with Americans. According to their findings, Mexican farmers tend to

contrast things, keeping them distinct, while Americans group them into classes. While it would not be possible to carry this too far, there are probably some domains where it is important. The difference noted by Maccoby and Modiano is not absolute, otherwise people would not be able to class animals as dogs or cows, which they clearly do. The question that remains is under what circumstances, and in what cases do the Mexicans discriminate, and keep separate classes, and in what cases do they group them? Returning to the main question of how we know what is relevant aside from the received categories of culture and custom, Reitman provide one other possible source. He says a concept:

> is an abstraction or generalization *with respect to* a limited subset of characteristics of the set of instances. The point is of importance because we may expect that individuals form abstractions, generalizations, and concepts in connection with particular purposes. As a result, we may anticipate that there will be linkages between particular characteristics and particular functions. Indeed, one of the most important aspects of human heuristics, one of the main abstractions from the experience of the individual, is his notion of what consitutes the significant variables in some particular class of situations (Reitman 1965:101).

Note again the closeness of purpose and content, the two are inseparably linked. What further sources of information there are regarding what is relevant presents another line of research.

School and Attention

One of the critical differences that school makes is teaching people to notice certain things that were not considered important before. In order to teach adequately in another culture it would seem imperative to know what these differences are, and at present

there is no place one could go to find them. This type of analysis would have to rely on a new understanding of the material to be taught, and the ways in which the cultural concerns of the target population differ from those areas of information that are to be taught. What precisely does the school teach students to pay attention to that is different from that they learn in ordinary life? From what we have seen previously, school seems to teach the learner to relate and consider in an abstract way things that are not present. There is also a certain artificiality about school, in that problems are presented, and must be solved within the confines of the information in the problem as stated, instead of importing other information and expanding the problem conditions. Teaching as in extension education, where existential problems of life were presented, students would imagine cases they had known, and bring into consideration conditions from these cases, instead of limiting themselves to the problem presented. In many cases, the additional information provides a realistic context, but at other times, by diluting the problem context, some of the contrasts being taught lost their emphasis.

Development

In this study the hypothesis has been presented that development proceeds along two different lines. One line involves discrimination that begins at high levels and becomes less toward maturity, while skills move from less precision to greater. This is contrary to the commonly accepted version that all processes move from the more general, ill-defined to the more highly defined. It was pointed

out that the common understanding does not account for the precise discrimination necessary for the young to imitate exactly speech sounds before acquiring words. Therefore the pattern of two separate lines is proposed. In this it is conceived that children begin with clear discrimination between stimuli, even to the point of seeing the same display as different if it is hidden and then revealed. As concepts are formed, they are conceived as being single member categories. The language skill begins and grows, first by naming, probably as unique categories, but gradually these are united and refined so that stable classes begin to be formed. As concepts are attained, extraneous material is more and more ignored until concept domains are clear and well labeled. At this point some even go further and ignore so much of the irrelevant information in the stimuli that it becomes impossible for that person to discern between subclasses within the concept. For this reason, one implication of the theory is that children's learning faces a different problem from adult learning. Children must learn to relate information and form categories, so the problem is one of generalizing. For adults it generally is a case of breaking down already formed categories in order to make discriminations they have learned to overlook. Due to this, for adults, analysis is important, to break up an item in order to become aware of the subordinate parts. For research, the problem is to examine the hypothesis in light of the developmental process that actually takes place in the child. There are fragments of information that support the hypothesis, but it has not been defined nor investigated

precisely. For instance, studies of pattern recognition have presented children of from one week to a couple of months age with a pattern or photograph, and then photographed the eye movements as the infant scans the display. The eyes follow in very precise ways, and attention is directed at certain salient features, intersections of lines, borders of faces, eyes, etc. The babbling child babbles in his mother tongue. This hypothesis fits well with Piaget's findings.

Generalization

As noted in the last paragraph, individual cases are brought together to form concepts. This implies that relations are established between them, generalization. As was previously discussed, at the beginning there is over-discrimination and separation, but as concept formation proceeds, for most people items are related, and categories refined until stable concepts emerge that are fundamentally similar to the social understanding of the speech community. This process involves first establishing relations or connections, and then refining them. At first the connections are casual, on the basis of some chance impression, and quite unstable. Presumably with experience the real connections hold up, the others do not. This happens because connections made at one point are contradicted by experience and therefore must be changed. As Bower points out

> the learning mechanism seems to become 'switched on' mainly when environmental events do not confirm expectations--when they are surprising or informative (1975: 70).

At first a child does not sense the conflict, and therefore sees no need to justify the statement of a connection he has made. Later with contradictory evidence that must be faced, a reorganization takes place. As Piaget remarks regarding the learning process at this point

> Remember also that each time one prematurely teaches a child something he could have discovered for himself, that child is kept from inventing it and consequently from understanding it completely (1970:715).

The point may come that concepts are so well formed and so much of the real context dropped that the adult can no longer make discriminations within the concept domain. A number of curious things may happen. Adults may continue to make generalizations that cannot be refined due to their nature, the connections can not be disconfirmed. Thus with peasants, if one becomes sick he begins to search his memory for certain types of experience in recent days, and if something out of the ordinary occurred, that fits the pattern, and it usually has, the sickness is attributed to that, the cause is identified, and the person satisfied. He may have taken a bath, gotten in a draft, had a scare, etc. each can be considered the cause. When abstractions become general enough they make the level of not communicating anything at all, a common occurence with speeches for public events. The implication is again that for adults different strategies must be used to make them become aware of discriminations they have lost. The feedback from concepts to perception is the determining process.

Combinatorial Modes

Information is not only generalized, it is also combined. It is combined in certain ways so that efficient coding in memory can take place, and so that the information can be manipulated well. The most efficient codes are those that incorporate hierarchies and mathematical formula. In the mathematical form, a very large amount of information can be included in a small rule. Hierarchies are not as efficient, but still much better than analogy, or 1:1 coding. However, neither of these really is possible for the child, and apparently not for most traditional societies, especially if they do not have access to a language that has extensive hierarchies. As has been pointed out, the most extended hierarchies in the Western languages are the artificial ones of scientific terms. The coding principle of the traditional societies seems to be thematic. A story codes the information. Like a good theory, all the details are integrated, so that once the theme is remembered and started, all of the other information comes to mind. A series of scenes is produced. An interesting parallel is found in the way people give directions in Nepal. A description of the successive scenes is given to the traveller, who can then recognize them as he journeys. Also Piaget tells of children in the preoperational stage of not being able to follow a process, but only the beginning and end points, for instance, a pencil held vertically, and allowed to drop. It might be well to think in terms of introducing information to traditional societies in narrative form. The soap opera is effective. Other ways of combining information are the logical operations. Wasan and Johnson-Laird (1972) have explored many of

these and found a number of important differences between the psychological laboratory experiments and the practical way people reason. Of particular note were the way negative information is used, and the use of conditionals. For instance, most negatives are not used directly, though in the laboratory experiments it seems to be the most useful information. But in real life, all negatives of one concept are positives of another. For instance, one does not identify cows, horses, houses, and cats and say they are not dogs, but one identifies dogs, and that excludes all the others. It would be well to examine other probems solving strategies, and logical operations to see if in reality they work the same way in real life. Also, there is a need to examine the tasks that traditional people have to solve, and to see what kinds of operations are required, for unless there is use for them, they would not normally be attained.

Sense Modes

It has been postulated that initial processing of information received in each sense mode, visual, aural, kinesthetic, haptic, etc., is different. In higher level processing there is at least some difference between verbal and visual processing. Some extreme cases have been cited. At the level of perception or acquisition of information there are individual differences, physically some are important such as being tone deaf, color blind, myopic etc. But there are undoubtedly other differences as well coming from practice and refinement of the use of that particular mode. Painters and other graphic artists see colors, shadings, configurations much more

precisely and sensitively than the layman. The same happens for the musician, the dancer, the skater, machinest or tea tester. It has not been determined to what extent these are influenced by genetic factors in contrast to nurture, but they do exist, and could be taken into consideration in education. Also, some people are desensitized to certain modes. For instance, certain Americans have become so unaware of their body sensations that they have to consult a doctor for things that people in other cultures immediately perceive. These differences could conceivably make large differences in test results. However, also from this standpoint, it is probable that major differences will appear not only between individuals, but between social groups with respect to which senses are practiced, and developed.

Visual and Aural

In the style studies another contrast was made, between those with spatial ability, and those with verbal abilities outstanding. How this happens, and to what extent people are limited in these areas is not known. Presumably high verbalizers can also have vivid dreams, so can have clear mental images. What is the difference? In Western society, expecially in the United States, there has been much discussion of the visual mode, and the impact of movies and television. If our society is visually oriented, it certainly relates to images, not visual symbols. The low level of reading skills generally is well known. In fact it might be the case that only a small group of Americans are functionally literate in the sense that they are able to read new material and understand

it without recourse to collateral oral explanations. If this is so, and most psychological testing is done in college populations, what then is the prime mode of information acquisition for Americans? While there seems to be no problem in interpreting two dimensional displays, there is still the question as to whether Americans are principally visual or aural with respect to semantic content. It could well be that the aural mode is the most important for Western societies as well as traditional societies.

Intersense Transformation

Another aspect of sensory acquisition that needs study is the ability to transform information from one mode to another. There are some people who are more conceptually oriented, and others visually, e.g., Luria's mnemonist. If there is a tendency to transform information into modalities that a person is most adept at, this could impose critical barriers for them on some types of learning. It would certainly make those with capacities in one mode do poorly on tests that make use of other modes. Some studies indicate that any transformation to or from the kinesthetic mode is the most difficult. The relations here are not well defined yet.

Implications for Teaching

A number of suggestions for teaching have already been presented, for instance, the difference between the cognitive processes for adults and children and the way these differences can be met, the use of narrative as a means of coding information for traditional societies. One or two others that might be of value follow.

Instructions

An area that requires some consideration relates to instructions. As has been seen in the testing programs, one probable reason for radically different results in some programs relates to the probable lack of adequate instruction. The people being tested were learning new concepts as well as being placed in an unfamiliar context to be tested. This being the case, without adequate understanding being assured, and with the propensity of people from these communities to agree with authority figures, it is not surprising that test scores were low. The same is true in the school setting. It is common in schools and also in ordinary life that when instructions are given that they appear clear, until the point comes when they have to be acted upon. Then, it becomes clear that there was not adequate understanding, and then there are further questions. There is the continued need to assure that comprehension has been attained. This is doubly important where memorization of school texts is common, for it is possible to memorize without understanding.

Overabstraction

From the literature that has been related to cognition in non-Western communities nothing has been said about overabstraction and talking in such high level generalities that nothing concrete is communicated, yet this is one of the greatest problems that I have encountered. In certain areas, particularly in Latin America, the tendency to discuss endlessly and in generalities is rampant. It occurs frequently in the universities in the U. S. with people whose second or third language is English. The vocabulary is

learned, and used correctly, yet one gains the impression that the person can not relate these high level abstractions to any concrete situation. This problem could be overcome, or at least moderated by requiring concrete examples, and relations in discussions and term papers. Use of discussion methods which continually force people to relate their thoughts to practical programs might alleviate this.

Contradictions

If it is true that much learning takes place when a person is confronted with the existence of contradictions in their own understanding, in conflict situations, then teaching implies focusing attention by using situations that bring to light these conflicts. Until such a conflict is recognized, there seems to be no reason to strive for a higher level resolution and integration of information. Therefore, one strategy that might be important is to include systematically problem situations that throw into sharp contrast areas of unresolved conflict. Then by providing strategies of analysis and synthesis, guide the student to look for and find a resolution. The Piagetian tasks are frequently of this sort, as are the Kohlberg dilemmas. Similar conflict areas could be discovered and study units planned around them. In such areas as social studies, the concepts of freedom and law might be contrasted, and historical cases examined to illuminate the consequences. In agriculture, the relations between functional and pathogenic disorders of plants and animals could be contrasted to illuminate the concept of disease.

Narrative Matrix

In the area of methodology, reference has been made to the use of narratives to provide the context and matrix for concept acquisition. It has been said that in Africa, every sermon begins with Adam and Eve. Links are established with the ancestors and history, and this provides the context to which new ideas can be grafted. A similar pattern could be used for teaching most school subjects. Present teaching tends to be couched in generalizations of a level that provides little anchoring in daily experience. If this is so, more story forms and narratives that relate to concrete life situations might well serve to connect new information to old in a meaningful way.

Conclusion

Cognitive style has been examined and found to be a broad set of ability factors, that due to their range correlate with a wide group of variables. The low shared variance between the tests, and the lack of clear definitions make it impossible to be sure of what is measured and how it relates to other areas of functioning. As an alternative, it has been proposed that the major factors measured by the cognitive style tests are the ability to focus and to shift attention. As the foundation, a modification has been proposed for the understanding of developmental processes which concerns two of them, discrimination beginning at a relatively high level and being modified as conceptual thought takes control, and conceptual thought beginning with overdifferentiation and then

moving to the formation of stable concepts. These proposed theoretical modifications can be interpreted satisfactorily within an information processing model. From the examination of style theory and its relation to other areas, certain cultural differences have appeared, the lack of extended semantic hierarchies, the use of thematic modes to code information, and the probable lack of a need for any formal operations in the context of traditional cultures. These have led to some concrete suggestions for teaching and research.

APPENDIX

APPENDIX

The following is a list of the studies cited in the text in order of appearance.

Date of Publ.	Investigators	Style	Principal Tests	Subjects			Remarks
				Group Country	Rural-Urban	Age	
1960	Rokeach	Rigid-Flexible Dogmatism	Doodlebug Dogmatism EFT, KBD	U. S.	Urban	Various	
1959	Gardner, Holtzman, Klein Linton, Spence	Sharpening-leveling	Size esti. Assoc.	U. S.	Urban	College	Factor study of Five Controls
1967	Guilford	Convergent-Divergent	Utility Match Problems	U. S.	Urban	Various	Part of SI Model
1962	Witkin, Dyk, Faterson, Goodenough, Karp	Global-Articulate	EFT, RFT BAT	U. S.	Various	8 to adult	Several programs reported
1960	Gardner, Jackson	Sharpening-leveling	Size Est.	U. S.	Urban	Females Adults	Factor study of five controls.
1963	Kagan, Moss, Sigel	Analytic, Relational Categorical	Sigel Test	U. S.	Urban	8 to adult	Several studies reported

Date of Publ.	Investigators	Style	Principal Tests	Subjects			Remarks
				Group Country	Rural-Urban	Age	
1969	Cohen	Analytic, Relational	Sigel Test EFT	U. S.	Urban ghetto	8 to 15	
1970	Kagan, Kogan	Analytic-relational Global-Articulate					Integrating study of others work.
1967	Sherman	Global-Articulate					Integrating study
1972	Arbuthnot	Global-Articulate	EFT, RFT, BAT, KBD				Integrating study
1972	Wachtel	Global-Articulate	EFT, RFT DAP	U. S. Israel			Integrating study
1976	Berent	Global-Articulate	RFT	U. S.	Urban	School	
1977	Pitblado	Global-Articulate	RFT	U. S.	Urban	School	
1977	Reinking	Global-Articulate	RFT	U. S.	Urban		Validity of RFT
1977	Hoffman, Kagan	Global-Articulate	GEFT PRFT	U. S.	Urban	School	
Other Cultural Groups							
1967	Dawson	Global-Articulate	EFT, KBD	Temne Mende	Rural	Adult	

Date of Publ.	Investigators	Style	Principal Tests	Subjects			Remarks
				Group Country	Rural-Urban	Age	
1972	Dawson	Global-Articulate	EFT, KBD	Temne Arunta Eskimo Chinese Katanga	Rural & Urban	Adult	Relates dependence to lateralization
1967	Berry	Global-Articulate	EFT, KBD	Temne Eskimo Scottish	Rural & Urban	8 to	Relate to socialization
1967	Wober	Global-Articulate	EFT, RFT	Nigeria	Rural & Urban	Adult	Related to experience
1972	Siann	Global-Articulate	EFT, RFT	Zambia	Rural & Urban	Adult	Related to education
1966	Dershowitz	Global-Articulate	EFT, BAT	Jewish WASP	Urban	School	
1971	Dershowitz	Global-Articulate	EFT, BAT	Jewish WASP	Urban	School	
1973	Handel	Global-Articulate	PRFT, EFT	Israel		7 to 11	
1969	Okonji	Global-Articulate	RFT, EFT CEFT	Nigeria	Rural & Urban	College	

Date of Publ.	Investigators	Style	Principal Tests	Subjects			Remarks
				Group Country	Rural-Urban	Age	
1975	Gruenfeld, MacEachron	Global-Articulate	PRFT, GEFT	22 countries	Rural & Urban	College	
1969	Maccoby, Modiano	Analytic-Relational	Sigel Test	Mexico	Urban & Rural		
1977	Hoppe, Kagan, Zahn	Global-Articulate	RFT	Mex-Amer.	Urban	Children	
1976	Berry	Global-Articulate	EFT, RFT KBD	Temne Eskimo Arunta Amer-Ind.	Rural & Urban	Adult	Several studies brought together

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