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COGNITIVE STYLE AND VERBAL REGULATION:

AN INTEGRATION OF YU AND SCHUBERT

BY

 JONAS DARKO-YEBOAH

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

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.....
 (Student's signature)
 Dept. of Educational Foundations,

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 (Student's permanent address)

Date: 1/11/85

THE BLIND MEN AND THE ELEPHANT

JOHN GODFREY SAXE (1816-1887)

IT WAS SIX MEN OF INDOSTAN
TO LEARNING MUCH INCLINED,
WHO WENT TO SEE THE ELEPHANT
(THOUGH ALL OF THEM WERE BLIND),
THAT EACH BY OBSERVATION
MIGHT SATISFY HIS MIND.

THE FIRST APPROACHED THE ELEPHANT
AND HAPPENING TO FALL
AGAINST HIS BROAD AND STURDY SIDE,
AT ONCE BEGAN TO BAWL:
"GOD BLESS ME! BUT THE ELEPHANT
IS VERY LIKE A WALL!"

THE SECOND, FEELING OF THE TUSK,
CRIED, "HO! WHAT HAVE WE HERE
SO VERY ROUND AND SMOOTH AND SHARP?
TO ME 'TIS MIGHTY CLEAR
THIS WONDER OF AN ELEPHANT
IS VERY LIKE A SPEAR!"

THE THIRD APPROACHED THE ANIMAL,
AND HAPPENING TO TAKE
THE SQUIRMING TRUNK WITHIN HIS HANDS,
THUS BOLDLY UP AND SPAKE:
"I SEE," QUOTH HE, "THE ELEPHANT
IS VERY LIKE A SNAKE!"

THE FOURTH REACHED OUT AN EAGER HAND,
AND FELT ABOUT THE KNEE.
"WHAT MOST THIS WONDROUS BEAST IS LIKE
IS MIGHTY PLAIN," QUOTH HE;
"TIS CLEAR ENOUGH THE ELEPHANT
IS VERY LIKE A TREE!"

THE FIFTH WHO CHANCED TO TOUCH THE EAR,
SAID: "E'N THE BLINDEST MAN
CAN TELL WHAT THIS RESEMBLES MOST;
DENY THE FACT WHO CAN,
THIS MARVEL OF AN ELEPHANT
IS VERY LIKE A FAN!"

THE SIXTH NO SOONER HAD BEGUN
ABOUT THE BEAST TO GROPE,
THAN, SEISING ON THE SWINGING TAIL
THAT FELL WITHIN HIS SCOPE,
"I SEE," QUOTH HE, "THE ELEPHANT
IS VERY LIKE A ROPE!"

AND SO THESE MEN OF INDOSTAN
DISPUTED LOUD AND LONG,
EACH IN HIS OWN OPINION
EXCEEDING STIFF AND STRONG,
THOUGH EACH WAS PARTLY IN THE RIGHT,
AND ALL WERE IN THE WRONG!

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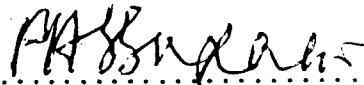
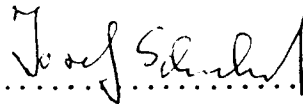
The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled, "Cognitive Style and Verbal Regulation: Towards an Integration of Yu and Schubert", submitted by Jonas Darko-Yeboah, in partial fulfilment of the requirements for the degree of Master of Education in Educational Psychology.



.....
Supervisor



.....
Rank Gupta


.....
Rank Gupta

Date 15th October, 1985

DEDICATION

To my dear wife, mother and beloved children: Lydia, Obed,
Lois and Anna, whose love and unselfishness overcame the
painful sacrifice of my companionship for me to study
away from home.

ABSTRACT

I asked two questions, one theoretical and the other empirical. The theoretical question was: Are there developmental continuities and/or discontinuities between cognitive style and verbal regulation? The empirical question was: What is the relationship between scores on Sigel Conceptual Style Test (Sigel 1967) and Verbal Regulation of Behaviour? Based on conceptual and empirical review of literature, it was hypothesized that there are age-related differences in performance on the VRB and SCST; there are no sex differences; no interaction between age and sex; but there are correlational relationships among the 4 variables (VRB, SCST Descriptive, Relational and Categorical).

Fifty-eight Canadian school children living close to the University of Alberta, comprising of 27 boys and 31 girls, aged 5 to 9 years (kindergarten through to grade 3), were scored on the Verbal Regulation of Behaviour test and Sigel Conceptual Style Test (SCST). A 2x4 factorial design, self selection and unequal sample sizes was used. The following computations were performed: means and standard deviations; Pearson Correlation Coefficients; two-way analysis of variance and Multiple Range Test using Newman-Keuls Procedure.

At .05 level of significance, the following results were reported: age related differences in the VRB and the SCST Categorical; no sex differences; no interaction between age and sex; significant negative correlation between SCST Descriptive and Relational, and between SCST Relational and Categorical. There was also positive correlation between the VRB and SCST Categorical.

Further studies with a larger sample are needed to examine these findings within a cross-cultural and/or cross-class setting.

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CHAPTER 1

INTRODUCTION

Background of Problem

There are various traditions for conceptualizing and measuring constructs in the area of higher cognitive functions. One tradition is represented in the work of Agnes Yu (1981, et. passim.) and the other in the work of Josef Schubert (1973, et. passim.). Yu (1981) examined the place of cognitive style and concept formation in the tradition of Vygotsky (1962, et. passim.) and Werner (1948, et. passim.). Schubert preoccupied himself with regulation of behaviour as individuals internalized speech functions in the tradition of Vygotsky (1962, et. passim.) and Luria (1961, et. passim.). My attempt was to try to unite some aspects of these two traditions which seem to be developing side by side without truly merging.

This thesis proposed that the progressive (evolutionary) differentiation of signs into signals and symbols, and the two-pronged principle of differentiation and integration (Werner, et. passim.) provide points of convergence for these two traditions. However, necessary in the long-run, and as a prologue to this thesis, I shall include issues on class and social, cultural and ecological differences in psychological development. At present, the biological aspect of the Verbal Regulation of Behaviour (Schubert, 1973) and Sigel Conceptual Style Test (1967) shall receive attention. First, this area was delimited because of popularity. Secondly, the instruments are readily available. Thirdly, the constructs which the instruments test fit the interactional mediational way of analysing cognitive processes.

Schubert's Work

Schubert's work in the tradition of verbal regulation issues from the work of both Vygotsky (1962) and Luria (1961). The Verbal Regulation of Behaviour Apparatus was developed by Schubert (1973) to replicate the work of Luria (1961). Initially, the instrument served diagnostic purposes. For example, based on performance on the VRB, children who were organically deficient could be distinguished from those who were experientially deprived. His major findings were: that poor performance on traditional intelligence tests may be due sometimes to unsupportive socio-economic and socio-cultural structures; and that Luria's (1961) claims about the nature and development of the second signal system and verbal regulation are reliable.

Schubert (1969, 1973) built on Vygotsky's (1962) idea of the second signal system and Luria's emphasis on the relationship between internalization of speech functions and the ability to verbalize one's experiences and voluntarily regulate one's behaviour. This tradition has not related verbal regulation to the concepts of differentiation, concept formation and cognitive style in any explicit way. However, the importance of signs in the processes of higher mental functions has been acknowledged. The distinction that was made between human and animal behaviour was made in terms of first and second signal systems. Thus taken alone, verbal regulation as a concept does not explain comprehensively the differentiation that takes place in the way individuals classify objects (Vygotsky, 1962, et. passim; Sigel, 1953, 1967; Sigel, Anderson & Shapiro, 1966) and assign reasons for their classifi-

cation (Sigel, 1953, 1967). For these explanations, I turn to Yu (1981).

Yu's Work

Yu (1981) investigated "the implications of language, culture, social class and cognitive style in higher cognitive processes" (p. iv). In her studies, 3 tests were employed. These were Sigel Conceptual Style Test (SCST), Witkin's Embedded Figure Test (EFT), and Vygotsky Blocks of investigating concept formation (VB). Yu (1981) observed significant variation in performance on the above tests as a function of language, culture, social class, and cognitive style (p. iv).

The idea of differentiation and integration (Werner, 1948; et. passim.) were demonstrated in concept formation (Vygotsky, 1962) and cognitive style (Sigel, 1967; Witkin, et. al., 1962). In addition, she explored and integrated numerous ideas on symbols (Bain, 1974; De Saussure, 1959; Cassirer, 1944; Werner & Kaplan, 1963; Bertalanffy, 1965; White, 1949; and Merleau-Ponty, 1973). However, she did not emphasize verbal regulation and the place of the internalization of speech functions in higher cognitive functions, a topic which received central attention by Schubert (1973).

Proposal

I therefore reviewed literature in these two traditions to establish various points of productive contact. This attempt resulted in a personal conceptualization of the phylogenetic development of signs. Based on suggestions from this literature review,

I proceeded to empirically examine the developmental relationship between SCST and VRB in a small sample of 58 Canadian school children by specifically attempting to answer the following questions:

Research Questions:

1. How do children between the ages of 5 and 9 group objects and what kind of reasons do they give for their groupings?
2. Do children between these ages change the way they group objects and the reasons they give, with age?
3. Do boys differ from girls at this age range in the way they perform on the Sigel Conceptual Style Test?
4. Does performance on the Verbal Regulation of Behaviour Procedure show age related changes?
5. Do girls differ from boys in performance on the VRB?
6. What is the correlational relationship between the Verbal Regulation on Behaviour and Sigel Conceptual Style, Descriptive, Relational and Categorical?
7. Is there interaction between age and sex in performance on a) the VRB, and b) the SCST, Relational, Descriptive and Categorical?

Overview of Subsequent Chapters

In the review of literature, conceptual and empirical issues central to the two traditions were presented. There were three subdivisions: The first section centred on issues of Verbal Regulation; the second section reviewed material in the area of cognitive style, concept formation and psychological differentiation. To conclude chapter 2, an attempt was made to integrate certain aspects of Yu

(1981) and Schubert (1973).

Chapter 3 was divided into 2 major sections: Section 1 concerned the sample used, the research design and instruments; section two was divided into three subsections as follows: presentation and analyses of data using the techniques of analysis of variance, Student-Newman Keuls Procedure and Pearson's Product Moment Coefficient of Correlation; the second subsection included descriptive data on the VRB, and SCST, Descriptive, Relational and Categorical; and the last section presented the findings in a more integrated form.

Chapter 4 summarised the study, made some concluding remarks and related the findings to the initial research questions. Finally, a further attempt was made to integrate Yu and Schubert's work, making comments on the study in terms of application and future research.

Purpose of the Study

The purpose of this study was two-fold. First it was to conceptually integrate two traditions represented by the works of Yu (1981) and Schubert (1973). Secondly, it was to empirically verify the findings of Schubert (1973) and Sigel (1953) with respect to Verbal Regulation of Behaviour and Sigel Conceptual Style Test respectively. Hopely it is also to prepare the stage for a cross-cultural and/or cross-class study.

Limitations of the Empirical Study

1. The study did not consider cultural, social and class differences.
2. Owing to the smallness of the sample size, generalization beyond

this must be done with caution.

3. Because the empirical base for the integration of the work of Yu and Schubert was delimited, the larger theoretical integration at this point must necessarily be speculative.

CHAPTER 2
REVIEW OF LITERATURE

Introduction

The purpose of this review is to present two traditions with respect to studies in mental processes. In the end, I shall bring up points of possible conceptual and empirical integration.

These two traditions are traced through Werner (1948, et. passim.) and Vygotsky (1962, et. passim.). Vygotsky contributed to both traditions. The first tradition which Yu (1981) represents, stresses Werner's concept of differentiation and Vygotsky's concept of concept formation. The second tradition represented by Schubert combines Vygotsky's work on the development of the second signal system, and Luria's work on the regulation of behaviour through speech. It must be stressed here that Vygotsky only implicitly referred to the idea of differentiation. On the part of Werner, though he referred to the importance of signs in psychological development, he did not explicitly discuss the regulatory function of speech.

Werner's (1948) Orthogenetic Process:

Werner (1948) coined this term to designate the combined principles of differentiation and integration, mainly in biological processes. This principle was later applied to psychological processes. Since then, the idea of differentiation has been adopted to many dimensions of human psychic functioning.

Langer (1969) explained this principle of orthogenesis in his treatment of organismic theory as follows:

In the organism, action systems are initially fused with each other in one global organization. It is therefore described as primitive. In the course of development, novel and increasingly discrete action systems emerge. These action systems become increasingly integrated within themselves. At the same time, most advanced systems hierarchically integrate less developed systems. A system is considered advanced if it is differentiated, specialized and internally integrated. Because of their all-embracing function, advanced systems are able to functionally subordinate and regulate the functions of less developed subsystems. At this advanced stage of development, the system becomes more functionally effective and efficient.

In this tradition Vygotsky could be linked this way. Man has the capacity to use symbols. According to Bruner's understanding of Vygotsky, it is this capacity to use symbols...

that provides the means whereby man provides a mediator between himself (herself) and the world of physical stimulation so that he can react in terms of his own symbolic conception of reality (forward to Vygotsky, 1962, p. x).

It may then be said in connection with differentiation that it is this ability of symbolize that pushes the level of psychological differentiation to its upper limits in humans. This enables humans to regulate their behaviour more effectively. Implicitly then, the role of language in differentiation and verbal regulation go hand in hand.

Actually, it is not human speech nor any particular language per se that is implicated here. Rather, what is important is the use of symbols of all types that enables humans to abstract (Furth 1966). It appears then that Vygotsky and Luria overstressed the role of human speech in cognitive processes without qualifications.

Yu's Integration of Werner, Witkin, Sigel and Vygotsky

In her doctoral dissertation (1981), and other works, alone and coauthored with Bain (eg. 1979), Yu demonstrated interest in the principle of psychological differentiation in cognitive processes in general. In exposition, the phylogenetic development of signs and related significance to higher cognitive processes became a central theme.

In order to relate the use of symbols to concept formation and cognitive style, the way the idea of differentiation has been applied either explicitly or implicitly, by Witkin, et al. (1962), Sigel (1953, 1967) and Vygotsky (1962) were analyzed. (See Figure 3 and Figure 4, on pages 10, and 11 for summaries of different positions in cognitive style research).

Witkin's Field-Dependence:

Witkin, Oltman, Raskin and Karp (1971) defined cognitive style as:

the characteristic self-consistent modes of functioning which individuals show in their perceptual and intellectual activities (cited in Goldstein & Blackman, 1978, P. 174).

Here, intra- and inter-individual consistencies in cognitive functioning across tasks and situations are stressed. Secondly, field dependent and independent individuals are classified in terms of differentiation. Field dependent ones tend to be relatively less differentiated in their responses, perception, and intellectual operations; furthermore, they tend to be more impulsive, have low self-esteem and an undifferentiated body image. The opposite was considered to be the case with field independent individuals.

FIGURE 1 : NINE COGNITIVE STYLES

1. Field independence vs field dependence: an analytical in contrast to global way of perceiving (which) entails a tendency to experience items as discrete from their backgrounds and reflects ability to overcome the influence of an embedding context.
2. Scanning: a dimension of individual differences in the extensiveness and intensity of attention deployment, leading to individual variations in the vividness of experience and the span of awareness.
3. Breadth of categorization: consistent preferences for broad inclusiveness, as opposed to narrow (exclusiveness), in establishing the acceptable range for specified categories.
4. Conceptualizing styles: individual differences in the tendency to categorize perceived similarities and differences among stimuli in terms of many differentiated concepts, which is a dimension called conceptual differentiation, as well as consistencies in the utilization of particular conceptualizing approaches as bases for forming concepts (such as the routine use in concept formation of thematic or functional relations among stimuli as opposed to the analysis of descriptive attributes or the inference of class membership).
5. Cognitive complexity vs simplicity: individual differences in the tendency to construe the world, and particularly the world of social behaviour, in a multidimensional and discriminating way.
6. Reflectiveness vs impulsivity: individual consistencies in the speed with which hypotheses are selected and information processed, with impulsive subjects tending to offer the first answer that occurs to them, even though it is frequently incorrect, and reflective subjects tending to ponder various possibilities before deciding.
7. Leveling vs sharpening: reliable individual variations in assimilation in memory. Subjects at the leveling extreme tend to blurr similar memories and to merge perceived objects or events with similar but not identical events recalled from previous experience. Sharpeners at the other extreme, are less prone to confuse similar objects and by contrast, may even judge the present to be less similar than is actually the case.
8. Constricted vs flexible control: individual differences in susceptibility to distraction and cognitive interference.
9. Tolerance for incongruous or unrealistic experiences: a dimension of differential willingness to accept perceptions at variance with conventional experience.

*Kogan, N. Educational implications of cognitive styles. In Psychology and Educational Practice; ed. G.S. Lesser. Glenview, Ill.: Scott, Foresman and Co., 1971, p. 246, cited in Yu, 1981, p. 44.

FIGURE 2 : DIFFERENT PERSPECTIVES IN COGNITIVE STYLE RESEARCH*

- | | |
|---------------------------------|--|
| 1. Bruner (1956) | focusers and scanners |
| 2. Broverman (1960) | conceptual and perceptual dominance |
| 3. Gardner (1953) | leveling and sharpening; field articulation; and equivalence control |
| 4. Guilford (1959) | convergent, divergent and evaluative types of cognitive operations |
| 5. Kagan, Moss and Sigel (1963) | descriptive, relational and categorical styles in grouping and sorting |
| 6. Witkin et. al. (1962) | field dependent and independent modes of cognitive behaviour |

*Yu, 1981, p. 3, 4

Measurement was largely in the perceptual domain (Yu, 1981). (See Figure 3 for a summary of some of the measuring instruments in the area of Field Dependence). In the attempt to clarify cognitive style conceptually and empirically, there has been the tendency to extend the limits of the construct from perceptual to cognitive and to affective correlates. From the idea of field dependence as a designation, the name changed to 'global articulated' and then to 'psychological differentiation (Goldstein & Blackman, 1978). The consequence of this shifts in designation will be taken up later. Presently, we are interested in the question: How does Witkin's (1961) model explain the idea of differentiation?

Witkin's basic premise is that there is "manifestation of differentiation tendencies in broad dimensions of personal functioning" (Yu, 1981, p. 49). Witkin (1962) defined differentiation as...

the complexity of a system's structure. A less differentiated system is in a relatively homogeneous state; a more differentiated system (is) in a relatively heterogeneous state (p. 9).

Witkin breaks down the process of differentiation in terms of structure and function, and identifies two major principles as making this possible. These principles are specialization and hierarchical integration. Specialization involves the allocation of specific functions to semi-independent units in a system. When each unit performs its function, the overall goals of the system are achieved. In order for this to be possible, there is structural organization. Structure and function thus go together.

In terms of specialization of function, it takes place in the

FIGURE 3 SOME INSTRUMENTS THAT MEASURE FIELD DEPENDENCE IN THE
TRADITION OF WITKIN(ET. AL., 1962).

Assessment of this cognitive style uses a variety of perceptual and cognitive tasks (Goldstein & Blackman, 1978). In these tasks, successful performance depends on one or more of the following principles:

1. differentiating a simple figure from a complex geometric design : EMBEDDED FIGURE TEST (EFT);
 2. adjusting a tilted luminous frame from a chain which is either tilted or upright: ROD AND FRAME TEST (RFT); or
 3. requiring the subject to adjust a suspended chair to the true vertical in a suspended, tilted room: BODY ADJUSTMENT TEST (BAT)
-

individual as a whole. It is then carried to lower levels of function. At the lowest level, there tends to be increased specificity of function. Applied to psychological processes, first, the functions of cognition, perception and affect are undifferentiated; they are globally mediated by the system as a whole. However, with increased differentiation, perceptual, cognitive and affective structures become separated and functionally more articulate and self-sufficient. However, this sub-systemic independence could affect the integrity of the organism were it not for the existence of the complementary principle of integration.

Yu (1981) defined integration as "the patterning of the system and the patterns of relationships between the system and its environment (p. 50). This means that in terms of structure, the lower subsystems are linked step-wise with the upper subsystems. The ultimate objective of this integration is to improve functional coordination among subsystems and thus maintain the integrity of the organism.

In applying these principles to cognitive style, Witkin (1962) divided styles into less differentiated and more differentiated states. He used the criterion of "the extent of separation or distantiation between self and non-self". On the Embedded Figures Test (EFT), a field dependent individual experiences more embeddedness of the self in his/her surroundings, and in his/her field of experience Yu (1981, p. 51). The opposite is usually the case with the field independent.

Yu (1981) noted that most of the empirical work was done in the perceptual domain and thus the results cannot be generalized

to cognitive and affective domains without due empirical verification. Secondly, the tendency to conceptually extend Witkin's construct has tended to make it so diffuse that it is sometimes difficult to differentiate it from other psychological constructs, such as cognitive structure, intelligence, cognitive ability, response style, etc.

The fact that Witkin's model stresses differentiation places it in the realm of structural theory. Though most of the literature in this area relates the concepts of field dependence and differentiation, in the course of empirical studies a distinction is not made between the two (Goldstein & Blackman, 1978). As for the dimension "field articulated", coined by Witkin (1962), it could not enjoy popularity for long.

Since there are many instruments, and within each instrument, variations for measuring field dependence, it is often difficult to meaningfully compare studies especially when contrasting results is an issue. There is also the problem of fixing the criterion for determining who is field dependent and who is field independent (Vaught, 1968). Also, Goldstein and Blackman have noted that many researchers show concern in how intelligence has been linked to field dependence (cf. Zigler, 1963a, b; Brody, 1972; Wachtel, 1972).

The controversy is related to the issue of whether cognitive style ought to stress ability or preference. In this regard, Witkin's approach has been criticised on account that it measures ability more than structure or style (Wachtel, 1972; Kogan, 1973, 1976). According to Yu (1981), it is also doubtful if Witkin, et. al. (1962) were justified in extending inferences in the area of perception to

other areas of psychological function with what she sees as "insufficient empirical support".

Witkins way of measuring cognitive style is not the only way. Another approach is to see cognitive style in terms of different ways of conceptualizing (ie. conceptual style). This second approach has been developed by Sigel (1953, 1967) in cooperation with others such as Kagan (1963). Though both models stressed differentiation they did it differently.

Sigel's Conceptual Styles:

Cognitive style viewed as different modes of conceptualization was originally measured by Kagan (1963) Conceptual Style Test (CST).

In this orientation, cognitive style is viewed as:

stable individual preferences in mode of perceptual organization and conceptual categorization of the external environment (Goldstein & Blackman, 1978, p. 10).

The importance of consistency in the way individuals group objects and assign reasons are important in determining their conceptual styles. In this way, people could be described as using relational-contextual, descriptive-analytic or categorical-inferential styles.

Sigel's (1953, 1967, 1976) developmental model follows Werner's (1948, 1957), from the sensori-motor to perceptual to conceptual. According to Yu (1981), Sigel designated the sensori-motor level of the young infant as perceptual.

At the perceptual level, the immature individual operates at a less differentiated and global manner (p. 59).

This means that in perceptual operations, the young person "would yield to demands of the situation, and the organization of the material is determined by the nature of the stimuli as well as by the limited maturity of the subject" (Sigel, 1953, p. 131). At the

conceptual level, there is "more conscious and deliberate behaviour". For example, materials are classified "into more abstract categories". This mode of operation is characterised as more differentiated and articulated, by Sigel.

Sigel (1953) intimates that there is the likelihood for a four-year old to "react to stimuli as-a-whole or globally; whereas an older nine-year old child would tend to take account of the whole as well as the internal parts of a complex stimuli. That is, the conceptual processes are initially global and over-generalized. The younger child forms fragmented sub-concepts which are not integrated to form a true concept. On the other hand, the older child can combine larger numbers of attributes into a single integrated concept (Yu, 1981, p. 60). Sigel further claims that concept formation is dependent on 'a priori perceptual cognitions'.

What Sigel is implying is that there is differentiation at both the perceptual as well as conceptual levels; but that concept formation subsumes perceptual processes. Sigel divided conceptual styles into three as follows: Descriptive, Relational and Categorical.

Descriptive type of conceptual style:

A style is designated descriptive if the criterion for grouping is based on physical attributes which are readily observable. There are two subtypes: descriptive global and descriptive part-whole. The former refers to a response "to the stimulus as-a-whole", while the latter mode refers to analytical and discriminating (differentiating) mode, in terms of the components of the stimulus complex. These two modes resemble Witkin's field dependent and independent modes of cognitive and perceptual responses respectively

(Witkin, et. al., 1962).

Relational type of conceptual style:

"Relational-contextual style is related to grouping based on thematic, geographical, temporal, comparative or functional relationships of the stimuli" (Yu, 1981, p. 62). In this mode, "no stimulus is an independent instance of the concept" (Sigel, 1967, p. 5). The concepts formed are based on interdependent function of the stimuli". The relationship of this style to Werner's (1948) principle of integration as a sub-set of orthogenesis needs clarification: Whilst relational level of functioning in conceptual style is basic, integration seems to be a higher order form of cognitive functioning.

Categorical type of conceptual style:

The style labelled categorical-inferential is based on classifications using criteria which are not readily observable, and which depend on the use of class or taxonomic labels and inferences (Yu, 1981). The difference between the descriptive part-whole and categorical inferential seems to be that the latter is superordinate to the former (Yu, 1981). Another possible explanation is that the former types are pseudoconcepts (in Vygotsky' 1962, terms) while the latter are true concepts. At this stage of research, the difference between the descriptive and categorical styles requires specification.

In distinguishing between the two (descriptive part-whole and categorical styles), Yu (1981) noted that, whereas categorical inferential is based on a more inclusive and abstract label, the descriptive part-whole style emphasizes a physical, concrete and des-

criptive attribute. Secondly, the former includes inferences in the moral, aesthetic and judgemental areas.

Comments of Sigel Conceptual Style:

Yu (1981) notes that the empirical work in this area has been done mainly in the conceptual domain and little in the perceptual area. She therefore considers it "somewhat inconsistent...to formulate (cognitive style) as stable individual preferences in mode of perceptual organization and conceptual categorization of the external environment" (Kogan, Moss & Sigel, 1963, p. 74). Sigel (1967) and colleagues appear to have premised their definition of conceptual processes 'a priori perceptions'. That is, before one can classify, one must be able to perceive the criterion of classification, be it colour, shape, form, function or aesthetic value. However this reasoning is only at the theoretical level and needs empirical support.

Unlike Witkin (1962), Sigel's construct stresses preference rather than ability to perform according to a predetermined standard. For Sigel, an individual's response is merely one of the many alternative answers he could provide. However, viewing style in this way raises the issue of consistency. Does it imply that situational variables are more important determiners of style? Does it imply that it is not entrenched and habitual cognitive and perceptual structures that determine style? Yu (1981) did not address this issue. Clarification may be necessary in connection with this issue of consistency in future attempts to conceptualize cognitive style.

Related to this same issue of consistency in response modality, is the possibility of making a distinction between capacity and

performance. Maximum exhibition of capacity may, among other things, be dependent on motivational factors. That performance level at a given instance of task may fall short of capacity has been noted in classroom situations. In the measurement of cognitive style, it is not clear how this factor may be controlled.

In the measurement of conceptual style, one important characteristic of Sigel Conceptual Style is that it uses stimulus cue properties as a delimit for classifying types of responses. The criterion here is an attempt to answer the question :What particular aspects of a complex stimulus is used as basis for grouping and assigning reasons for one's groups. This property of the test makes it easier to score and analyze children's responses

In Kagan's (1976) classification system for cognitive styles found in research literature, conceptual style is a type III cognitive style. This means that it does not stress content and moreover, tends to be value-free. Incidentally, it has been found that the various versions of of CST are similar in concept to the instruments used by Kelly (1955) and Bieri (1966). However, the latter two authors defined the same concept (ie. cognitive complexity) differently. For them, complexity is measured in terms of the number of ways objects are grouped; they do not include the reasons for grouping the objects. On the other hand, SCST does not use the number of ways objects are grouped as a measure of style. Thus while Kelly (1955) and Bieri (1966) seem to stress content, Sigel (1967) seems to stress preference instead of content. What the SCST emphasizes are the actual groups and the types of reasons given as determiners of one's conceptual style.

The possibility is that SCST (1967) may have assumed content

as given, being the possession of the individual before the test. Kelly's and Bierli's models do not seem to assume this. To clarify this issue, it may be in order to consider the possibility of uniting the two ways of viewing conceptual style.

Some areas of contact for Witkin and Sigel's models of cognitive style:

1. Both models claim that perceptual and conceptual domains of cognitive style are intimately related. Yu (1981) has however noted that only tenuous evidence has been offered in support of this claim (p. 6).
2. Witkin and Sigel have not considered the relationship of cognitive style to higher cognitive processes (Yu, 1981).
3. In both styles, the influence of Gestalt Field Theory (cf. Kurt Lewin) and Organismic Developmental Theory (cf. Heinz Werner) are evident.
4. The idea of differentiation and integration are considered to underlie psychological development in general.
5. Cognitive style is a mediational process.

Concept formation was used as an underlying aspect of the developmental process in conceptual style. Thus Sigel analyzed concept formation vis-a-vis cognitive style, though this was done implicitly. Vygotsky's (1962 experimental study of concept formation may shed more light upon the concept of differentiation and cognitive style.

The Relationship Between Cognitive Style and Vygotsky's (1962) Concept Formation:

Based on experimentation using Vygotsky Blocks (VB), 3 main

phases of concept formation were identified by Vygotsky (1962). These were: stage of syncretic thinking; stage of thinking in complexes; and stage of conceptual thinking.

Syncretic thinking:

Objects are grouped into "unorganized congeries or heaps"; grouping behaviour is concrete, diffuse and unstable. It may be described as "an undirected extension of the meaning of the sign to inherently unrelated objects linked by chance in the child's perception" (Vygotsky, 1962, p. 59). For the child at this point, word meaning is "a vague syncretic conglomeration of individual objects coalesced into an image... In perception, thinking and acting, there is the tendency to merge...diverse elements...into one unarticulated image (ibid.). (See Figure 4, p.23 for the stages under the syncretic phase in concept formation).

Thinking in complexes:

At the second phase, described as "thinking in complexes", objects are grouped by both a subjective impression as well as by bonds actually existing between these objects" (Yu, p. 61). This is considered a higher level of differentiation; the child is said to have outgrown his/her egocentrism. There is some exhibition of logical and abstract thinking but because "these deductions (made by the child) are discovered through direct experience (the deductions) lack logical unity...operative at the adult level of concept formation"(ibid.)

The phase of 'thinking in complexes' is divided into 5 stages as follows: associative complex; collective complex; chain complex;

FIGURE 4 : STAGES OF THE SYNCRETIC PHASE OF CONCEPT FORMATION
(VYGOTSKY, 1962; YU, 1981).

1. TRIAL AND ERROR STAGE : a kind of guessing game with
the experimenter.
 2. SYNCRETIC VISUAL IMAGE STAGE : things are grouped to-
gether because of 'contiguity in space or time'
or the fact that they come under 'the child's
immediate perception'.
 3. COMPOSITE GROUP STAGE : grouping based on the select-
ing of 'elements... from (already formed groups)
without any apparent criterial basis
-

FIGURE 5 : STAGES OF THE PHASE OF CONCEPT FORMATION DESIGNATED
 "THINKING IN COMPLEXES" (VYGOTSKY, 1962; YU, 1981)

1. ASSOCIATIVE COMPLEX: grouping based on any perceived similarity among objects. eg. colour, shape, size, etc.
 2. COLLECTIVE COMPLEX : grouping based on differences (contrasts). If colour is selected, the child is inconsistent and moves to other criteria; objects may be grouped into function: eg. knife, fork, spoon, etc, as belonging to the kitchen; he/she does not realise the arbitrary relationship between the label and the concrete object.
 3. CHAIN COMPLEX : a criterion is deliberately selected; eg. colour. It is used in grouping, until another striking attribute diverts attention and supersedes the previous criterion. There is inconsistency and tendency to perceptual shifts; however, always there is an existential relationship between any two object (blocks) selected.
 4. DIFFUSE COMPLEX : remote bonds between objects are observed; eg. shape. However, there are shifting criteria for grouping; If he/she begins with triangles, he/she moves to say, trapezoids, to squares, hexagons, etc; this level of functioning, unlike (3), is not constrained by the 'perceptual field'; still, there is inconsistency and diffuseness in criterion selection.
 5. PSEUDO-CONCEPTUAL THINKING : resembles 'true concepts' in appearance but not in substance. The child has not as yet realised the arbitrary relationship between 'the sign vehicle' and 'the signaled entity' (Silverstein, 1976). Thus the level of abstraction required for mature conceptual thinking would be lacking.
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diffuse complex; and pseudo-conceptual thinking. (See Figure 5, p.24 for description of the stages of 'thinking in complexes').

Phase of conceptual thinking:

At this phase of concept formation, concepts are tied in a network of relations of abstraction and generality; the mode of operation involves analysis and synthesis (Berg 1970). There is a reorganization of both previous and present experience. There is also a movement from the referencing function toward the semantic function of the word (Vygotsky, 1962; Luria, 1961).

The word (or label used as the criterion for grouping) has now become the abstract symbol of the concept (Yu, 1981, p. 94).

Thus in concept formation, like all mediational processes, the principle of differentiation and abstraction take place. According to Vygotsky (1962, 1966), "perception initially functions in a global, immediate manner...where...different elements (are merged) into an unarticulated image... There is a haphazard organization of a child's visual field" (p. 94). Later progressive differentiation takes place in perception, by the use of the aids of abstraction. This becomes possible because of the ability of humans to symbolize or in the words of Mead 'change roles as subject and/or object'.

In the process of abstraction, the principles of analysis into units and subsequent synthesis (reorganization of experience) become the bedrock of the development of higher cognitive functions. In discussions on cognitive style, in relation to Werner's orthogenetic process, the twin principles of differentiation and integration were stressed. These principles seem analogous to the pri-

nciples of analysis and synthesis that underlie mature concept formation. Vygotsky (1962) puts this relationship very succinctly:

All the higher psychic functions are mediated processes and signs are the basic means used to master and direct them. The mediating sign is incorporated in their structure as an indispensable...part of the total process (p. 56).

This suggests that the concept of differentiation must also operate hand in hand with verbal regulation which received considerable attention by Schubert (1973).

Verbal Regulation of Behaviour (Schubert, 1973)

The objective of this section is to review the developmental trends in the concept of Verbal Regulation of Behaviour (VRB) through Vygotsky (1962), Luria (1961) and Schubert (1973). The central thesis of the VRB is that in the course of the internalization of speech functions two changes take place:

(An) increasing dominance of the significative aspect of words, and secondly, an increased autonomy, a shift from regulation by external stimuli to internalized verbal control (Schubert, 1973, p. 10).

This implies that the conditioning effect of words as well as the regulatory effect begin externally and develop internally. In his model, Luria (1961) adopted the definition of Psychology as "the study of the formation of mental processes". With this as his disciplinary orientation, he based his work on Pavlov's (1951) concept of the development of higher nervous activity and Vygotsky's (1962) work on the interactional nature of the development of children's language and thought.

According to Vygotsky, the difference between animals and humans is a difference in the use of signs. Whilst humans use both

signals and symbols, animals can only use signals and thus come short of the development of the second signal system. Similar to Vygotsky, in Luria's model of mental development, the first signal system is basic to, yet different from the second signal system.

In relation to the second signal system, the first signal system is more concrete and primary in time, function and formation. While the latter describes a link between two concrete stimuli, the former is an abstraction and generalization from a number of concrete stimuli (Schubert, 1973). Furthermore, the laws of conditioning underlying the first signal system are insufficient in describing human learning at the second signal level.

Luria (1961) notes that the second signal system undergoes stages of development. First, the child operates at the concrete and impulsive level. However, progressively, he/she traverses stages associated with the internalization of speech functions. These speech functions can be classified in different ways; however, basically, they may include communicative, nominative, executive and semantic functions. At the highest level of internalization of speech functions, the child is able to plan and execute actions and thus be able to regulate his/her behaviour from within. This presupposes the development of skills of abstraction and generalization or be able to use symbols.

Luria (1961) also adopted and deepened Vygotsky's idea of the internalization of speech functions and concept formation. Through the referencing function, a parent may externally regulate a child's behaviour and help to organize his/her thinking processes. Naming

elicits an observing behaviour on the part of the child, of the objects named. There is thus selective attention; the characteristics of the object that are striking stand out. Their similarities to and differences from other objects are noted; and the rudiments of abstraction may develop. However, these processes of abstraction are actually possible when 'the faculty of speech is acquired'. It is then that the child begins to actively name the objects him/herself.

According to Luria (1961), this internalization process leads to higher order organization of the child's perceptual and attentional processes. This also promotes lasting retention. Thus, early socialization seems to underlie future motivation for development.

Luria further notes that by recalling the early dialogues with the parenting one, the child learns independent formulation of his/her own wishes and intentions in the future. First, he/she uses overt speech but later after internalization these external dialogues he/she guides him/herself silently and internally. At this stage, also the child has been able to create the highest forms of purposive memory and deliberate activity:

What he (she) could previously do with adult help, he (she) is now able to do unassisted... (This) enables man to go far beyond the bonds of physical capacities.. (He/she is able to create and organize) well defined forms of active deliberate behaviour (Luria, 1961, p. 18).

The child, according to Luria, is thus able to regulate his/her behaviour from within. Luria did not end here; he became interested in the dynamics of psychological processes, posing the question:

(How are individuals able) to focus attention on given objects, to single out from their environment a given stimulus whose physical properties were not necessarily stronger than those of other stimuli, and might even be

weaker and indeed to inhibit his/her own motor activity at will and restrain his/her own impulses (Luria, 1961), p. 19)?

For Luria, the answer became easier if we recognized that the relevant properties were formed in the course of interaction with adults after which these structures changed and actively were used by the child to organize his/her own behaviour.

This process is illustrated in the area of perceptual development in a discussion of the transforming role of the referencing function of speech on concept development. Adults' pointing gestures in the presence of the child become secondary signals that aid selective attention, discrimination, development of object relations, association formation and developing the skills of analysis and synthesis. All these act on the child to condition his/her behaviour. This conditioning effect may partly underlie adults' ability to lead and mislead the child. Intentionality, meaning, dialogue and interpretation become important processes in the study of language.

Schubert (1973) identifies two major aspects to the Lurian system: "a biological approach to human behaviour and the analysis of the social conditions determining its development" (p. 59). The biological approach is revealed in Luria's research about the stages of development of the Verbal Regulation of Behaviour (VRB). The socio-cultural aspect stresses the fact that the content of the second signal system as well as the modes of the VRB are developed through social interaction.

The biological aspect of the VRB:

The biological maturational aspect of the model may be demonstrated using the VRB procedure which Schubert (1973) developed. In

the experiments, the child activates a device to register his/her response to a configuration (sequence) of light signals. These lights of different colours are displayed on two windows of the VRB Apparatus. The tasks are increasingly made difficult. They begin with a simple basic stimulus requiring motor response. Then an additional stimulus requiring discrimination is introduced. This may then be followed by different modes of stimuli presentation. For example, weak, strong, and the use of the left and right hands. Further, there is the introduction of verbal response. For example, the subject may be required to squeeze and say 'yes'. In addition, the rhythm, as well as the duration and sequencing of the stimuli may be changed. The latter requires the use of abstract principles to differentiate among stimuli, some of which appear identical.

Five stages in verbal regulation of behaviour were identified. These stages roughly correspond to the following ages:

1 - 2; 2 - 3; 3 - 4 1/2; 4 - 5; and 6 - 7 years of age respectively.

Stage 1 (1 - 2 years):

Language is underdeveloped; there is lack of abstraction; the word is still a part of the the total concrete situation; response can be initiated using verbal instruction, but only in the same on-going activity; adult help is not needed and language is not used to regulate behaviour.

Stage 2 (2 - 3 years):

Verbal instruction may interrupt an on-going activity so that a new activity may begin; beginning of the internalization of speech functions; behaviour is beginning to be voluntarily regulated; however,

FIGURE 6 : EXPERIMENTAL VARIATIONS IN THE VRB PROCEDURE*

-
-
- 0 - the stimulus is verbal: "squeeze" or "press" (given as preliminary instruction).
 - 1 - presentation of one stimulus ("yes").
 - 2 - presentation of two stimuli in identical position but differing in colour ("yes, no").
 - 2a - reversal of significance of preceding stimuli.
 - 2b - two stimuli differing in position but not in colour.
 - 2c - two stimuli differing both in colour and position.
 - 3 - extinction. For example, red is positive when a blue light in different position is extinguished. Both red and green are negative when in conjunction with blue.
 - 4 - alternation. The identical stimulus is alternately positive or negative. (+ - + -)
 - 5 - identical stimulus, in sequence + - -
 - 6 - one stimulus, the subject is required to press two times. (v and c: "one, two". c₁; "twice".)
 - 7 - counting; two hands. Two stimuli. The correct response to one stimulus is two pressures with the right hand; the correct response to the other stimulus is three pressures with the left hand. (v, c, "one-two", "one-two-three". c₁: "two, three").
 - 8 - two response keys or bulbs, position. Two red lights. The correct response to the right light is with the right key, to the left light with the left key. v, c: "right-left". c₁: "table-chair").
 - 8a - reversal of significance of position.
 - 9 - strong-weak. Two stimuli, strong and weak response required. (v,c: "strong-weak". c₁: "lion, mouse").
 - 9a - reversal of significance of stimulus.
 - 10 - duration. Identical stimuli. The long stimulus (5 sec. or more) is positive. The short stimulus (not longer than 2 sec.) negative.
 - 11 - sequence - the red light following a green light is positive.
 - 11a - sequence - the red light following a green light is negative (Response K- is used).

there is confusion when new stimuli are introduced (ie. when light is displayed on the window of the VRB Apparatus); behaviour is regulated by separation of action into components or through 'extero-receptive feedback', where squeezing puts on the light. Combined motor and verbal learning is not possible. This is because, verbal response tends to distract the child instead of helping him/her to learn. Learning is however promoted by the adult's verbal dialogue. This is in accordance with Vygotsky's (1962) concept of 'zone of proximal development'.

Stage 3 (3 - 4 1/2 years):

Between ages 3 and 4 1/2, the word could help in regulation of behaviour; the child follows 'conditional instructions'; and is able to control his/her impulses; ie. he/she is able to wait for the appearance of the light to be displayed on the VRB windows. His/her verbal response helps him/her on the task; and fewer mistakes are made on combined motor and verbal tasks.

However, still, behaviour is largely determined by the impulsive instead of 'the significative aspect of the word'; though the child is able to learn simple discrimination tasks, with increased task difficulty, more mistakes are made. The giving of abstract principles does not help learning. However, naming, 'concrete signs of differentiation (ie. colour, shape, size), and handling the object, aid learning (Schubert, 1973).

Stage 4 (4 - 5 years):

There is now less impulsiveness and more analytic behaviour as a result of increased internalization of speech functions. This stage is marked by a shift in speech function from the external to the

internal; and the child is able to grasp complicated instructions. Furthermore, he/she is able to accompany activity with verbal comments which are later internalized.

Stage 5 (6 - 7 years):

By age 6-7, silent speech or verbal thought predominates; internalized speech constitutes an important part of thought and volitional action. The verbal analysis of the situation begins to play an important role in the establishment of new connections. The child is better able to regulate his/her response with the help of self-formulated verbal rules.

Comments on the developmental stages of the VRB:

In the course of the discussion of the developmental stages in verbal regulation (Luria, 1961; Schubert, 1973), the following became evident:

1. Stages 3 and 4 overlap, whereas there is an apparent gap between stages 4 and 5.
2. Since the 5th stage ends at 7 years of age, may it be construed that the process of internalization is complete by age 7? This is not necessarily the case. As an explanation, Schubert (1973) has commented that the developmental stages presented here emphasize the biological aspect of the process. This implies that socio-economic and socio-cultural structures would naturally modify the nature and rate of this development.

Theoretical Implications of the Verbal Regulation of Behaviour

Procedure:

1. In contrast to pure behaviourism, the Lurian (1961) model is developmental. Laws which describe animal learning (Seligman,

1970) are not the same as the laws which describe human learning. That is, there is a difference in the laws describing the first and the second signal systems as well as between qualitative and quantitative change (Vygotsky, 1962, Luria, 1961; Schubert, 1973).

2. "Learning is described as an interaction between environmental conditions and biological characteristics". That is, there is both species-specific as well as relative social conditions directing learning.
3. Didactic methods enable adults to teach the child appropriate responses at different points in time in the course of children's development. This is in accordance with the principles of biological maturation and readiness (Schubert, 1983, in Bain, ed.).
4. Identification of the second signal system with human speech poses problems in the understanding of the relationship between signs and cognitive development. Luria is criticized for this since language seems to be only a tool of abstraction; and since in this regard, there are other systems that could serve similar purpose. For example, the American Sign System offers opportunity to deaf children to develop structures of thought similar to what human speech provides to children who can hear.

Toward an Integration of Yu (1981) and Schubert (1973)

Both the SCST and the VRB follow a developmental course (Luria, 1961, Luria & Yudovich, 1959; Sigel, 1953; Kagan, Moss and Sigel, 1963; Schubert, 1973; Yu, 1981). However, not much is known in terms of their comparable developmental trends.

Both constructs have their roots and nurturance in socio-

historical and socio-cultural conditions of existence (ibid.); that the processes involved are based on the active interaction of symbols with a biological base.

The developmental principles of differentiation and integration are revealed in both constructs (Werner, 1948) either implicitly or explicitly.

Both the SCST and the VRB could be related at the level of skill or strategy development. That is, skills like attending, describing, discriminating, identifying, analyzing, synthesizing, and so on, seem to be common to them (Paris & Lindeur, 1982).

Apart from these similarities, more could be learned in terms of their differences and active relationship. Insights based on previous discussions suggest that the SCST and the VRB or perhaps some aspects of them, may load on the same factor, 'differentiation'. However, this needs empirical confirmation.

Both instruments, to varying extents, offer opportunities to subjects to use speech or symbols as a medium of learning to guide themselves (Vygotsky, 1962; Luria & Yudovich, 1959; Sigel, 1967).

Higher scores on the VRB are assumed to reflect higher functioning at the cognitive and behavioural levels. It seems that increased internalization of speech functions and the ability to generalize and abstract go hand in hand (Flavell, 1977; Schubert, 1973; Schubert & Cropley, 1972). However, the nature of this relationship is yet to be specified empirically.

On the SCST, movement away from the descriptive style toward the categorical-inferential style is supposed to be an indication of

psychological differentiation (Sigel, 1953; Yu, 1981). If this is so, then the construct of SCST ceases to be value-free, in the sense that implicitly, 'development' in terms of efficiency and functional effectiveness are suggested as measuring rods.

Both instruments incorporate the idea of problem solving to some extent. In a study of both human and infrahuman species, Kendler and Kendler (1962) demonstrated that the changing rules underlying a task situation affects problem-solving behaviour. The authors experimented with these changing rules in terms of different kinds of 'shift'. First, the shift was made within the same dimension, say, colour throughout, or shape, or size; this type of shift was designated 'reversal shift'

Secondly, the shift was made across dimensions, say, from colour to size, or from shape to colour, etc. This second type of shift was termed non-reversal shift.

It was observed that 'rats and most nursery school children learn a non-reversal shift (problems) easier than problems involving reversal shift. On the other hand, older children as well as college students find reversal shift easier' (Lerner, 1976, p. 41).

This finding seems to relate to Vygotsky's (1962) and Luria's (1961) findings that children seem to discover differences before they discover similarities among objects. The principle of shifts in problem solving underlie to some extent the VRB and the SCST. In the case of the VRB, after discovering the rule behind the display of a given sequence of lights, another dimension requiring one to change or shift rules in order to solve the problem, is added.

It has been noted that the lower the age, the more mistakes the child makes in these 'multi-dimensional' kind of tasks. There tends to be the error designated 'perseveration' (Schubert, 1973), as the child nears his/her limits or capacity. Perseveration generally implies sticking to an old rule of solving problems in the face of changing conditions. This idea of perseveration is however not apparent in the SCST.

CHAPTER 3

RESEARCH DESIGN, INSTRUMENTS AND ANALYSES OF DATA

Population and Sample

The target population was a group of school-going children aged 5 to 9 years, who lived about a quarter of a mile from the University of Alberta, Edmonton. Edmonton is the seat of Alberta's Provincial Administration. It has a population of over half-a-million and life is urban-oriented. It has also been observed that the type of school children attend and their location were generally indicators of social class status (Yu 1981; Stacey 1976). In this regard, the University of Alberta community is largely middle-class.

The sampling population consisted of children in kindergarten through to grade 3 in two schools. The schools were Garneau Junior School and McKerna Junior High School. These two schools were selected by the Edmonton School Board for the study. Twenty children were selected from Garneau School and forty from McKernan School. (See pp. 39,40 for Table 1 and Table 2 describing the composition of the samples selected from these two schools).

Each prospective participant needed parental approval to be eligible for the study. In Garneau School, all the 20 children selected were available for the study. In McKernan School, 38 out of 40 were available. (See Table 3 for the final composition of the sample for which the Verbal Regulation of Behaviour Procedure, and SCST scores were available, p. 41).

To select the sample boys were listed separate from girls and the required number selected from each subgroup.

TABLE 1 : THE COMPOSITION OF THE SAMPLE SELECTED FROM GARNEAU
JUNIOR SCHOOL

Grade	S e x		Total
	Boys	Girls	
Kindergarten	3	2	5
Grade 1	2	3	5
Grade 2	2	3	5
Grade 3	3	2	5
	10	10	20

TABLE 2 : THE COMPOSITION OF THE SAMPLE SELECTED FROM MCKERNAN
JUNIOR HIGH SCHOOL

Grade	S e x		Total
	Boys	Girls	
Kindergarten	5	5	10
Grade 1	5	5	10
Grade 2	5	5	10
Grade 3	5	5	10
	20	20	40

TABLE 3 : FINAL COMPOSITION OF SAMPLE FOR WHICH VRB AND SCST SCORES
WERE AVAILABLE

Grade	Age	Sex		Total
		Boys	Girls	
Kindergarten	5 - 6	7	7	14
Grade 1	6 - 7	6	8	14
Grade 2	7 - 8	7	7	14
Grade 3	8 - 9	7	9	16
Totals		27	31	58

Research Instruments

Two tests were used. One was Sigel Conceptual Style Test (SCST) and the other was Verbal Regulation of Behaviour Procedure (VRB). The tests were considered suitable because of the following reasons:

1. They allow the child to verbally express the reason behind the way he/she responds.
2. They use the learning approach in testing.
3. The instruments were readily available.
4. The instruments fitted the interactional mediational way of viewing the constructs being measured.

Sigel Conceptual Style Test (Sigel, 1976; Yu, 1981)

This test was selected among other cognitive style tests because of the following reasons:

1. It emphasizes structure or preference in conceptualizing the construct of cognitive style, instead of content or ability;
2. It allows subjects scope for exhibiting creativity;
3. It is relevant to school situations; and
4. It has high validity and reliability.

Description of Sigel Conceptual Style Test:

Sigel Conceptual Style Test (1976) is similar to Kagan (1963) Conceptual Style Test (CST). SCST (1976) is a modified version of SCST (1967). The modified version has 14 triads of pictures. The trial item consists of tomato, pear and apple. Treating the three stimulus objects as one compound stimulus, children are expected

to make as many pairs out of the triad as they possibly can. They are then to provide reasons for their pairings. If for example, 'big', which is a physical attribute, is given for putting tomato and apple together, the response is scored under descriptive-analytic style. On the other hand, if the child said 'fruit', it was scored under categorical-inferential style; and if she/he said, 'Apples and tomatoes could be purchased from a farm', the response is put under relational-contextual style.

The same two objects could be selected twice, if different reasons are assigned. Children spend about 60 seconds for each 'compound response'.

Validity and reliability of the SCST:

Yu (1981) referred to the validity and reliability figures of the SCST from studies by Gray and Knief (1975). Internal consistency reliabilities were cited as .79, .80 and .80 respectively, for categorical, descriptive and relational conceptual styles. Also, test-retest reliabilities were quoted as .75, .77 and .80 respectively for categorical, descriptive and relational styles. Based on this, the test seems to have high validity and reliability.

Test administration and scoring of the SCST

Test administration of the SCST followed the guidelines given in the SCST Manual (1967, 1976). The test was individually administered to subjects. Each child spend 15 minutes on average on the test. Before starting, the experimenter reviewed the trial item with the child. This was in accordance with the principle of giving adult guidance at the initial stage of a test before measuring the

FIGURE 7 : THE CRITERIA FOR CLASSIFYING SIGEL CONCEPTUAL STYLE
TEST INTO DESCRIPTIVE, RELATIONAL AND CATEGORICAL SUB-STYLES*

DESCRIPTIVE: Groupings based on:

- D1 physical attributes such as colour, texture, shading, or shape.
- D2 the description of the object, or part of it. For example, grouping objects together because they both have heads, legs, guns, belts, clothing, hair-colour, posture.
- D3 similar materials used in making the objects: eg. they are made of wood, plastic, steel, etc.
- D4 same status or/and occupation, where there are physical cues that the child can see. eg. They are policemen, cowboys, nurses, teachers, etc.
- D5 similar age categories (discrete): eg. children, old-people, adults, babies, young people, etc.
- D6 same sex: eg. males, females, men, women, etc.
- D7 age + sex: eg. old men, young women, boys, girls, etc.

RELATIONAL: Grouping based on:

- R1 themes, plots, stories, where no category has been used: eg. He killed this man; he is climbing the tree; etc.
- R2 geographic: space-locale, place, habitat, etc. eg. This man and woman live in the house; they work on the farm.
- R3 temporal: stages of development of a person or event: eg. a person growing up; stages of life; also, the use of 'before' and 'after'.
- R4 comparative: eg. better than this one, etc.
- R5 functional: interdependent use, eg. The truck carries horses; the light sits on the table for reading; etc.
- R6 kinship relations: family, mother-son, doctor-nurse; teacher-student; etc.
- R7 social event, institution, organization, etc, where the physical cue of the stimulus is not used. eg. They are teachers; they have something to do with the law, etc.

CATEGORICAL: Grouping based on:

- C1 common behaviour or function: eg. They all do services; they work for a living; or the use of participles of action - eating, singing, etc.
- C2 common role, class or attribute, eg. animals, forms of transportation, tools, violence, juicy, squarely, etc.
- C3 moral, aesthetic judgement, eg. good, evil, wicked, pretty, ugly, etc.
- C4 affect state, eg. sad, happy, etc.
- C5 geographical: common locale, domiciliary, as basis for classification. eg. jungle animals, household furniture, under-water animals, etc.
- C6 unseen, presumed and/or constituent parts or inferred attributes. eg. seeds, motors, colours other than black and white; etc.
- C7 value judgement; of an intrinsic worth: eg. important for men; good for food; associated with women, etc.

* Sigel (1967, 1976) Manual

extent of transfer of training. Vygotsky (1962) called this 'zone of proximal development'. This zone represented the difference between what a child can do by himself/herself and what he/she can do under adult guidance. What is being measured is his/her ability to learn.

In the Sigel Conceptual Style Test, specific instructions were given and repeated for each child. For example,...

What I want you to do is to pick out any two of three pictures which go together, belong together, or are related in any way...(SCST Manual, 1967, 1976).

Children's groupings and the reasons they provide are sorted and classified using guidelines from the Manual. Figure 7 on page 44 specifies the criteria for classifying children's responses into Descriptive, Relational and Categorical styles under Sigel Conceptual Styles.

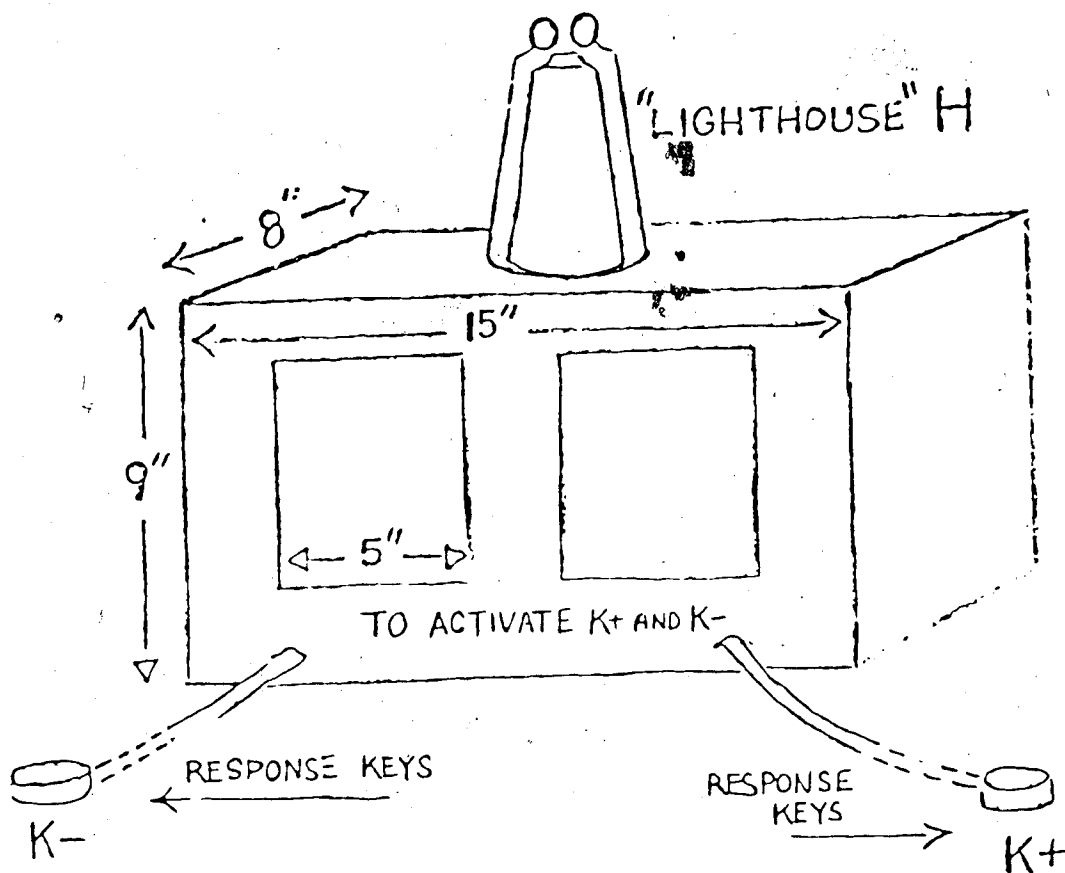
Separate frequencies are computed for each substyle and then relative frequencies are also computed.

The Verbal Regulation of Behaviour Apparatus (Schubert, 1973)

Refer to Figure 8 and Figure 9 (pp.47,48) for diagrams showing the front and backview of the Verbal Regulation of Behaviour stimulus box.

The VRB Apparatus is an electronic box 8x14x5 inches. It has two compartments and two frosted windows. Each compartment contains two lamps, and a buzzer. The right hand window displays red and green lights; and the left hand window displays red and blue lights (12 watt, 12 volt). The buzzers differ in pitch. Each light or buzzer or a combination of them can be used as stimulus, rein-

FIG. 8.
VRB APPARATUS (FRONT VIEW).



1. FROSTED GLASS WINDOW
2. OUTLET CONNECTED TO RUBBER BULB K+
3. OUTLET CONNECTED TO RUBBER BULB K-
4. KNOB CONNECTED TO STRINGS WHICH ACTIVATE K+ AND K-

REARVIEW OF VRB APPARATUS

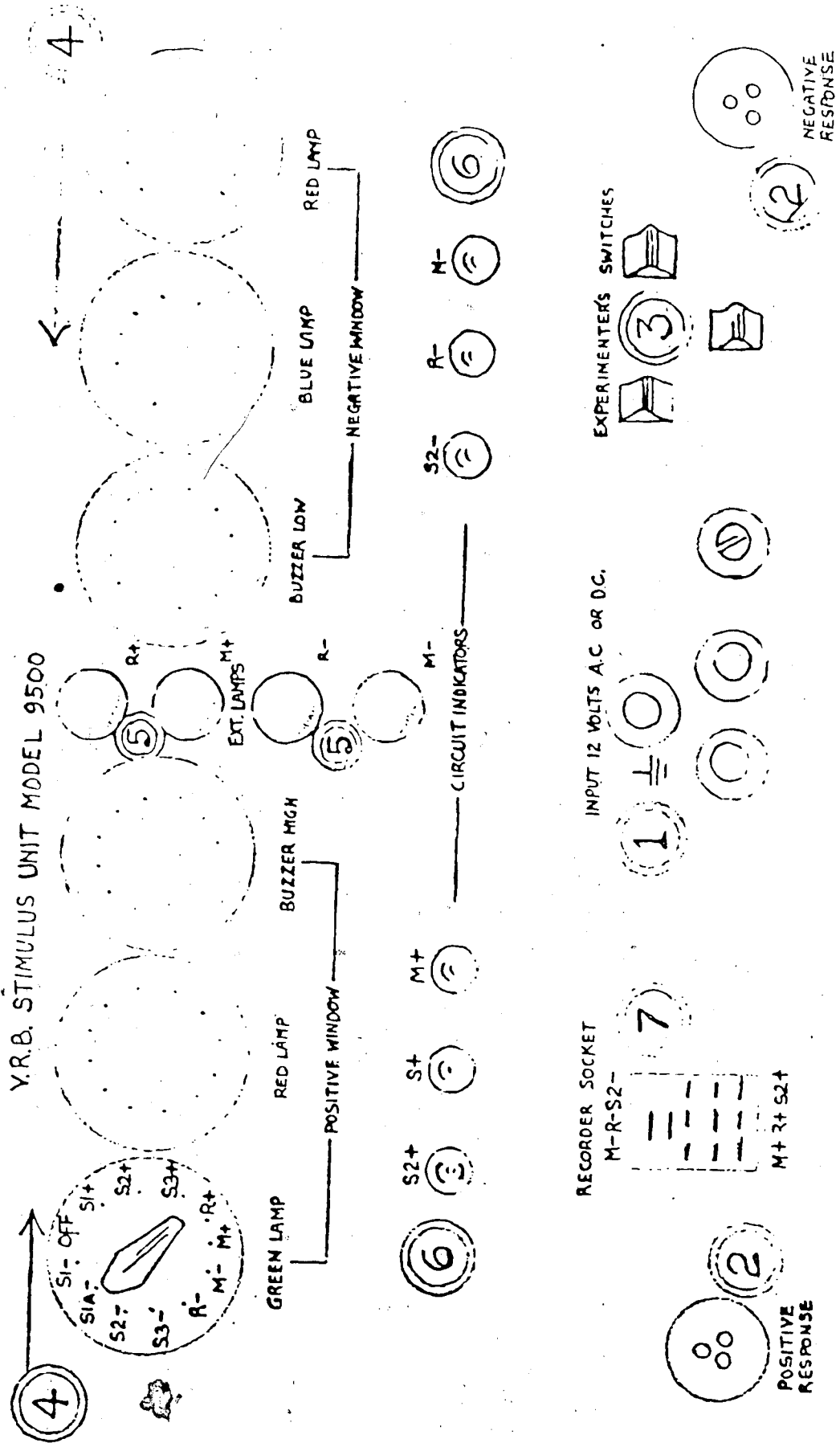


FIGURE 9

forcement or error indicator. A toy light house with a six-watt bulb, stands on the box. This is connected to the light that gives the correct response so that whenever the child presses for it, the lighthouse lights. It therefore serves as reward indicator.

There are three experimenter's keys marked E+, E- and C. These are make-and-break pushbutton switches. They are found at the back of the stimulus box. E- administers negative stimuli, E+ administers positive stimuli and 'C' administers both positive and negative stimuli. When a light is displayed on the window, the child responds by squeezing a rubber bulb. There are two such rubber bulbs which are connected to the box through two keys, K+ and K-. However, in the administration of the test, only the bulb necessary for a correct response is given to the child at any specific time.

Recording:

The rubber bulbs and the electrical apparatus are connected to a kymograph. This is an automatic recording device. There are six pens which register positive and negative stimuli. The switch board is attached to the back of the box. It displays the experimenter's switches and sockets for the following connections:

- a) electricity supply (12 volt);
- b) correct and incorrect response keys- K+ and K-;
- c) kymograph pens;
- d) stimulus sockets, reward sockets, and mistake indicator sockets for the lamps and buzzers.

There are 6 monitoring bulbs (6 watt) in different colours, which indicate stimuli, correct response and mistakes. The kymograph

is only needed when exact recording is required. The subject's performance can be scored directly through prior practice. Refer to Schubert, 1969, pp. 241, 242).

Administration:

Before administering the stimuli, the child is put at ease. For example, he/she is allowed to play with the morse keys, and shown the lights. The experimental procedure is divided into 3 levels. These are as follows:

1. Training Level; 2. Conditional response; and 3. Discovery of rule level. Children need not solve all the problems at all the levels. For example, the 'training level' is omitted if children are 5 or more years of age. This is because this level is very basic. Refer to page 51 for the VRB test battery).

a. Training Level:

Training experiments are conducted with children who are 4 years or younger or mentally retarded subjects. At this level, the subjects merely followed and acted according to the instructions of the experimenter. The experimenter showed the light on the window and said to the child: 'Squeeze the bulb' or press or 'give it a squeeze', as considered suitable. Then the light was put out, and if the child pressed the bulb before the second light was shown on the window, the experimenter said: "No, don't press now, wait for the light".

The rate at which the lights are displayed on the windows is adjusted to the child's speed of reaction. The experimenter continues to give verbal encouragement; however, when the child starts to press the rubber bulb correctly, the experimenter stops giving

FIGURE 10 : VRB TEST BATTERY - SPECIFIC INSTRUCTIONS*

This battery includes ten problems. It is suitable for children who reach level IV (cf. p. 35) i.e. for children age four years and above.

Table 1 summarizes the experiments of the test battery.

Table 1

code	description of experiment	stimulus switches	schedules
<u>B</u>	rule stated by experimenter; motor response, verbal response and combined response required	all B experiments: buzzers in "off" POSITION. H connected to R+. Right window: RR = red light = S1+ GR = green light = S1a-	
<u>B1</u>	("squeeze for the red light") One stimulus		iv
<u>B2</u>	Two stimuli, differing in colour. ("Squeeze for the red light, <u>don't</u> squeeze for the green light".)		v
<u>B6</u>	One stimulus, two responses required. ("squeeze two times for every light" "squeeze two times and say 'one-two'.")		iv
<u>B6c1</u>	One stimulus. (squeeze <u>two times</u> and say 'twice'.")		iv
<u>C</u>	subjects discover the rule in the light of the positive or negative reinforcement given by the apparatus:	all C experiments buzzer BR = M+ house H = R+	
<u>C2</u>	two stimuli in left window (not scored, for demonstration only)	blue BL = S1- red RL = S1+	v
<u>C2a</u>	two stimuli, reversal of meaning of colour	BL = S1+ RL = S1-	vii
<u>C3</u>	<u>extinction</u> of the red light is positive	red RL = S3+ until end of test: GR = S1a- RR = S1+	viii
<u>C4</u>	alternation. Identical stimuli in sequence +, -, +, -, ...	RL = off	ix
<u>C5</u>	Identical stimulus, sequence +, -, -, +, -, -, ...		x
<u>C11</u>	<u>Sequence green</u> = negative, red positive when following green, otherwise negative.		xi

(Table cont'd)

C10 Duration. red is positive if of
long duration (5 secs or more);
negative if of short duration.

FIGURE 11: POSSIBLE VARIATIONS IN MODE OF RESPONDING TO STIMULI
IN THE VRB PROCEDURE

- m motor response only. eg. 'When the light goes on press the bulb'.
- v verbal response. eg. "When the light goes on say 'yes'".
- c combined motor and verbal response. eg. 'press and say yes'.
- c₁ combined motor and verbal response requiring a more complicated verbal component. eg. "press two times and say 'yes', twice.
-

verbal instructions. 'Training' is continued for about 10 minutes. This is to see whether the child could learn to 'give a conditional response'. That is, if he/she could learn to follow instructions to press or not to press the rubber bulb at the appropriate time. During 'training', different stimulus combinations are given for the child to respond to. Refer to Figure 9 on page 53 for a list of experiments and required verbal responses from which the experimenter may select VRB tasks.

Some of the stimulus combinations or tasks, could be the drawing of a curtain in order to attract the attention of the child; and the putting on of two lights simultaneously. Different children react better with different modes of giving their responses. What the experimenter aims at doing is to try 'different combination of stimulus response and reward in order to find out whether the child would be able to learn a rule and to respond systematically (to an adult's instructions) Schubert, 1969, pp. 241, 242).

b. Conditional response:

At this level of task difficulty, the experimenter gives a rule, showing the child what correct and incorrect responses are for a given task. For example, "Every time the light shows on the window, squeeze the bulb; wait for the light". The child is expected to wait for the light to appear. The way the lights are displayed on the window is according to a specific and standardized procedure which Schubert (1973) calls 'schedules'. Refer to Manual, p. 34. For example, a schedule involving 'discrimination problem' or two stimuli may be indicated in the schedule in the following way: (Continue at page 56).

FIGURE 12: SCORING OF VRB PROBLEMS AT THE CONDITIONAL RESPONSE LEVEL*

(a) Scoring of variation (m,v or c).

Level 0 - failure. First schedule scored 0 or 1, second schedule scored 0.

Level 1 - i) Repeat schedule scored 1.

- ii) Repeat schedule scored 0 after previous score 2+.
(In certain circumstances it is necessary to repeat the experiment. If the repeat score is 0 or 1, but the first score was 2 or better, the whole experiment will be scored 1.)

Level 2 - If after an initial score 0-2 all later schedules are scored 2+.

Level 3 - All schedules scored 3+ (excepting experiments to be scored "4").

Level 4 - i) All schedules scored 4.

- ii) In cases where three or more schedules are administered, one schedule scored 3 and all the others scored 4.

(b) Similarly, a complete B-experiment (combining B_m, B_v and B_c) is scored as follows:

Level 0 - All three variations are scored 0.

Level 1 - i) No variation scores better than 1.

- ii) Any variation scores 1 or 0 after a previous variation of the same experiment scored 2+ (e.g. B-l_m = 2, B-l_v = 4, B-l_c = 3, B-l_m repeat = 1; total level B₁ = 1).

Level 2 - If after an initial score 0-2 all later variations are scored 2+.

Level 3 - All variations scored 3+ and at least two variations scored 3.

Level 4 - Not more than one variation is scored 3, all the others are scored 4.

* Taken from Schubert (1973), VRB Apparatus

++ -+ -- +- +- +- +- --

(see page 57 for the complete list of 'schedules')

The above sets of positive and negative sign-sequences show when lights displayed on the window is positive and when it is negative; it shows the order of presentation of the lights on the window; it also shows the rate and duration for displaying the lights. If mechanically administered, each dot represents a second. Where no sign appears on a dot, there is a pause of a second, for 1 dot, two seconds for two dots, etc. After every 4 dots, there is a longer pause.

Different problems have different positive and negative sign arrangements in the 'schedule'.

c. Discovery of rule level:

This is the third and most advanced level in the VRB procedure. At this level, the child is not given the rule used to present the lights on the windows of the apparatus. He/she is to discover it for him/herself through trial and method approach. Before the child starts the actual tasks, the experimenter demonstrates that a correct response lights the toy lighthouse and a wrong response sounds the buzzer.

The problems are such that one after the other, the child has to find out which light is right and which is wrong. When the child meets difficulty, he/she is given some help. The experimenter says: "Don't press for the buzzer"; 'try all the lights'. The child proves by his/her motor behaviour, the way he/she presses the rubber bulb, that he/she has discovered the rule. He/she is then asked to explain the rule to the experimenter. If in the

*(continue from p. 61)

FIGURE 13 : LIST OF 'SCHEDULES' THAT GUIDE THE EXPERIMENTER AS TO HOW STIMULUS IS TO BE PRESENTED ON THE VRB WINDOWS*

(i)	+	+	+	+				
(ii)	+	+	+	+				
(iii)	+	+	+	+				
(iv)	+	+	+	+	+	+	+	+
(v)	+	+	-	+	-	-	+	-
(vi)	+	+	-	-	+	+	-	+
(vii)	-	+	+	-	+	+	+	-
(viii)	+	C	C	+	-	+	C	+
(ix)	+	C	+	C	+	C	+	C
(x)	+	C	C	+	C	C	+	C
(xi)	-	+	C	C	-	+	C	-

continue in random order, - never followed by C, but always by - or +; + is always followed by - or C; C always followed by C or -

Experimenter switch followed by

	+	-	C		-	C	
	-	+	C		-	+	
	C	-	+		C	-	
(xia)	C	-	+	C	continue like (xi)		

Remember that subject has negative response key and therefore a response to + is incorrect (R+) and responses to - and C are correct (R-).

(xii)	(+)	C	C	C	(+)	(+)	C	(+)	C	(+)
-------	-----	---	---	---	-----	-----	---	-----	---	-----

continue in random order.

* Taken from Schubert (1973) Manual on the Verbal Regulation of Behaviour,

FIGURE 14 : SUMMARY OF THE SCORES ON THE VRB 'FIND THE RULE' LEVEL*

Response	Problem					
	<u>C2a</u>	<u>C3</u>	<u>C4</u>	<u>C5</u>	<u>C11</u>	<u>C10</u>
<u>B-</u>	0	0	0	0	0	0
<u>B+</u>	0	0	0	0	1	1
<u>Cm+</u> after help	1	2	1	1	2	2
<u>Cv+</u> after questioning (no help)	2	2	2	2	3	3
<u>Cv+</u> no help needed.	2	3	2	2	3	3

Maximum score for all C problems = 15

* Schubert (1973) Manual on the Verbal Regulation of Behaviour Procedure

FIGURE 15 : EXACT SCORING PROCEDURE OF THE VRB PROBLEMS*

Definition of Errors.

I) Major errors (symbol "m").

1. Inhibition: No response is given until after termination of stimulus.
2. Irradiation: Spontaneous response, no stimulus given.
3. Disinhibition: Response to the wrong stimulus.
4. Excessive prolongation: Response is not terminated before the appearance of a new stimulus.
5. Counting: Error in number of responses, when counting is required.

II) Minor errors (symbol " \bar{m} ")

6. Delayed reaction - given only 2 seconds after beginning of stimulus, but before its termination.
7. Prolongation: A-level: Any response continuing for more than 2 seconds after termination of stimulus.

B and C level response lasting more than 2 seconds.

Criteria for scoring of schedules. Errors may be systematic or cumulative. If the identical error appears twice within two consecutive bars, it is scored "systematic" (symbol "s"). Any other combination of errors is called "cumulative" (symbol " \bar{s} ").

The following table summarizes the scoring rule for different schedules in logical notation. The symbols used are: -

t = total number of errors within the schedule, at least one error to occur after the first bar.

e = number of errors occurring in second half of schedule.

s = systematic; \bar{s} = cumulative; m = major; \bar{m} = minor error.

Combinations of letters refer to logical multiplication, i.e. sm = major systematic errors, excluding any other errors.

v refers to logical addition (either of both conditions is sufficient; both may be present, if not excluded by another condition.

x refers to logical multiplication (both conditions connected by x are necessary.)

Schedule	Score	Necessary and sufficient conditions
All schedules	4	Any number of errors in first bar, none thereafter.
(i), (ii)	3	(1-2)t.
	2	Not scored.
	1	(3-5)t x (0-2)e x (0-1) me.
	0	[(3-5)t x (2+m v 3+)e] v = 6+t
(iii) and all other half schedules	3	(1-3)t x (0-2)st
	2	Not scored
	1	[(4-7)t x (0-4m] v 3st x excluding irradiation in all three last bars.
	0	(5-7)t x [(5-7)m v irradiation in last three bars] v 8+t
Full schedules	3	(1-3)t x (0-1)e
	2	(2-11)t x (0-2)e
	1	[(3-4)t x (3sm v 3s)e] v (5-11)t x [(2-3)sm v 3s]e
	0	12+t v 3+sme v 4+e

The verbal definitions of errors are as follows:

<u>Schedule.</u>	<u>Score.</u>	<u>Definition.</u>
(i), (ii)	3	Not more than two errors. (Here and thereafter it is always assumed that at least one error occurs after the first bar.)
	1	3 to 5 errors, provided that in the second half there are no more than two errors, at most one of them major.
	0	2 major errors in second half, provided total of errors is at least 3. Or at least 3 errors in second half, or more than 5 errors altogether.
(iii) (v)a - (xii)a	3	Not more than 3 errors, provided not more than 2 are systematic
	1	3 systematic errors, excluding irradiation in the three last bars, or 4 to 7 errors, provided that there are no more than 4 major errors.
	0	5 or more major errors, or 8 or more errors altogether, or irradiation occurring in each of the last three bars.
(iv) - (xi)	3	Not more than 3 errors, and not more than 1 error in second half of schedule.
	2	2 to 11 errors, but at most 2 errors in second half.
	1	3 or 4 errors, if in second half there are 3 errors, but not 3 major systematic errors. Or 5 to 11 errors, if in second half there are 3 errors excluding 3 systematic major errors.
	0	3 systematic major errors or any 4 errors in second half, or if there are 12 or more errors altogether.

course of discovering the rule, he/she was helped by the experimenter, the child's score is reduced accordingly. To achieve problem-solution of 'find the rule' type, the child should learn to eliminate incorrect responses; take cues from the lighthouse and the buzzer; and be able to conceptualize the rule and verbalize it.

Verbal Regulation of Behaviour Problems:

Schubert (1973) describes the verbal regulation of behaviour problems as 'experimental variations'. Any experiment can be given in one or more of the variations summarized in Figure 9, p. 53.

Scoring of the Verbal Regulation of Behaviour Problems:

Each schedule, variation (motor, verbal or combined), and each experiment are scored on a five-point scale. Refer to the Manual for the exact scoring definitions (page 59). See Figure 10 for a summary of the maximum scores on "Find the rule" level of problem solving in the VRB (p. 58).

RESEARCH HYPOTHESES

1. Performance on the VRB increases significantly with age.
2. Performance on the SCST Descriptive increases significantly with age.
3. Performance of the SCST Relational decreases significantly with age.
4. Performance on the SCST Categorical increases significantly with age.
5. Boys perform equally well on the VRB as do girls at all age levels.
6. Boys give as many responses in the SCST Relational

style as do girls.

7. Boys give as many relative responses in the SCST Descriptive style as do girls.
8. Boys give as many relative responses in the SCST Categorical style as do girls.
9. There is interaction between age and sex in performance on the VRB.
10. There is interaction between age and sex in performance on SCST Relational.
11. There is interaction between age and sex on the SCST Descriptive style.
12. There is interaction in performance between age and sex in the SCST Categorical.
13. There is positive correlation between scores on the VRB and SCST Descriptive.
14. There is positive correlation between the VRB scores and the SCST Categorical.
15. There is negative correlation between between VRB scores and the SCST Relational.
16. There is positive correlation between SCST Descriptive and SCST Categorical.
17. There is negative correlation between SCST Relational and SCST Categorical.
18. There is negative correlation between SCST Descriptive and SCST Relational.

Statistical Hypotheses:

1. $H_0 : A_1 = 0$

- $H_1 : A_i \neq 0$
2. $H_0 : B_j = 0$
- $H_1 : B_j \neq 0$
3. $H_0 : AB_{ij} = 0$
- $H_1 : AB_{ij} \neq 0$
4. $H_0 : \text{There are no correlational relationships among the VRB, SCST Descriptive, Relational and Categorical.}$
- $H_1 : \text{There are correlational relationships among the VRB, SCST Descriptive, Relational and Categorical.}$

ANALYSES OF DATA AND FINDINGS

Two methods will be used to analyze the data:

- a) the main method will use analysis of variances, multiple range tests and Pearson Product Moment Coefficient of Correlation.
- b) the second section shall present some-side interests in the form of descriptive data based on means and standard deviations.
- A third section shall bring up the findings.

Section A : Analyses of Variance, Multiple Range Test, and Correlation Coefficients

Hypothesis 1 : Verbal Regulation of Behaviour (VRB)

$H_0 : A_i = 0$

$H_1 : A_i \neq 0$

Accept H_0 at .05 level

Results:

Analysis of variance was performed and the result summarized in Table 4 on page 64. The results ($F = 12.12^*$) of the VRB showed

TABLE 4: ANALYSIS OF VARIANCE OF VRB SCORE BY GRADE AND SEX

Source	DF	Sum of Squares	Mean Square	F	P
Grade	3	333.68	111.23	12.12	0.000
Sex	1	7.36	7.36	0.80	0.38
Grade X Sex	3	6.82	2.28	0.25	0.86
Residual	50	459.03	9.18		

N = 58

TABLE 5: MULTIPLE RANGE TEST ON THE VRB -- AGE

MEAN	GROUP*	GROUP			
		1	2	3	4
9.50	1				
11.29	2				
14.29	3	*	*		
15.50	4	*	*		

* Denotes pairs of groups significantly different at the
0.05 level

significant difference in performance on the VRB as a function of age.

The H_0 is therefore rejected at .05 level.

Multiple Range Test (Newman-Keuls) presented in Table 5 on page 65 showed that the following groups were significantly (at .05) different in performance on the VRB, from each other: Kindergarteners and third graders; kindergarteners and fourth graders; second graders and third graders; second graders and fourth graders. However, Kindergarteners and first graders were not significantly different.

Discussion:

The results were in accordance with the findings of Luria (1961); Luria and Yudovich (1959); Schubert (1969); Schubert and Cropley (1972) and Steinberg (1974/75). That as children increased in age their scores on the performance of VRB tasks increased significantly.

Hypothesis 2: VRB

$H_0 : B_j = 0$

$H_1 : B_j \neq 0$

Accept H_0 at .05 level

Result :

The results of the analysis of variance shown in Table 4, p 64 did not show any significant difference in performance on the VRB tasks as a function of sex ($F = .80 = NS$).

The H_0 is therefore not rejected at .05 level of significance.

Discussion:

Luria (1961); Schubert (1969, 1973); Schubert and Cropley (1972);

and Steinberg (1974/75) who have done studies in the area have not reported and sex differences in performance on the VRB. This present study therefore is in agreement with their findings.

Hypothesis 3: VRB

$H_0 : AB_{ij} = 0$

$H_1 : AB_{ij} \neq 0$

Reject H_0 at .05 level.

Results:

The results in Table 4, p 64 of analysis of variance did not show any significant interaction between age and sex on the VRB ($F = .86 = NS$).

The H_0 was therefore not rejected at .05 level of significance.

Discussion:

The previous studies done in the area (ibid.) have not reported any interaction between age and sex in performance on the VRB.

Summary of Results of Analyses of Variance and Multiple Range Tests on the Verbal Regulation of Behaviour Problems

Results of the above tests on the VRB scores showed that while there are no significant sex differences and age-sex interaction, age related changes in performance do take place. The results were significant at .05 level.

Hypothesis 1 : Sigel Conceptual Style Test Descriptive:

$H_0 : A_i = 0$

$H_1 : A_i \neq 0$

Reject H_0 at .05 level

Results:

The result of analysis of variance was presented in Table 6 (p. 69). At .05 level, there was no significant difference between the different age levels in performance on Sigel Conceptual Style Test, Descriptive ($F = 0.28 = NS$).

Discussion:

Yu (1981) found age related differences significant for 6-7 year olds but non-significant at higher ages (p. 178, 182). In her discussion of results she concluded that : "In SCST SD (Sigel Conceptual style Descriptive) the pattern is from more global to the more discrete or analytic, with age" (p. 182).

This finding in terms of statistical significance (.05) has not been confirmed in the present study being reported. A possible reason for this difference in results is the fact that in my analysis Descriptive global and descriptive analytic (part-whole) were not separated. Further studies however may be needed to confirm or disconfirm either of the two findings.

TABLE 6 : ANALYSIS OF VARIANCE OF SCST DESCRIPTIVE
BY AGE AND SEX

Source	DF	Sum of Squares	Mean Square	F	P
Grade*	3	280.87	93.62	0.28	0.84
Sex	1	273.46	273.46	0.82	0.37
Grade x Sex	3	1339.70	446.57	1.40	0.27
Residual	50	16676.48	333.53		

N = 58

* Grade and age have been used interchangeably.

Hypothesis 2 : Sigel Conceptual Style Test Descriptive:

$H_0 : B_j = 0$

$H_1 : B_j \neq 0$

Reject H_0 at .05 level of significance.

Results:

Analysis of variance was performed on the data and the results presented in Table 6. Sex differences in the SCST Descriptive was nonsignificant at .05 level. ($F=0.82$)

Therefore the H_0 was not rejected.

Discussion:

Yu (1981) and Sigel, Jarman & Hanesian (1967) found sex differences with respect to the SCST Descriptive. But it seems that these studies were done in a cross-cultural setting. The present study however was not. It may be necessary to confirm the present result in varying socio-economic and socio-cultural settings.

Hypothesis 3 : Sigel Conceptual Style Test Descriptive:

$H_0 : AB_{ij} = 0$

$H_1 : AB_{ij} \neq 0$

Reject H_0 at .05 level.

Results:

The results of analysis of variance presented in Table 6, p. 69 was nonsignificant ($F=1.40=NS$). Therefore, do not reject H_0 at .05 level of significance.

Discussion:

In the present study, the results show that there is no age x sex interaction in terms of performance on Sigel Conceptual Style Test, Descriptive. Previous studies (eg. Yu, 1981) have not reported interaction between age and sex in this substyle in the SCST.

Hypothesis 1 : Sigel Conceptual Style Test Relational:

$H_0 : A_i = 0$

$H_1 : A_i \neq 0$

Reject H_0 at .05 level of significance

Results:

The results of analysis of variance on the SCST Relational style was presented in Table 7, p. 72. The age differences in performance were not significant ($F=2.49= NS$). However, it was approaching significance ($p=.07$). Do not reject H_0 at .05 (NB: with reservation).

Discussion:

In terms of childrens performance in the Relational Style within Sigel's Conceptual Style, Yu (1981) reported significant age differences for 6 to 7 year olds (p. 182). In this connection she concluded that "In Sigel Conceptual Style - Relational (the developmental pattern) is from more relational to less relational, developmentally" (p. 182). However, the present study found the differences in performance nonsignificant at .05. In the present study the sample size was small ($N=58$). Further confirmation may be necessary with a larger sample.

TABLE 7 : ANALYSIS OF VARIANCE OF SCST RELATIONAL
BY AGE AND SEX

Source	DF	Sum of Squares	Mean Square	F	P
Grade	3	2419.06	806.35	2.49	0.07
Sex	1	256.97	256.97	0.79	0.38
Grade x Sex	3	1374.69	458.23	1.42	0.25
Residual	50	16187.99	323.76		

N = 58

Hypothesis 2 : SCST Relational:

Ho : $B_j = 0$

H₁ : $B_j \neq 0$

Reject Ho at .05 level of significance.

Results:

See Table 7 on page 72 for the analysis of variance of SCST Relational style in relation to sex. The result was statistically nonsignificant at .05 level ($F=0.79$). Do not reject Ho at .05 level of significance.

Discussion:

Yu (1981) has shown that girls produce more relational type of responses than boys at a statistically significant level ($F=13.44^*$, $p.001$).

This finding of Yu (1981) was not supported in the present study.

However, the two studies are not strictly comparable. Yu (1981) did her study in a cross-cultural context and used a larger sample than the study being reported here.

Hypothesis 3 : SCST - Relational:

Ho : $AB_{ij} = 0$

H₁ : $AB_{ij} \neq 0$

Reject Ho at .05 level.

Results:

The results of interaction between age and sex presented in Table 7 p. 72, was not statistically significant ($F=1.42$). Therefore do not reject Ho at .05 level of significance.

Discussion:

The previous studies did not report interaction between age and sex in performance on the SCST relational style (Yu, 1981). This present study did not show significant interaction. Perhaps the use of a larger sample than was used in the present study (N=58) may lend more credence to the findings.

Hypothesis 1 : Sigel Conceptual Style Test, Categorical.

Reject Ho at .05 level of significance.

Results:

Analysis of variance was performed on the data and presented in Table , page 77. The results showed that there was significant age differences in performance on the Sigel Conceptual Style Test, in the Categorical substyle ($F=13.25^*$). Therefore the Ho was rejected at .05 level of significance.

A Multiple-Range Test was also performed using Newman-Keuls Procedure. The results of this test was presented in Table 9, page 75. The following groups were found to be significantly different at .05 level:

- a) kindergarteners and first graders;
- b) kindergarteners and third graders;
- c) kindergarteners and fourth graders;
- d) first graders and fourth graders; and
- e) third graders and fourth graders.

TABLE 8 : ANALYSIS OF VARIANCE OF SCST CATEGORICAL
BY AGE AND SEX

Source	DF	Sum of Squares	Mean Square	F	P
Grade	3	1748.05	582.68	13.25*	0.00
Sex	1	1.28	1.28	0.03	0.87
Grade x Sex	3	52.22	17.41	0.40	0.76
Residual	50	2198.86	43.98		

N = 58

TABLE 9 : MULTIPLE RANGE TEST ON THE SCST--CATEGORICAL
 4-- AGE

MEAN	GROUP ⁺	1	2	3	4
5.29	1				
13.79	2	*			
14.64	3	*			
20.56	4	*	*	*	

* Denotes pairs of groups significantly different at the 0.05 level

+ 1 = Kindergarten
 2 = Grade 1
 3 = Grade 2
 4 = Grade 3

Discussion:

Yu (1981) found significant age-related differences in children's performance on Sigel Conceptual Style, Categorical. Her finding is therefore supported by the present study. Jarman and Hanesian (1967) found similar results. However these two studies did not present data on interaction between age and sex in the area of SCST Categorical.

Hypothesis 2 : SCST Categorical:

$H_0 : B_j = 0$

$H_1 : B_j \neq 0$

Reject H_0 at .05 level.

Results:

Analysis of variance in terms of sex was presented in Table 8, p. 75. In terms of performance on SCST Categorical, the difference between the sexes was nonsignificant ($F=0.03$). The H_0 was therefore not rejected at .05 level of significance.

Discussion:

Studies by Yu (1981) did not also report significant sex differences in performance on SCST Categorical. This present study is therefore in support of her findings.

Hypothesis 3 : SCST - Categorical:

$H_0 : AB_{ij} = 0$

$H_1 : AB_{ij} \neq 0$

Reject H_0 at .05 level.

Results:

The results on the interaction between age and sex (analysis of variance) was presented in Table 8, p. 75. It was not significant at .05 level. The H_0 was therefore not rejected. ($F= 0.40$)

Discussion:

The findings are in agreement with Yu (1981) who reported no significant interaction between age and sex in terms of children's performance on the SCST Categorical style. A cross-cultural study in this area using a larger sample than was used in the present study being reported ($N=58$) is necessary to confirm these findings.

Hypothesis 4 : With respect to all the four variables : Verbal Regulation of Behaviour.; Sigel Conceptual Style, Descriptive, Relational, and Categorical substyles.

H_0 : There are no correlational relationships among the 4 variables:

VRB, SCST - Descriptive, Relational and Categorical Styles.

H_1 : There are correlational relationships among the variables of interest.

Reject H_0 at .01 level of confidence.

Results:

Pearson's Product Moment Coefficients of Correlation were found among the four variables : VRB, SCST - Descriptive, Relational and Categorical styles. The results were summarized in Table 10, p. 79.

TABLE 10 : PEARSON CORRELATION COEFFICIENT MATRIX OF THE
 VRB, SCST -- RELATIONAL, DESCRIPTIVE AND CATEGORICAL

	VRB	SCST-R	SCST-D	SCST-C
Verbal Regulation of Behaviour	1.00	-.14	-.02	.44*
Sigel Conceptual Style Test-- Relational		1.00	-.90*	-.31*
Sigel Conceptual Style Test-- Descriptive			1.00	-.11
Sigel Conceptual Style Test-- Categorical				1.00

* P .01

Results:

At .01 level of significance the following relationships were significant among the 4 variables:

1. VRB and SCST- Categorical -- $r = .44^*$

2. SCST Descriptive and SCST-
Relational $r = -.90^*$

3. SCST Relational and SCST-
Categorical $r = -.31^*$

Discussion:

The results show that as VRB scores increase with age, children tended to produce more categorical style responses. On the other hand as SCST-Relational responses decreased with age, children tended to produce rather more a) descriptive style responses, and b) categorical style responses.

This finding was supported by Yu (1981) and Sigel (1953) propositions about the developmental trends in the Sigel Conceptual Style. This present study is unique in that there are no studies specifically relating verbal regulation with cognitive style in general and the SCST in particular. The data in table 10 page 79 shows that there was not significant correlational relationship between the VRB and SCST Relational and Descriptive Styles (at .01 level of significance, and even at .05 level). This seemed unexpected to the present author when theory reviewed in chapter 2 of this thesis is considered.

Only an aspect of the SCST (ie. Categorical Style) had a strong positive relationship with the VRB.

However, since SCST- Categorical is strongly negatively

related to the SCST- Relational Style ($r = -.31^*$, $p.01$), one may perhaps apply the law of transitivity here. That the VRB could also be negatively related to the SCST Relational style. This however needs verification in a larger sample than was used in the present study ($N=58$).

SUMMARY OF FINDINGS OF ANALYSES OF VARIANCE, CORRELATION COEFFICIENTS,
AND MULTIPLE RANGE TESTS

Both the VRB and SCST Categorical style showed a developmental trend in the form of increasing scores with age, that were statistically significant at .01 level of significance. However the VRB did not show significant correlational relationship with the SCST Relational and Descriptive. This was to be explained in terms of size of sample and may be artifactual aspects of the study. I am not sure.

In the 4 variables of interest (VRB and SCST- Descriptive, Relational and Categorical, there were no significant sex differences at .05 level of significance. This is explained in terms of that the present study did not vary socio-economic and socio-cultural factors.

Also, in all the 4 variables, there was no statistically significant interaction between age and sex in terms of performance. However interesting revelations in the descriptive data in the following section of this chapter seems to suggest the possibility of such an interaction. Could be the smallness of the sample may have been the reason for this statistical nonsignificance in interaction between age and sex. Further studies therefore need to increase the size of the sample in order to verify this suspected interaction between age and sex in both the VRB and the substyles of Sigel Conceptual style.

Part of the findings showed that there was strong positive correlation between the VRB and SCST Categorical ($r=.44^*$, $p.01$). However VRB and SCST- Relational and Descriptive styles did not significantly correlate. The doubt was placed on the side of the smallness of the sample used in the present study ($N=58$). Within the SCST style itself, there was strong negative correlation between SCST Relational and descriptive substyles ($r=-.90^*$). There was also a strong negative correlation between SCST Relational and SCST-Categorical ($r=-.31^*$). Contrary to expectation, the relationship between SCST Descriptive and SCST Categorical was nonsignificant statistically ($r=-.02$).

Another interesting finding was in connection with the question of whether the kindergarteners were different in performance from the first graders. On the SCST Categorical, they were significantly different, but not on the rest (of the 3 variables - SCST Relational, Descriptive, and Verbal Regulation of Behaviour). Could it be that in actuality 5 year olds and 6 year olds are not very different in terms of the variables being measured? That in fact that the two groups should have been collapsed into one group ? Future studies may shed more light on this issue.