

SELF-NONSELF-DIFFERENTIATION AND ITS RELATION
TO STUDENT-TEACHER INTERPERSONAL PERCEPTIONS,
ACADEMIC ACHIEVEMENT, AND SELF CONCEPT

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CURRICULUM STUDIORUM

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INTRODUCTION

Impetus for the present study derived from pedagogical unrest emerging from consistent observation that some children who were faring rather poorly academically in the class of one teacher seemed to improve their condition in a very noticeable manner when placed in the classroom of another. On several occasions, the children's original teachers had the respect of colleagues and administrators and could not be considered as inadequate in their roles.

The unrest was magnified by the extreme nature of the adverse reactions of the students concerned. Their behaviour deterioration was a usual preliminary change to academic stagnation and interpersonal student-teacher communication breakdown. It was not until teacher, student and parent counselling over a period of usually a few weeks appeared to be having no noticeable effect that a placement change for the student was made.

These observations have influenced the direction of this investigation which is concerned with an examination of some of the variables, separately and in interaction with others, which are considered of importance in the interactions described.

In preliminary address an attempt is made to establish the reality of the problem. Consideration is given to the

literature addressed to an assay of those variables which appear intimately involved in the change in student behaviour; student-teacher interaction in relation to achievement; student-teacher interaction in relation to student self concept and student-teacher interaction in relation to interpersonal perceptions.

Chapter two has three sections. In the first the nature of classroom pedagogical interaction is examined especially as it contributes to the social and emotional development of the student and to his achievement in the two major areas of curriculum, mathematics and reading. The factors existing in the classroom environment which can inhibit or cultivate the development of a positive student self concept are then established.

In the second section of chapter two the developmental theory of Witkin and his associates is introduced. Some aspects of the theory appear to offer possible answers to a number of questions raised by the original problem. His position is initially presented in overview and then more specifically his findings in two related studies are discussed. The focus of interest at this stage is basically a derivation of possible effects in a student-teacher setting from the interactive relationships of patient and therapist and mother and child whose degrees of self-nonselldifferentiation are matched. Actual projection into an

academic setting of student-teacher interchange is then examined in a study by DiStefano. From this position, one in which teacher and student matched in degree of differentiation have mutually favourable interpersonal perceptions, argument is then presented that students can then be expected to develop a more positive self concept and that increments in student achievement may result.

In the conclusion of chapter two a theoretical summation which consolidates the presentations of the first two chapters precedes the statement of the research problem and the formation of two theoretical hypotheses.

Research methodology is described in chapter three. The research population is identified as grade six students and their teachers in selected Ontario schools. Measuring instruments for dependent and independent variables are examined and evaluated and the procedure for the collection of data is described. Data analysis is identified as a multivariate analysis of variance with step down analysis to be used as the post hoc procedure.

Chapter four consists of the presentation and discussion of results. It is followed by a thesis summary and a statement of conclusions which can be drawn from these results.

CHAPTER I

THE PROBLEMATIC SITUATION

1. Clarification of the Problem

In this section of the paper an introduction to the original unrest or curiosity will be followed by a preliminary examination of selected studies in the literature in order to establish the actual existence of a problem.

Society has institutionalized the process of the formal education of its youth. The process is now, in large measure, the responsibility of Boards of Education and member schools. One agent of instruction within the public school is the teacher and it is widely recognized that some students appear to perform better academically under the direction of some teachers than others. Differences in academic progress can also be observed from year to year. They are evident too when for some reason a child who is not making progress commensurate with various measures of his ability is removed from one classroom and placed in another under the tutelage of a different teacher. Why does the child appear to make better progress with one teacher than another? One initial answer is of course that teachers vary in their ability as pedagogues. But there are occasions when two teachers appear equally dedicated and capable and yet there are differential effects in the attitude and progress of their students.

An administrator who makes changes in the placement of students during the year is in a position of advantage to observe both the verbal and behavioural reaction of students thus reassigned as it relates to two teachers and to the student.

On a number of occasions, striking differences in the student's behaviour, attitude and progress have been observed and that often only in a matter of a few weeks. On the one hand after change the child reports a happier disposition, a "better" teacher who gives assistance more readily and recognizes the child's efforts. On the other, the teacher reports a child who appears to be reasonable in terms of behaviour, who tries conscientiously to complete assignments, and who is no real problem academically.

Some of the personal characteristics of student and of teacher certainly appear to influence the new and the old interactions described. It would also appear that differential effects impinge on the self concepts of the students involved, for in personal communication, the child in the new relationship appears more confident, more relaxed, and more capable of handling the interactions of an academic environment.

The observer of these transformations must eventually be concerned with whether or not there is indeed some consistent relationship between how a student thinks his teacher

views him as a student and as a person, his own feelings about himself and his achievement in a particular student-teacher dyad.

2. The Reality of the Problem

A preliminary consideration of the variables involved in the events described clearly suggests that student self concept, achievement, and interpersonal relations are important factors. Some aspects of the concern receive elaboration in studies which are reported in the literature of investigations in the behavioural sciences. Reference will be made to those in which three relationships are examined: student-teacher interaction in relation to achievement; student-teacher interaction in relation to self concept; student-teacher interaction in relation to interpersonal perceptions.

A. Student-Teacher Interaction in Relation to Achievement

Good (1970) sought to assess opportunities given by the teacher for pupil response when the students were seen by the teacher as high, medium and low achievers. He observed four teachers separately for a period of 2 days each. Students seen as high achievers by the teacher consistently received more response opportunities. Low achievers consistently received far fewer response opportunities in the

classroom interaction.

Brophy and Good (1970) examined student behaviour in order to establish if there was a difference in patterns between the opportunities taken by high and low achievers, to interact with their teachers. Three boys and 3 girls assessed as high in achievement ranking by their teachers and three boys and 3 girls assessed as low in achievement ranking were observed in each of four first grade classrooms for a period of four separate days in each class. Students assessed as high achievers were found to initiate significantly more contacts with their teachers than did low achievers. The authors also note that "the teachers failed to give any feedback whatsoever 14.75% of the time when reacting to low achievers but only 3.3% of the time when reacting to high achievers" (Brophy & Good, 1970, p. 380).

Subjects in Willis's study (1970) were special class students ranked by their teachers from a high of "most efficient" to "least efficient" as learners. Teachers and students were observed for thirty minutes each day for a period of 8 days. Teachers ignored the comments of "least efficient" students more frequently than they ignored the comments of "most efficient" learners. Willis concluded that teachers provided consequences for the behaviour of the least efficient learners which was really a systematic extinction of the behaviour that they most needed to develop for social competence.

Purkey (1970) has noted that academic success or failure appears to be as closely related to concepts of the self as it is to measured mental ability and Brookover, that "The student's attitudes limit the level of his achievements in school" (Brookover, 1959, p. 85). These comments serve well to introduce references in studies involving self concept.

B. Student-Teacher Interaction in Relation to Student Self Concept

Fink (1962), working with ninth grade boys, concluded that there was a significant relationship between negative self concept and academic under-achievement. Brookover (1964) discovered a significant positive relationship between self concept and the perceived evaluations of seventh grade students by significant others.

Diller (1954), Shaw and Alves (1963), and Durr and Schmatz (1964) report that students considered as under-achievers by their teachers tended to have negative self concepts.

Coombs (1963) described under-achievers in his study as seeing themselves as less adequate and less acceptable to others. Under-achievers also found their peers and significant adults as less acceptable to them.

Perkins (1956) found that teachers who had completed several years of child study were able to promote healthier

personality growth in their students defined in terms of the congruency between the self and the ideal self.

C. Student-Teacher Interaction
in Relation to Interpersonal Perceptions

Davidson and Lang (1960) examined how the child perceived his teacher's feelings toward him related to self concept and achievement. Their subjects were eighty-nine boys and 114 girls in grades four, 5 and 6. The children were rated by their teachers for achievement on a number of dimensions and the children themselves completed a "checklist of trait names" consisting of thirty-five descriptive terms to assess their reaction to their teachers. The authors reported that the children's perception of the teacher's feelings toward them was significantly correlated with self perception. The child with the more favourable self image was more likely to perceive his teacher's feelings toward him favourably. The more positive the children's perceptions of their teachers' feelings, the better was their academic achievement and the more desirable their classroom behaviour.

Elashoff and Snow (1971) have accumulated from the person-perception literature five general guidelines which summarize the nature of some aspects of teacher-student interaction.

- a) Teachers view pupils in terms of their own values and needs. Different teachers have different views of the same pupil.

- b) Teachers meeting pupils for the first time form impressions based on physical appearance and conduct. These initial impressions may be expected to influence pupil teacher interaction for the remainder of the year.
- c) When teachers label pupils they are likely to label them as good or bad on one of a number of dimensions. These global classifications affect other judgments.
- d) Information conflicting with current impressions may be rearranged to resolve contradictions.
- e) Interaction between perceiver and perceived may influence how the perceived subsequently presents himself. (Elashoff & Snow, 1971, pp. 62-63)

3. Summary

In terms of achievement, there are very marked differences in the manner in which high achieving students interact with their teachers. Teachers initiate more interaction with students whom they perceive as high achievers and tend to react consistently to comments and answers of high achieving students, ignoring more often the reactions of low achievers. It is probably appropriate to consider that both student and teacher differential reactions are at an unconscious level. Given the differential effects over an extended period of time, achievement for those students considered as of low ability would probably deteriorate. Associated with academic deterioration, student feelings of self worth would also decline. If, as Purkey (1970) suggests, success or failure is as deeply rooted in concepts of self as in mental ability, then a negative self concept is clearly associated with

students who are academic underachievers.

Students with a negative self concept consider themselves as less adequate and less acceptable to others. They also consider significant others with whom they interact as less acceptable and less adequate to them. Regression in student achievement and feeling of self worth is perpetuated by an exchange running from teacher to student and from student to teacher. The nature of a teacher's pedagogical preparation may also promote or curtail a healthy student personality growth.

There is definite evidence that exchanges between teacher and student can influence student self concept. When a student assesses a teacher's feelings toward him as more positive, he feels more positively toward his teacher and the mutuality of interpersonal approbation apparently effects the academic achievement of the student. Elashoff and Snow (1971) found that different teachers do indeed have different views of the same student and that interaction between perceiver and perceived may influence how the perceived subsequently presents himself.

It has to be recognized that in the specific interactions which have been considered and in many of those which are later evaluated, there are distinct roles for the two people considered in the interaction. The teacher role is traditionally the more dominant one and the student role more

one of accepting direction. However, it would appear that if interpersonal perceptions which are themselves bilateral, are adverse, then student achievement and student self concept deteriorate through a regression which is influenced by both student and teacher.

Some of the findings of this diverse group of studies would suggest that in the interactions of teachers and students certain characteristics of both appear to have considerable influence on student achievement and self concept and on student-teacher interpersonal perceptions.

The concern does indeed appear to be a reality. A problem exists and further elaboration is necessary to establish it in clearer perspective.

CHAPTER II

ELEMENTS OF SOLUTION

The elements of finding a solution to the problem appear to lie in the process of examining the variables:

1) interaction, as the basis of learning, 2) achievement, as the result of teacher-student interaction, and 3) self concept and then finding a theoretical position which might in part explain the differential effects of different teacher-student relationships.

This chapter will then have three parts. The first will consider the three variables listed above. The second part will consist of developing a theoretical framework through which basic thesis questions may be answered and the third a summary of the theoretical position.

1. Consideration of the Variables

A. Interaction as the Basis of Learning

In this section attention will be directed to the nature of the interaction process, some results of such processes and the respective roles of the participants in interaction between teacher and student. Emphasis will be placed on the position that interaction can facilitate the fulfillment of a variety of human needs. It will also emerge that in a learning situation the teacher may, to

greater or lesser degree of success, occupy a number of different roles. In these roles the teacher's verbal behaviour is seen as an important modifier of some of the effects of student-teacher interaction.

Most human learning occurs in a social context (Withall & Lewis, 1963). The neonate is in contact with, dependent on, and nurtured by the physician, nurse and mother as soon as it emerges from the uterus. Thereafter most of the individual's knowledge, ideas, feelings, goals, values and ways of behaving are developed in interaction with other persons. "Most of the knowledge any one of us possesses derives from direct or vicarious interaction with our fellows in the psychological and social context of objective reality" (Withall & Lewis, 1963, p. 687).

Before his interaction at school, the child learns through social interaction with his parents, siblings, peers and other people around him the meaning of the world and ways of behaving toward that world. Such meaning is influenced by the specific cultural, socioeconomic, moral and ethical values of significant others in the child's environment.

The process of socializing and acculturating the individual has been institutionalized in our society by setting up schools. Here trained workers deliberately utilize social interaction to bring about changes in the knowledge, skill, and attitudes of the youth put into their charge. (Withall & Lewis, 1963, p. 687)

a) Traditional Roles of Teacher and Student.- The interaction of teacher and student was, for some time, considered as involving the interchange of ideas between the teacher who knew and the learner who did not know. But it soon emerged that classroom learning was intricately related to interchange of feelings as well as ideas. It was also recognized that "the traffic (of ideas and feelings) was not limited to lines running from teacher to learner but extended to channels among all the individuals in the classroom" (Withall & Lewis, 1963, p. 687).

b) Assessment of Effectiveness of Learning.- Withall and Lewis (1963) view most attempts to assess the effectiveness of learning in a classroom setting as falling within one of 3 categories. In some studies emphasis has been placed on teacher characteristics. The assumption in these endeavours has been that the "right combination of personality traits, attitudes and background characteristics on the part of the teacher would enable (him) to provide the right kinds of learning experiences for his pupils" (Withall & Lewis, 1963, p. 685). Often the teacher has been considered as the primary contributor to the learning process. In many other studies the qualities brought to the learning situation by the student have been examined. Careful evaluation of his skills, it has been argued, will facilitate the development of programs appropriate to his stage of development. The third category of

studies designated by Withall and Lewis includes those investigations which examined the outcomes of instruction related to method of presentation. Such studies proceeded on the assumption that the arrangement, timing and sequence of learning experiences would be crucial determinants of student learning. A pervasive shortcoming has been inadequate examination of the interactive classroom process (Withall & Lewis, 1963).

c) Interaction as Need Fulfillment.- Jennings (1947) has characterized group interaction as fulfilling two major human needs. He described these as friendship or psyche needs and task or socio needs, designating the friendship needs as pre-eminent in man's interpersonal relations.

Withall and Lewis (1963) elaborate:

Where individuals have similar interests and socio-emotional needs which they perceive the other can fulfill, they gravitate to each other as they work on the substantive problem and thus sustain and affirm each other's unique, individual worth apart from their role and responsibilities in the task-centered operation (p. 697).

Jensen (1955) also emphasized the close interdependence of personal needs and group needs. He maintained that the possible fulfillment of one kind of need necessarily depended on the satisfaction of the other kind. In order to satisfy personal needs, Jensen argued that group needs would also have to be fulfilled. Effective teacher-student relations were prerequisite to the satisfaction of the

personal needs of the student. This is consistent with the assertion made by Jenkins(1951) that learning is more effective when the emotional needs of the student are met.

Thelen (1950) emphasized the close interdependence of personal needs and group needs. He elaborated on concepts and principles relating to a fuller understanding and better prediction and control of teacher-pupil interaction. He exposed the three concepts of experiencing, interdependence and conflict to examination. They were essential dimensions of any pupil-teacher interaction. Of the three, conflict was the most significant social psychological phenomenon.

d) Emergent Principles Regarding Interaction.- Thelen (1950) further proposed nine principles that related to teaching and learning in a classroom setting. These asserted that learning experiences 1) served to meet the psyche (affective, interpersonal) and socio (achievement) needs of the learner, 2) had potency for the learner to the extent that they helped him meet his needs, 3) dealt with the basic problem of learning and experimental method, 4) when structured and planned, provided goals and limits for the learner, 5) were highly susceptible to anxiety pressures arising from interpersonal conflict, 6) were only a fraction of the total life experiences of the learner, 7) could provide reinforcement to the culturally approved sides of student ambivalence, 8) could best be guided through an assessment of group affect

and group problems, and 9) would be most effective when governed by the principle of least group size.

e) Importance of Teacher Empathy.- Thelen (1950) has emphasized that it is of great importance to try to understand the idiosyncratic frame of reference of each student. Such understanding is only effective if it emerges in the context of the values and pressures exerted by the class on each of its members. Thus teacher understanding demanded ability to empathize with the student. Wright, Barker, Nall and Schoggen (1951) refer to a similar process of identifying individual psychological habitats.

f) Interaction Roles of the Teacher.- Thelen's analysis (1950), projected in part in his nine principles which described the learning experience, suggested very complex interaction factors. The classroom process was conceived as a dynamic interaction of teacher, student content and environment.

Trow (1960) has distinguished a classroom environment as a group climate. The group members have genuine interaction with one another. They are not just a collection of people. Hence he too describes the teacher-student environment as one of dynamic interaction. He sees the teacher in four roles: as controller, instructor, democratic strategist and therapist.

g) Influence on Interaction of Teacher's Verbal Behaviour.- Withall (1949) considered that the social

emotional climate of a classroom was determined primarily by the teacher's verbal behaviour. His Climate Index instrument was devised to categorize and quantify that verbal behaviour. Analysis was undertaken of the teacher's statements within the context of students' questions, responses and statements. The emotional tone implicit in each teacher verbalization was assessed. Withall subsequently consolidated the total range of teacher statements into seven categories. These encompassed statements or questions which: commended or approved the learner (learner-supportive); conveyed understanding or acceptance of the learner (clarifying or acceptant); gave information to or asked questions of fact vis a vis the learner (problem structuring); comprised chit chat and routine administrative items (neutral); limited or controlled the learner's behaviour (directive); deprecated or disapproved (disapproving or reproving); defended or supported the teacher (teacher supportive). The first three categories are learner supportive. The latter three are teacher supportive.

It can be anticipated that the effects of student-teacher interaction in which the teacher's verbalizings fall extensively within the first three categories might well be different from the effects of interaction in which the teacher's statements and questions are mainly characterized as teacher-supportive.

Summary.- Most learning occurs in a social context and therefore through interaction whether socially or through formal instruction. Genuine interaction involves not only ideas, principles and facts directed by the teacher and reacted to by students but also a reciprocal process initiated by the students. Effectiveness of student-teacher interaction has been assessed by examining teacher characteristics, student characteristics and methods of instruction. Group interaction was considered as fulfilling human needs. When people have similar interests and needs which they perceive the other can fulfill, they tend to "gravitate to each other". Personal needs and group needs are closely interrelated. In any teacher-pupil interaction, experiencing, interdependence and conflict are important dimensions. Students react differentially on these dimensions and an important teacher task is that of developing sensitivity to the student's idiosyncratic frame of reference. The teacher was seen as controller, instructor, democratic strategist, and therapist. His verbal behaviour was recognized as an important moderator of the effects of student-teacher interaction.

B. Achievement in Mathematics and Reading
as the Result of Student-Teacher Interaction

Students in school today are exposed to a wide ranging curriculum. Particularly in sound informal programs even primary children are exposed to content and concept that more traditional schools of a few years ago would not have considered suitable subject matter for junior students. The fact remains, however, that though social and emotional growth may now be a greater part of more progressive education, student competence in mathematics and reading must still be considered as the primary goal of the school and the task it is best equipped to pursue. Achievement then, for the purposes of this paper, will be considered as achievement in mathematics and achievement in reading comprehension.

a) Student Achievement in Reading.- In this section of the review of the literature, attention will first be directed toward observation of the reading tasks and the respective roles of teacher and student in fulfilling these tasks. Initially traditional classroom practice will be examined, and purposes established for the reading act. The nature of the reading comprehension task will be established and related to student responses. The teacher's role will be assayed.

Traditional Classroom Practice.- Gray (1960) estimated that some 4,000 studies of the sociology, psychology and teaching of reading were available.

Many more have accumulated in the literature since that time. Nevertheless, Russell and Fea (1963) state that the practices of a successful teacher of reading in the primary grades are sometimes the result of historical influences rather than of specific research studies.

Skillful teachers and textbook writers have developed materials and methods which have greatly influenced reading instruction usually without making any careful study of either the material or method in the sense of rigorous experimental testing (p. 866).

Teachers often proceed on the precedent of their own successful practice and that of their predecessors. It is obviously advantageous to combine this process with the results of carefully executed research.

Purposes of the Reading Act.- Comprehension of the ideas expressed in a passage is often the purpose of a reading act. The purpose determines in large measure the specific reading techniques which the student must employ.

The child who reads carefully for detailed recall is not necessarily the child who reads best for the main idea of a passage and the child who recognizes clearly the sequence in a chapter in a history textbook is not necessarily the one who masters his facts in a chapter on science. (Russell & Fea, 1963, p. 899)

Nature of the Reading Comprehension Task.- Reading is not a unitary skill and there is evidence that the poor reader enters the reading task, irrespective of purpose, in an inflexible way. The good reader adapts his method to the purpose on hand (Shores & Husbands, 1950).

Bell (1942) considers that reading comprehension questions lie within one of five categories. These are:

- 1) Questions of direct reference whose answers can be found in the text in the same words.
- 2) Questions of indirect reference whose answers can be found in the text in slightly different words.
- 3) Questions demanding easy inferences that are not stated in the text but can be inferred from it.
- 4) Questions involving comprehension of qualifying phrases such as largely, only, alone.
- 5) Questions demanding difficult inferences with emphasis on ideas rather than words.

The Task Related to Student Responses.- Such a delineation indicates that some pupils may well find some questions more difficult than others and will therefore require more teacher guidance and direction. McNaughton (1960) analyzed the written responses of seventh grade students to comprehension questions. He described their responses as either: 1) copied facts, or 2) qualified facts, or 3) concrete concepts, or 4) abstract concepts, or 5) generalizations. The kind of question asked was an important determinant of the level of children's responses. Smith (1952) showed that specialized reading skills can be improved with direct instruction and teacher intervention.

Role of the Teacher.- The role of the capable teacher is to assist the child to recognize various purposes and then to provide a variety of opportunities for the student

to develop skills pursuant to a purpose (Russell & Fea, 1963). The process has to be one of careful direction, supervision and evaluation in order to establish entry capabilities in any reading task and to recognize increments of progress. With progress monitored the student can be exposed to materials of increasing complexity and with more demanding purpose.

Summary.- There are many references in the literature which examine the nature of the teaching-learning process as it relates to reading. The purpose in a reading comprehension task determines in large measure what technique should be used but the poor reader finds difficulty in recognizing the different purposes and in adapting his technique to best fit the purpose. The teacher's role is one in which the child is given assistance to recognize purpose and opportunities to develop specific skills which are found to be weak. Careful supervision to recognize progress and plan new, more difficult learning experiences is necessary. Reading comprehension requires specific types of skills and children may be weak in one area but strong in another.

b) Student Achievement in Mathematics.- Some basic trends in mathematics instruction are now identified. The

components of mathematics tasks are examined and related to the skills required by the student. Both the tasks and the skills are further related to five levels of student behaviour. Recent innovations in mathematics instruction are considered.

Traditional Teacher Approach.- Henderson (1963) identifies three trends pervasive in the theory of mathematics instruction. The tendency to use mathematical constructs as an organizational basis has been enduring. Teachers have adhered to the belief in the efficacy of a methodological sequence. Traditionally the teacher has, by means of introduction, begun his overtures by reference to concrete objects or ideas which the student understands. The student has then been guided in activity and thought to discover relations, principles and procedures. This sequence stands in contrast to a teacher statement of relations, principles and procedures. Rote drill has been assessed as having value only after meaning and understanding have been established. There has been a consistent recognition of the desirability of choosing subject matter relative to the ability of the students to be taught.

Components of a Learning Situation in Mathematics.- Mathematics teaching and learning are tasks with many components. The teacher is concerned with establishing cognitive skills of computation, comprehension, application, and analysis; the student with acquisition of these skills

(Wilson, 1971). Computation represents the least complex behaviour requiring no decision making or complex memory. It includes knowledge of specific facts, knowledge of terminology and ability to carry out algorithms. Comprehension is more complex. It involves knowledge of concepts, principles, rules, generalizations, and mathematical structure and an ability to follow a line of reasoning. The application level requires a sequence of responses from the student. It subsumes ability to solve routine problems, to make comparisons, to analyze data and to recognize patterns. The highest and most complex level of mathematics behaviour, analysis, includes ability to solve nonroutine problems, to discover relationships and to form generalizations.

There are, therefore, as in most learning situations, three basic components. These are the teacher, the set of knowledge, beliefs or skills, and the student. More specifically it is what the teacher does which makes greatest impact: it is the behaviour of the student which is more important. One aspect of teacher behaviour can be considered as method which may maximize certain factors and diminish others. A teacher who discourages questions may reduce the time required to cover a topic but he may also increase frustration and minimize understanding in his students (Henderson, 1963).

Levels of Behaviour Which Describe the Student's Responses.- Complementary to the four required skills which Wilson(1971) has identified, Wood (1968) presents five levels of behaviour as descriptive of the tasks confronting the student in mathematics. These are: 1) Recall of notations and concepts related to knowledge and information; 2) computation: manipulation of symbols related to techniques and skills; 3) comprehension: developing a capacity to understand problems, to translate symbolic forms, to follow and extend reasoning; 4) application: of appropriate concepts in unfamiliar mathematical situations; 5) inventiveness: reasoning creativity in mathematics.

Summary.- The learning of mathematics requires specific skills often involving complex operations. At the least sophisticated level it involves knowledge of facts and terminology. As the complexity of operations increases the student must acquire knowledge of concepts, principles, rules and generalizations and an ability to follow a line of reasoning. In even more complex operations, the student must learn how to make comparisons, recognize patterns and solve routine problems. Further complexity demands ability to solve nonroutine problems and to discover relationships.

Different teachers use different methods of instruction and as a result their own behaviour varies. So too does the behaviour of their students in differential response. Though there are many different methods employed in teaching mathematics, certain trends have been recognized as pervasive, one of which is the tendency to adhere to a particular methodological sequence.

C. Self Concept

In this section of the paper the concept of self receives elaboration. Purkey's synthetic position is recognized. His concern with the stability of the self concept over time will be linked to ways in which the self concept can change. The relationship he sees between self concept and academic achievement will be briefly examined.

a) Purkey's Peripheral and Central Beliefs.- Purkey (1970) derives from the literature a composite definition of self. It is "a complex and dynamic system of beliefs which an individual holds true about himself, each belief with a corresponding value (p. 7). Purkey invokes dynamism and organization as integral characteristics. Within this organization he also holds that certain beliefs are closer to the essence of self while others are more peripheral. "Things are significant or insignificant, important or

unimportant, attractive or unattractive, valuable or worthless in terms of their relationship to oneself." (p. 10) The more peripheral the beliefs the less stable they are. When the central beliefs do undergo change, then there is likely to be a parallel change in a wide range of other quite unassociated beliefs, some peripheral, some stable. If a student considered academic success as important then to suffer academic failure would lower one's self evaluation not only in the academic area but in other apparently unrelated areas. The student then might consider himself less successful socially or less capable in sports. It is in the striving for maintenance, protection and enhancement of the perceived phenomenological self, that stable beliefs can be changed (Purkey, 1970).

b) Conditions that may Promote Change in Student Self Concept.- Purkey (1970) has considered the theory of self concept formation, its stability and the motivation which causes maintenance and enhancement of the self view. He projects these considerations into an educational setting of teacher and learner and establishes a very tenable perspective when he concludes

the self will change if conditions are favourable. If the child sees the educative process as meaningful and self enhancing and if the degree of threat provided by the school experience is not overpowering, then he is likely to grow in self esteem and in academic achievement. (p. 12)

c) Relation of a Positive Self Concept to Academic Achievement.- Purkey (1970) therefore relates the development of a positive self concept to academic achievement.

Academic success or failure appears to be as deeply rooted in concepts of the self as it is in measured mental ability ... successful students can generally be characterized as having positive self concepts and a tendency to excel in feelings of worth as individuals. (p. 20)

He warns against misinterpreting the persistent relationship between the self concept and academic achievement. Rather than assuming that the self concept determines academic achievement or that academic achievement moulds a self concept, Purkey advises that

the best evidence now available suggests that it is a two way street; that there is continuous interaction between the self and academic achievement and that each directly influences the other. (p. 53)

In review, Purkey provides a composite definition of self and indicates that within the organization of self certain beliefs are more central and others more peripheral. Change in the more peripheral beliefs is easier than change in the central beliefs. In an educational setting a student's self concept may become more positive if the educational process is meaningful to him and the degree of threat posed by the learning experience is minimal. Purkey sees continuous interaction between the

self concept and academic achievement at school; each directly influences the other.

D. Summary and Conclusions

From this brief review of the literature it can be recognized that interaction between teacher and student is a pervasive, complex process potentially influenced by a wide range of factors.

It is not adequate to consider the respective roles of teachers and students and the nature of the subject material to be learned as the basis for analysis of what occurs in a classroom. It is also necessary, though difficult, to follow the proposal that it is in the interaction of classroom variables that explanation may be found for role relationships which are established.

The teacher may indeed be controller, democratic strategist, instructor, and therapist. His verbal behaviour, a significant moderator of interaction results, may be learner supportive or self supportive, but it appears that in whatever role he plays, a significant contribution to the student is in meeting his needs. These needs may take a variety of forms depending on the student's entry preparation and capability for a specific academic task.

The tasks either in reading or in mathematics can be seen to have inherent structure, mastery of which demands the understanding of concepts of increasing sophistication. While the roles of the teacher and student during task performance might not be seen as consistently in interaction, such is indeed the case. When teacher-student verbal interaction may cease after an explanation, for example, the influence of the respective roles endures. In such a close relationship the quality of the interaction will influence how the student feels about his abilities, his attainments, his difficulties, and his worth as a student and as a person. This quality will also influence his views of his teacher and how he feels the teacher views him.

If the child does have central and peripheral beliefs which he "holds true about himself", and if they originate as positive, they will continue as positive if he can see progress in the tasks of the academic environment. The child's experiences are important or unimportant, valuable or worthless in their relationship to him. When the educational process in the classroom is meaningful and self enhancing for the student, he will develop and maintain self esteem and he will enjoy academic progress.

Unfortunately many enduring student-teacher

interactions leave the student without self esteem and with limited achievement.

Is it possible that when some students in a public school are placed in the classroom of a teacher in September, their resultant lack of success, negative self concept, and negative teacher perception could in fact be predicted on the basis of the assessment of personality variables of teacher and student?

2. Theoretical Framework

Introduction

A number of theoretical positions were assessed in the search for tenable explanation. The theory of human development (Witkin, Dyk, Faterson, Goodenough & Karp, 1962) based on the genetic principle of self-nonselldifferentiation was most favourably considered as providing a basis for explaining the situation described initially where a student in difficulty academically and behaviourally with one teacher was found to improve in these areas when placed in the classroom of another.

The choice of the position adopted by Witkin and his associates emerged because the theory is still the subject of very active investigation. It has a limited number of

definitions, assumptions and general propositions consistent with careful observations and verification of its deduced hypothesis is possible using scientific methods. Reliable and valid instruments for measuring the construct discussed are also readily available.

In reviewing the contributions of research studies on differentiation, initially section A will be an overview of the position of Witkin and his co-workers. It will be followed by an examination of two research studies conducted by the Witkin research group in which the degree of differentiation of both subjects in the interacting dyad was known. Witkin's own statements regarding the affects that matching teacher and student in degree of differentiation would have will be presented.

His deliberations will then be projected into an educational setting through a study by DiStefano (1969). Another variable in the student-teacher interaction, method of instruction, will be related to degree of differentiation and the section will conclude with a review of a study by Cleare (1966) in which achievement of students is related to matched student-teacher cognitive ability patterns.

Section C of the Theoretical Framework will relate degree of differentiation to student achievement in mathematics, achievement in reading, and self concept.

A. Overview of Witkin's Theory of Human Development

a) Differentiation.- Witkin and his associates have pursued the theory that human development emerges in terms of increasing differentiation of self and nonself. Differentiation refers to the complexity of the structure of a psychological system. Though not defined by Witkin et al. this can be considered as the co-ordinated set of characteristics that describe individual conscious life and behaviour.

Degree of differentiation is an important characteristic of structure of any system whether psychological, biological or social A less differentiated system is in a relatively homogeneous structural state; a more differentiated system in a relatively heterogeneous state. The emphasis on relative is important for even the most rudimentary system is to some degree differentiated. (Witkin et al., 1962, p. 9)

It is assumed that at birth, differentiation of the self from the environment is at a primitive level. With increasing differentiation of self and nonself the individual becomes more reliant on internal frames of reference. These have been established through the process of interacting with other people and the consequent internalization of particular selected content values and standards.

It is reasonable to presume that very early in development a child experiences himself and his environment mainly as a more or less continuous amorphous mass ... the segregation of self from the field is at best very limited. One of the early developments in the crystallization of experience is the growing awareness of a difference between inner and outer within the original body field matrix. Boundaries between the body, the early representation of self and the outer world are

formed and contrive to become stronger during the course of development. The developing sense of self is rooted in but obviously not limited to sensations generated by body functions ... Various other kinds of experiences (as emotions, ideas, memories) come to be perceived as emanating from within and are distinguished from experiences which have their source out there. The registration of activities and attributes which the child experiences as belonging to him do not remain discrete bits ... but early form a complex invested with special feelings and experienced as a bounded inner core. (Witkin et al., 1962, p. 12)

b) Development of Differentiation Over Time.- Witkin et al. refer to the body as the early representation of self. With development, the self parameters expand but the enduring reference made to self prescribes the meaning "the systematized awareness the person has of activities and qualities he identifies as his own" (Witkin et al., 1962, p. 12). Any psychological system is in continuous commerce with its environment. Increasing differentiation facilitates clear separation of what is identified as belonging to the self and what is identified as external to the self. This separation makes possible greater determination of functioning from within. A very significant aspect of the early development of differentiation is the child's "movement away from the initial inevitable state of unity with the mother towards some degree of separation" (Witkin et al., 1962, p. 12). This movement is an integral part of the process of development of a sense of separate identity.

While the development of a sense of separate identity involves the establishment of a bounded inner core of experience, it also connotes the segregation of this inner core from the environment or field. Increasingly, the field becomes more structured too.

Early in development perception of parts of the field is likely to be dominated by the organization of the immediate context in which the parts are contained. During the course of development the influence of the immediate context is reduced. (Witkin et al., 1962, p. 13)

Greater inner articulation is associated with greater articulation of experience of the world. "Experience which has the field outside the person as its source may also be conceived as showing development toward greater articulation." (Witkin et al., 1962, p. 13) When experience is described as articulated, the authors refer to the extent of structure imposed upon it. Structuring implies organization. Articulation also connotes the degree of analysis to which experience is exposed. Articulated experience, implying analysis and structure, stands in contrast to a global experience which is minimally analyzed and structured (Witkin et al., 1962, p. 13).

c) Individual Differences in Degree of Differentiation.-

Any psychological system is endowed with a given potential and, in the context of differentiation, the potential is fulfilled in varying degrees, differentiation being ordered

from rudimentary to complex in structure. The higher the degree of differentiation, the richer and more diversified are the resources for coping with the environment. People differ in the degree of differentiation attained. It distorts understanding to assume that there are within any population only two types of people; those whose psychological systems have reached high levels of differentiation and those whose systems are relatively poorly differentiated. The reality is that in terms of these two factors, most people lie on a continuum between the two described extremes (Witkin et al., 1962, p. 21).

d) Sex Differences and Stability of Differentiation Over Time.- The sex difference in degree of differentiation is observable at as early an age as eight years (Witkin et al., 1962, p. 215). Compared to the total range of individual differences in degree of differentiation, the amount that men tend to be more differentiated than women is quite small (Witkin et al., 1962, p. 218). For both sexes there is a relative stability of differentiation over time insofar as they tend to maintain their relative position in a group context (Witkin et al., 1962, p. 31).

e) Indicators of Degree of Differentiation and Their Implications.- After about the age of seven or 8 years, it is possible to refer "to some of the salient ways in which achievement of a differentiated state may be manifested in

various areas of functioning". These "salient ways" Witkin calls "indicators" of differentiation (Witkin et al., 1962, p. 15, 27). They are really dimensions of personality for which degree of differentiation is assessed. Since progress toward differentiation is expressed by increasing articulation of experience the indicators refer to degree of differentiation on the basis of articulation of experience in three areas: articulation of experience of the world; articulation of experience of self as reflected in a clearly defined body concept and a developed sense of separate identity; articulation of specialized, structured controls and defences.

The authors elaborate

It is difficult to imagine rapid progress in the development of an articulated way of experiencing the world without accompanying development of self-differentiation. The achievement of a segregated, structured self provides internal frames of reference for viewing, interpreting and dealing with the world from the position of an autonomous agency, enjoying an existence apart from the field, rather than fused with it. This in turn is likely to aid in the development of an articulated way of experiencing the world. At the same time a tendency for experience of the field to be articulated as it registers from moment to moment is likely to contribute to articulation of experience of the self...the establishment of internal standards provides an important basis for regulation of impulse and direction of activity. Conversely, development of a means for channelling impulse is apt to aid in the development of articulation of experience. (Witkin et al., 1962, p. 17)

Progress toward differentiation will be apparent in each of the indicator areas and measures of differentiation in the indicator areas will be significantly interrelated.

f) Witkin's Measures of Degree of Differentiation.-

The origin of Witkin's investigation of the nature of differentiation was his early discovery that people differ in the way in which they orient themselves in space (Witkin et al., 1962, p. 41). In a series of studies, Witkin and his associates demonstrated that a person's ability to estimate verticality in space was related to his dependence on the visual field. A number of tests was devised to measure the nature of this dependence. The Body Adjustment Test (BAT) evaluates a subject's ability to estimate body verticality. The Rod and Frame Test (RFT) is a measure of the subject's ability to align a rod to verticality given the perspective of a surrounding tilted frame. The Embedded Figures Test (EFT) involves the subject's ability to disembed from a complex geometric figure, a more simple figure. This skill is closely related to the ability to estimate verticality. Combined scores on these tests give a measure of a person's perceptual dependence on the field in decision making, referred to as "a perceptual index" (Witkin et al., 1962, p. 70). A Sophistication-of-Body Concept Scale has also been devised based on the degree of primitivity or sophistication of human figure drawings. The rating criteria are based on directly observable characteristics of the figures and not on projective interpretations (Witkin et al., 1962, p. 119).

g) Statement Regarding the Utilization of Terms Referring to the Construct of Differentiation.- To this point, consistent reference has been made to differentiation as the developmental concept under examination. Witkin and his associates conceive of differentiation as a construct for "conceptualizing communality in behavior in several areas of psychological functioning" (Witkin et al., 1962, p. 16). This is his most recent elaboration of the results of many studies over a period of twenty years. Differentiation implies the separation and articulation of self and nonself, as a basic mode of human development. Early studies, identifying an ability to overcome embeddedness referred to field dependence and independence and not to differentiation. A field dependent person found difficulty in overcoming the effects of the embeddedness. He was dependent for his decision on the more immediate field. A field independent person more easily overcame the effects of the immediate field and his decisions were thus more field independent (Witkin et al., 1962, p. 35-58).

When Witkin and his co-workers discovered that individual differences which had emerged at a perceptual level had their counterpart in intellectual functioning, he deployed a more comprehensive term global vs analytical field approach to refer to these differences. The term global is used to describe "the style of functioning that

involves submission to the dominant organization of the field and the tendency to experience items as fused with their background" (Witkin et al., 1962, p. 80). The term analytical describes functioning at both a perceptual and intellectual level and involves "the ready ability to overcome an embedding context and to experience items as discrete from the field in which they are contained" (Witkin et al., 1962, p. 80).

Field dependence-independence is then considered as the perceptual component of this more general cognitive style on the global analytical continuum.

Field dependence-independence scores are still Witkin's anchor measures for the degree of differentiation.

For the remaining sections of the paper the terms field dependent, field independent, dependent mode of field approach (MFA), independent mode of field approach, global or global field approach, analytical or analytical field approach will be quoted as used by a variety of authors as referents to degree of differentiation. The researcher will use the term degree of differentiation or more simply differentiation in complex references.

h) Differentiation, Analytical Function and Intelligence.- Many references are found in the literature which relate measures of differentiation to total standard intelligence test scores (Miller, 1953; Bell, 1955; Bound,

1957). Woerner and Levine (cited in Witkin et al., 1962, p. 59) found significant relations between scores on a perceptual battery of tests (including RFT, EFT, and BAT) and scores on the Wechsler Intelligence Scale for Children (WISC). Witkin, Lewis, Hertzman, Machover, Meissner and Wapner (1954) had speculated that individual differences discovered in perceptual tasks might have their counterparts in intellectual functioning.

It is likely ... that if a person has (the) basic ability to break up a configuration (perceptually) it will be manifested ... in problem-solving situations as well. (Witkin et al., 1954, p. 477)

Further pursuits were given direction by the discovery of Woerner and Levine that the perceptual measures were more highly related to WISC performance scores than to WISC verbal scores. Replication studies carried out by Witkin and his associates confirmed these findings (Witkin et al., 1962, p. 60). There was clearly a high relation between perceptual scores and WISC performance subscores. The performance subtests required an analytical ability as in the Block Design subtest. It was then suspected that the relation between performance and perceptual measures might lie in the common analytical ability required in both (Witkin et al., 1962, p. 61).

The Witkin group then conducted a factor analysis of the matrix of intercorrelations among WISC subtests and the RFT, EFT, BAT and RAT (Room Adjustment Test) perceptual tests

for a group of ten year old boys (Witkin et al., 1962, p. 61-65) with three major factors emerging. The first factor was named Analytical Field Approach. The Block Design, Picture Completion and Object Assembly WISC subtests were heavily loaded on this factor. The RFT, EFT, and BAT perceptual tests had their highest loadings on this factor too. A second factor was called Verbal Comprehension. It was best defined by the WISC Vocabulary Comprehension and Information subtests. The RAT series 1A was heavily loaded on this factor. The third factor given the label Attention-concentration was best defined by the Digit Span and Arithmetic subtests of the WISC. Though it was expected that EFT would have a high loading on this factor since it seemed to require an attention-concentration factor, such was not the case. No perceptual test of differentiation was heavily loaded on this factor. The subsequent conclusion was that

the relation between extent of field dependence and full-scale IQ scores is "carried" specifically by portions of intelligence tests which, like the perceptual tests themselves, involve the capacity for analytical functioning. (Witkin et al., 1962, p. 70)

Significantly it was not the verbal factor that "carried" the relationship. The analytical field approach in intellectual activities was best represented by the Picture Completion, Block Design and Object Assembly subtests of the WISC. The weighted scores for these three tests were henceforth summed to give an intellectual index parallel to

the weighted scores on EFT, RFT, and BAT which gave a perceptual index (Witkin et al., 1962, p. 70).

i) Styles of Life.- The characteristics of field dependent, global subjects with a relatively low degree of differentiation and in contrast those of field independent analytic subjects with a relatively high degree of differentiation are so pervasive as to constitute a style of life (Witkin et al., 1962, p. 4).

In extensive literature Witkin and his associates elaborate on the nature of these styles of life. In Appendix 1 the range of some of these differences is summarized. The information presented represents both Witkin's personal observations and reports by Witkin et al. of the work of others¹.

It can readily be observed that persons who have a high degree of differentiation differ in many ways from persons who have a low degree of differentiation which would be evident in interpersonal encounters. The subject with a low degree of differentiation on a sociability dimension, for example, is more gregarious, affectionate, dependable, and considerate than the person with a high degree of differentiation. A person high in degree of differentiation is in turn more active, self-confident and self-assured, less conforming and less dependent on others

¹ Modified from DiStefano, 1969.

for direction and support. The question arises; does a person's degree of differentiation expressed as a pervasive "style" effect his perception of others?

B. Pertinent Findings Based on the Theory

a) Witkin's References to Interpersonal Perceptions as Possible Answers to the Question.- In the literature which is addressed to an examination of the possible sources of contrasting psychological patterns, particularly as they relate to the effects of children's relations with their mothers, can be found reference to interpersonal perceptions when the degree of differentiation of each member of the interacting dyad is known (Witkin et al., 1962, p. 297-313).

In an attempt to relate level of child differentiation to level of maternal differentiation, the personal attributes of self-realization and self-assurance were used to categorize mothers as fostering differentiation or inhibiting differentiation in their child relations. Thus mothers considered as fostering differentiation (IFD mothers - interaction fostering differentiation) exhibited certain clearly observable higher levels of self-assurance and self-realization. Mothers considered as inhibiting differentiation (IID mothers - interaction inhibiting differentiation) were evidently much less self-assured and realized.

In order to establish an assessment of the mother as IID or IFD, two-hour interviews were conducted with them during which time the interviewer was endeavouring to establish both a cross-sectional view, oriented toward present disposition, and a retrospective position reflecting the ontogeny of the present disposition. The specific task, though not circumscribed by inflexible standardization of questioning procedure, was to gather information in each of six areas: Physical care; Child's social relationships and activities; Child's past and current adaptation to school; Discipline; Mother's attitudes toward child; and Family members.

The analysis of interview records was guided by the hypothesis that one source of difference in extent of differentiation among children would be the kind of relations they had with their mothers. (Witkin et al., 1962, p. 278)

The nature of the mother's interaction with her child and her personal characteristics were expected to relate to the level of child differentiation. This expectation was based on the premise that interaction would to a greater or lesser degree facilitate control over impulses and separation, impelling the development of a self identity and greater articulation of self and of the world.

Several "indicators" were recognized as significant denotation of whether or not mothers fostered or hindered differentiation in their children, for example: mother limits

curiosity, stresses conformity (indicator nine); physical care of child seems inappropriate to age (indicator seven) (Witkin et al., 1962, pp. 279-281).

Thus mothers were signified as promoting or inhibiting differentiation. When the ratings of these mothers were compared to the perceptual index scores of their children, it was discovered that the mothers of children with a low degree of differentiation had interactions with their children which tended to inhibit differentiation. Those mothers of children with a high degree of differentiation had interactions with their children fostering differentiation.

Rearing procedures which prevent the assumption of responsibility, which do not clarify standards of behaviour, which stress conformity, which are alternatively submissive and severe, which interfere with the child's developing ability to separate from the parent, and which are indicative of inappropriate age-care behaviour, primarily related to field dependence and concomitant limited differentiation for both mother and child. These characteristics rendered relative sterility to possible differentiation specialization, articulation of self-world separateness and acquisition of impulse control and defences. Rearing procedures which enhanced elaboration of these six categories of behaviour above related to field independence of mother and child and facilitated differentiation (Witkin et al., 1962, pp. 301-312).

As a complementary extension of investigations of mother-child relations, Witkin and his associates examined children's views of parents which were derived from projective tests and personal interviews. It was anticipated that less differentiated children would tend to produce stories and interview content which would portray nonsupportive parents. Children whose mothers were rated as IFD were expected to produce stories and interview content portraying essentially supportive parents (Witkin et al., 1962, p. 325). Both interviews and the results of Thematic Apperception Tests (TAT) rendered evidence which pertained to a second dimension of parental relations, that of child-father roles.

In TAT results, parent-child themes were quite frequent; thirty-eight children produced 435 stories of which 135 included parental figures. Half of the stories involving parents referred to the mother alone; twenty-one percent involved the mother along with the father.

As indication of support or non-support, eight categories were used in the classification of the stories. The four non-supportive categories were: the parent is coercive toward the child; the parent has a negative feeling toward the child; the parent renders non-physical punishment to the child; the parent administers physical punishment or kills or injures the child. The four supportive categories were: the parent gives guidance or direction to the child;

the parent's attitude and behaviour toward the child are helpful; the parent loves or likes the child, approves of the child and is proud of him; the parent is characterized as unsupportive but the child is specifically described as being improved thereby (Witkin et al., 1962, pp. 327-330).

A story representing a supportive category was assigned a weight of -1; one representing a non-supportive category was assessed as +1. In a complex story indicative of a variety of parental characteristics, if negative categories predominated over positive categories, a unit positive rating was given. Conversely, positive categories predominating over negative categories acquired a unit negative rating. Each child's projections received three scores: mother stories scores, father stories scores, and combined mother-father stories scores inclusive also of those stories in which mother and father had been treated as one category representing "parents" (Witkin et al., 1962, p. 330).

The correlation of children's perceptual index scores with measures of TAT projected parental role was .63 ($P < .01$). For mothers the correlation was .64 ($P < .01$). For fathers there was a non-significant .35 correlation. Thus it would appear that children with an independent MFA portray parents as supportive. Those with a more dependent MFA see parents as less supportive. Relations between parental ratings obtained from the interviews and perceptual index scores of

the children were in the expected direction but not significant (Witkin et al., 1962, p. 331).

In subsequent validation studies, Witkin and his associates found with another group of ten year old children a significant correlation between their perceptual index scores and ratings of father stories but not ratings of mother stories. With a group of fourteen year olds, there was not a significant correlation between their father stories and perceptual index scores. Correlation between mother stories and perceptual index scores was significant, .69 ($P < .01$) (Witkin et al., 1962, p. 332).

Emerging from these studies are two very significant notations. Adults can influence the development of self-nonselself-differentiation in children with whom they have enduring relationships. Children who have enduring relationships with adults view those adults differentially on the basis of whether or not the adults inhibit or foster their development of differentiation. The adults in the studies had very special physical and cultural relations with the children. They were the children's parents. It is also clear that no firm conclusion can be reached regarding the nature of the child's perceptions of his parents considered separately as father and mother. There is, however, more evidence of a tendency for the dependent child to view the dependent mother as unsupportive and for the independent child

to view the independent mother as supportive. It must be recognized that the children involved in all of these mother-child investigations were males and that no highly independent child studied had a mother who was judged as highly dependent; neither were there highly dependent children who had highly independent mothers.

Witkin discusses another study in which the degree of differentiation of both members of the dyad is known.

b) Witkin's Patient Therapist Study - Evidence of Differential Effects in Interaction.- Witkin, Lewis and Weil (1968) conducted another study in which the mode of field approaches of patients and therapists were matched and mismatched. For matching, independent patients had independent therapists; dependent patients had dependent therapists. For dependent patients with dependent therapists there were greater patient-therapist exchanges per unit time. For independent patients with independent therapists there were greater time intervals between therapist and patient comments. Field independent therapists intervened less often and both types of therapists had more interaction with dependent patients than with independent patients. There was, therefore, more interaction with dependent patients irrespective of the mode of field approach of the therapist. The mode of field approach of the patient in this situation appears to be more

important than the mode of field approach of the therapist in determining the total amount of interaction. This effect is not unexpected if it is considered that the therapist role was predominantly a listening one and the patient's role was one of verbalizing. The dependent patient, more gregarious, sociable and person oriented, would be expected to initiate verbal behaviour. Verbal expressiveness is linked by Witkin to field dependence. There is a second important aspect of the results. It is that two independent people appeared to have less interaction than two dependent people (Witkin et al., 1968).

In a recent paper Witkin (1972) directly addressed the topic of some of the possible effects of matching mode of field approaches of students and teachers.

c) Witkin's Comments Regarding the Effects of Matching Degrees of Differentiation of Teacher and Student.- His position was theoretically argued but without derived empirical support. He saw persons matched in cognitive style as "getting along better together". This hypothesis was based on a threefold reasoning. If their mode of field approaches were matched people would get along better because they would share a common focus of interest. It will be recalled for example that field independent persons tended to be more interested in intellectual, philosophical pursuits. Field dependent persons tended to be more concerned with social and interpersonal problems. Witkin contrasts the

social sensitivity and personal interests of field dependent and field independent people:

 Their shared tendency to attend selectively to the social content of the environment is likely to help two people of this kind to get along better when they interact ... when two field-independent persons interact their shared interest in the more impersonal, abstract aspect of their surround should again make for a positive outcome in feelings toward each other.
(Witkin, 1972, p. 37)

With similar degrees of differentiation people would also tend to get along better because they would have some common personal characteristics. Field dependent people, for example, tended to be more gregarious, affectionate, dependable, to be more socially approachable and to show more need for contact with and interest in people. Field independent people tended to be more socially remote and aloof. When the mode of field approaches were matched, people would communicate better because their communication modes would be similar. Witkin cites the studies of Jennings (1967) and Shows (1967) in support of this contention. Jennings found that field independent people used different word categories than field dependent persons. Field dependent persons made fewer references to themselves in their speech. Field independent persons made fewer references to the external field particularly to other persons. Shows was concerned with the ability of subjects to interpret messages descriptive of a series of pictures when the messages had been composed by

persons whose degrees of differentiation were similar to that of the experimental subjects. Matching of descriptive messages and the pictures they purported to describe was significantly better for those subjects who received messages from senders of similar cognitive style. Witkin comments:

If when nominally discussing the same topic, two people are in effect talking about different things, in other words not "speaking the same language," it is not likely that they will get along very well. (Witkin, 1972, p. 40)

It will be recalled that the three basic components of any teacher-learner interaction were the characteristics of teacher and student and the method of instruction. Witkin relates these dimensions to degree of differentiation (which he calls cognitive style--a reference to the global analytic dimension)

It is easy to see how a teacher's cognitive style may influence his or her way of teaching; how a student's cognitive style may influence his or her way of learning; and how a match or mismatch in cognitive style between teacher and student may determine how well they get along, with important consequences for the learning process. (Witkin, 1972, p. 25)

The statement, as already determined, is based on theoretical reasoning. It projects the possible interaction effects between two people matched in degree of differentiation into an educational setting. Important consequences for the learning process are predicted.

To some extent Witkin's proposal is influenced by the results of DiStefano's study (1969) which was concerned

with the nature of interpersonal perceptions between members of a dyad matched in cognitive style. Within the Witkin literature there are only two basic references to some of the possible effects that matching of the degree of differentiation of two interacting people would have. The first as elaborated involves the interpersonal perceptions of mother and child (Witkin et al., 1962). From this reference the conclusion was that there are more positive interpersonal perceptions between field independent mothers and children and less positive interpersonal perceptions between field dependent mothers and children. Thus in one situation, when children and parents are matched in degree of differentiation, interpersonal advantage seems to be derived. In the other matched situation, dependent mother with dependent child, no interpersonal advantage seems to occur.

From the second reference (Witkin et al., 1968), that involving the study of patients and therapists matched and mismatched in mode of field approach, two conclusions are drawn: the extent of interaction (i.e. the number of verbal exchanges) differs when independent subjects are matched and when dependent subjects are matched; in matching dependent patients with either independent or dependent therapists, there was greater total interaction than when patients were independent.

Neither study suggests greater compatibility in the interaction of matched dependent dyads and matched independent dyads. The mother child studies, alone, suggest greater

compatibility between matched independent dyads. Though in theory Witkin can defend his proposition that people matched in mode of field approaches would "tend to get along better" together, none of his research would specifically indicate support for this position. This is one reason why he refers to the very significant series of studies undertaken by DiStefano in which a certain interpersonal perceptual distortion occurs rendering matched dependent dyads compatible and matched independent dyads also compatible. DiStefano's results provide significant evidence in an educational setting of some of the consequences of matching or mismatching the mode of field approaches of student and teacher.

d) Findings and Influence of DiStefano's Research - Further Evidence of Differential Interaction Effects in an Educational Setting.- DiStefano (1969) has been involved for a number of years in an examination of the social-psychological implications of differences in perceptual style. In his early investigations, the specific objective was to discover if there were significant differences in the way in which field dependent and field independent persons were perceived by others and conversely whether field dependent and field independent people perceived others in a significantly different manner. The basis for these studies emerged from expectations that measures of field independence-dependence would be associated with the way people view each other and

content (the what) of social perceptions.

DiStefano has supported his position by reference to three dimensions of the research of Witkin and his associates. He has interpreted "overcoming an embedded context" involved in the MFA concept and various instrumentations of measurement, as parallel to the process of social perception in which the person perceived is "separated" from the environment in which he is "embedded". Characteristics of the person perceived have to be differentiated from the totality of characteristics exhibited.

DiStefano further refers to the effect of mother-child interaction on the development of individual differences in MFA. As even partial explanation of these individual differences, the interactions clearly imply differences in interpersonal functioning.

The third dimension invoked as supportive of the hypothesis that differentiation effects operate in certain areas of social functioning consists of the results of those studies which used persons (in contrast to figures) as the "objects of perception" (DiStefano, 1969, p. 3). Field independent children are more discriminating and selective in their friendships, for example.

Consequently in his earliest study to discover if the differentiation hypothesis applied to social functioning, DiStefano hypothesized that there would be significant

differences in the way in which field independent and field dependent persons were perceived by others and that field independent and field dependent persons would perceive others in different ways.

Five extremely field independent teachers and five extremely dependent teachers described eleven of their students selected at random. The students also described their teachers. The subjects were grade ten, 11, and 12 students and their teachers. There were eight categories of results: 1) Field Independent Students rating Independent Teachers, 2) Field Independent Students rating Dependent Teachers, 3) Field Dependent Students rating Independent Teachers, 4) Field Dependent Students rating Dependent Teachers, 5) Field Independent Teachers rating Independent Students, 6) Field Independent Teachers rating Dependent Students, 7) Field Dependent Teachers rating Independent Students, 8) Field Dependent Teachers rating Dependent Students.

The Embedded Figures Test was used to measure the MFA of the subjects and interpersonal perceptions were measured by bipolar adjective scales from Osgood, Suci and Tannerbaum (1957) and single pole adjective scales adapted from Peabody (1967).

The results supported the hypothesis that the MFA of the perceiver and of the person perceived would have

have discernable effects on interpersonal perception. Hence while objective measures would show field dependent people as more gregarious, sociable and fair and field independent people less so, DiStefano found that when the MFA of the person perceiving was taken into consideration then field independent people were seen as more friendly, fair and gregarious by other field independent people. Field independent people also saw dependent people in a less favourable light socially. Dependent people saw other dependent people as more sociable, friendly, gregarious, etc., and independent people as less so. This phenomenon DiStefano termed evaluative "distortion" (1969, p. 73).

The major finding of the study was that people whose perceptual styles are similar tend to describe one another positively while people whose perceptual styles are different tend to describe one another negatively (DiStefano, 1969).

In a second replication study, an attempt to further check the pattern of interpersonal perceptions discovered in the early investigation, DiStefano (1973) used salesmen and sales managers in a telephone and an insurance company as subjects. The hypothesis was that

Salesmen and sales managers with similar perceptual styles (both field independent or both field dependent) will describe each other positively. Salesmen and sales managers with dissimilar perceptual styles will describe each other negatively. (DiStefano, 1973, p. 7)

The subjects were eleven managers with 71 sales subordinates in the telephone company and eight managers with 70 salesmen in the insurance company.

The Embedded Figures Test was again used to establish MFA and the Peabody and Osgood, Suci and Tannerbaum scales utilized to derive a descriptive assessment measure for salesmen and managers.

Both the sales managers' descriptions of the salesmen and the salesmen's descriptions of the sales managers supported the hypothesis. Managers described salesmen with similar MFA as logical, rational, more open minded and flexible, fair, friendly, outgoing, active and sharp. When the MFA was mismatched, managers saw salesmen as irrational, less open minded and flexible, unfair, self contained, self absorbed, passive and dull. In a similar pattern, salesmen whose managers had a similar MFA saw them as more successful, regular and less severe. With MFA mismatched salesmen saw their managers as unsuccessful, unyielding and severe.

DiStefano concluded that interpersonal superior subordinate evaluations "tend to be positive when the pair have similar perceptual styles and negative when their perceptual styles are dissimilar". (DiStefano, 1973, p. 9)

In the results of DiStefano's studies a partial resolution of the thesis question is noted. Consistently he has found that people with similar perceptual styles tend to see

one another in positive terms. People with dissimilar perceptual styles tend to describe one another negatively. Perceptual style can be considered as referring to degree of differentiation. It is in these findings that a major explanatory dimension of the thesis question emerges. If teacher and student whose mode of field approaches are matched, describe one another in positive terms and their perception of each other is one of fairness, flexibility, friendliness, activity and "sharpness" then very clearly a student with a high degree of differentiation would find more compatibility with a teacher high in degree of differentiation. Students low in degree of differentiation would find greater compatibility with teachers also low in degree of differentiation.

It is appropriate at this point to refer again to the position of Elashoff and Snow (1971) because expectancy effects can be considered as partial explanation of DiStefano's results. They can also be seen as a possible source of higher student achievement and more positive student self concept when teacher and student are matched in degree of differentiation. It will be recalled that teachers view students and students view teachers in terms of their own needs and values and that teachers form stable impressions on relatively limited information, later rejecting information that is not congruent with this impression. It will also be recalled that students tend to conform to teacher expectations. When degree

of differentiation of student and teacher are matched, these reciprocal needs and values would tend to be mutually satisfied. If the interests and social characteristics of matched teacher-student dyads are similar, then both teacher and student would tend to form more favourable impressions of one another. Since this impression tends to be quite stable over time and since teachers who expect more from students often see students as responding favourably, and since students tend to conform to teacher expectations, then matching of degree of differentiation of teacher and student would tend to promote more positive interpersonal perceptions, more positive student self concept and higher academic achievement.

If classroom interaction is conceived as fulfilling certain needs (Jennings, 1947; Thelen, 1950; Jenkin, 1951; Jensen, 1955; Withall & Lewis, 1963) it is a tenable hypothesis that these needs would more readily be fulfilled if the degree of differentiation of student and teacher was matched. It will be recalled that productive interaction in the classroom was considered as dependent on a harmonious interdependence of teacher and student with conflict reduced to a minimum. Under the conditions where teacher and student had congruent degrees of differentiation, conflict would indeed be reduced and harmonious interdependence facilitated. The three factors which have been designated as important

moderators of the effects of student-teacher interaction were student characteristics, teacher characteristics, and method of instruction. In terms of the first two factors, DiStefano's studies would suggest that their contribution can be maximized when the degree of differentiation of student and teacher is matched. Witkin (1972) comments on DiStefano's teacher-student study.

Especially important in its implications for how teachers' evaluate their students' abilities was the finding that teachers valued more highly the intellects of students similar to themselves in cognitive style students viewed more favorably the personal characteristics and cognitive competence of teachers similar to themselves in cognitive style. (p. 33)

There are two questions which remain unanswered.

1) Why would Witkin's dependent children with a low degree of differentiation and their dependent mothers view one another in rather negative terms when DiStefano's dependent student-teacher dyad has mutuality of self regard? 2) If in fact people with similar perceptual styles describe each other in highly positive terms, while people whose perceptual styles are different tend to describe each other in negative terms, would teacher and student matched in degree of differentiation have such compatibility that student self concept and academic achievement would improve significantly?

e) Method of Instruction Considered as Moderator of Differential Interaction Effects - Studies of Wu, Grieve, and Davis and Wade.- The third factor, as moderator of interaction, method of instruction has not received elaboration in any of these studies. It will also be recalled that the teacher's verbal behaviour was an important influence on the effects of interaction. To find support for the importance of the influence of these factors related to degree of differentiation, attention will be directed to the studies of Wu (1967), Grieve and Davis (1971), and Wade (1971). Wu (1967) found that a discussion or discovery method of teaching was preferred to a lecture method by teachers whose mode of field approaches were dependent. This result may be indicative of the greater tendency for dependents to become involved in interpersonal interactions. Discussion and discovery methods are more democratic procedures involving interpersonal give and take. Grieve and Davis (1971) found that in teaching grade nine students geography, the more field dependent the student, the more he gained from discovery methods of teaching. In terms of verbal behaviour, Wade (1971) found that relatively field independent children tended to be much less influenced by praise or criticism than more field dependent children. The task performance of dependent children who were criticized was considerably reduced.

Teachers low in degree of differentiation prefer a discovery or discussion method of teaching and students low in degree of differentiation gain more from discovery methods. It is clear then that in terms of method of instruction, the matching of degrees of differentiation of student and teacher would be of academic advantage to the student. Since teachers high in degree of differentiation preferred the lecture method of presentation, and since students high in degree of differentiation respond well to this form of instruction, academic advantage would also accrue when degrees of differentiation of teachers and students were matched. If teachers low in degree of differentiation see students low in degree of differentiation in a positive way, as friendly and fair and co-operative, then the verbal behaviour of the teacher low in degree of differentiation is not going to be destructively critical of the student low in degree of differentiation and the student's behaviour will be commended. Hence the student's academic performance can be enhanced. Even if teachers high in degree of differentiation were more critical of their students who were also high in degree of differentiation, students high in degree of differentiation are much less sensitive to criticism than students low in degree of differentiation. When the degrees of differentiation of members of the teaching-learning dyad are matched, each member of the dyad sees the other more

positively. Where the teaching method is appropriate to the learning style, this would contribute to feeling of self worth which would in turn promote a more positive self concept. Purkey (1970) has consistently related higher levels of academic achievement with a positive self concept. Each directly influences the other. Hence in terms of teacher and student compatibility, in terms of teaching method suitability, in terms of verbal behaviour that commends and in terms of needs that are met, both academic achievement and self concept would be enhanced when teacher and student are matched in degree of differentiation.

f) Evidence of Differential Effects in Achievement When Cognitive Ability Patterns of Teacher and Student Were Matched - Cleare's Study.- Cleare (1966) investigated the interaction between student-teacher cognitive ability patterns and achievement in a structured chemistry course. The students were given seven cognitive factor tests: visual comprehension, visualization, syllogistic reasoning, semantic redefinition, induction, and flexibility of closure. Thurstone's flexibility of closure factor is different from field dependence-independence but measures of both factors use modifications of Gottschaldt original figures (Witkin et al., 1962, p. 49). The tests which Thurstone uses to define his factor are related to Witkin's tests for dependence-independence. The students were also given the CHEM Study

Tests of the Chemical Educational Material Study Institute. A student's pattern level and pattern similarity to that of his teacher was determined. The sample was divided into three groups representing high, medium and low teacher-student pattern similarity. Cleare's results indicate a significant teacher-student cognitive pattern interaction with performance on the CHEM tests. It must be noted, however, that Cleare's concern involved matching teacher-student cognitive ability patterns. These patterns had a number of components only one of which approximated the mode of field approach dimension. The question remains of whether or not when concern is with the matching of one component of a cognitive pattern, that of degree of differentiation, similar effects would be discovered.

C. Degree of Differentiation Related to Student
Achievement and to Self Concept

A selected review of the literature will now be considered which first relates degree of differentiation to achievement in reading and then to achievement in mathematics. It will conclude with a review of the literature relating degree of differentiation to self concept.

a) Reading Comprehension Ability Related to Degree of Differentiation.- Reading performance has been consistently related to various intelligence measures (Harris, Otto

& Barrett, 1966, 1967). Within the last twenty years there has emerged an awareness of the importance of the influence of other factors on level of reading ability (Haggard, 1957; Ames & Walker, 1964; Harris et al., 1967). In this same direction it is possible to anticipate that the degree of differentiation of the student may influence his reading ability.

References in this context within the Witkin literature tend to designate "verbal expressiveness" as more characteristic of subjects with a low degree of differentiation (Witkin et al., 1962, pp. 189-192, 197-198). This has to be explained as the differentiation hypothesis would infer that field independent persons with a high degree of differentiation would show articulateness in the use of language and that the less differentiated the personality the less facility the subject would have in language articulation. The explanation given by Witkin and his associates has a number of dimensions. It could be that because the less differentiated person cannot really actively cope with many situations as well as the differentiated person can, he substitutes "talking about" the situation for action. The dependent subject's greater need for social approval may be an agent in promoting verbal expressiveness which in turn might give favourable impressions to adults and hence increase interaction. Another possibility is that because the dependent person with a low degree of

differentiation requires more guidance and support from others he must use verbal communication to elicit suggestion and direction. This person also shows greater passivity and reliance on outside sources for behaviour which is conforming. It may be that in emulating adults in verbal expression, the child low in degree of differentiation is displaying conformity with adult expectations (Witkin et al., 1962, pp. 199-200).

Witkin's position is most clearly expressed in his discussion of a study by Haggard (cited in Witkin et al., 1962, pp. 200-201). Haggard investigated certain personality dimensions of two groups of children who were found to be high achievers in language and spelling (group one), and reading (group two). Those children in group one were found to be more passive and dependent on outside sources for direction of their thoughts and actions. They also relied on conformance and social techniques to gain acceptance. These characteristics are considered as similar to those of field dependent children with a low degree of differentiation (Witkin et al., 1962, p. 200). Haggard's explanation is that high achievement in language and spelling reflected obedience in the child to authority figures and the carrying out of rules learned by rote.

High achievers in reading had quite different personality characteristics. They were more active and self

reliant and their functioning was much more independent. These are characteristics of people with a high degree of differentiation. The conclusion is that: "Though reading, like spelling and language, involves verbal skills, it places more emphasis on relations and abstractions and an intellectually more active approach is required " (Witkin et al., 1962, p. 200). It is clear that children with a high degree of differentiation are more likely to show higher achievement in reading than children with a low degree of differentiation. The literature tends to support this position, e.g., Robbins (1962); Stuart (1967); Cohn (1968); Kaplan (1969); Peterson and Magaro (1969); Kafka (1970); Wineman (1971). Of these, the studies of Wineman and Cohn will receive brief elaboration.

Wineman.- As a measure of differentiation, Wineman (1961) used the Sophistication-of-Body Concept Scale. The reading ability of 270 fourth, fifth and sixth grade students was assessed as follows: in the fourth and fifth grades by the California Reading Test - Elementary; in the sixth grade by the California Achievement Test - Elementary. The former test gives only a general reading ability score. The latter gives separate vocabulary and reading comprehension subscores.

The results of the product-moment correlation indicated a significant statistical relationship between the Sophistication-of-Body Concept Scores and reading scores for

both male and female fourth grade subgroups (.39 and .36 respectively). Virtually no relationship was found within either the male or the female fifth grade subgroups (.10 and .04 respectively). Within the sixth grade, Reading Vocabulary and Reading Comprehension were significantly correlated with figure drawing scores within the female subgroup (.56 and .54 respectively). Neither reading variable was significantly correlated with figure drawing scores within the male subgroup (.18 and .29 respectively).

Wineman used a composite score for reading ability in grades four and 5. The moderate relations found between reading ability and field dependence-independence might have been higher if separate scores for reading comprehension and reading vocabulary had been used as they were for the grade six group. It has been indicated earlier, that there is expectation for vocabulary scores to be related more to field dependence than field independence. The single general reading ability score may also be partial explanation for the lack of correlations found in the grade five results. Wineman suggests that the impact of early adolescence may also incur a temporary period of discontinuity in the development of differentiation for students at the grade five level.

There is evidence, however, of at least a modest relationship between reading ability and degree of differentiation.

Cohn.- Cohn's sample (1968) consisted of 123 sixth graders of whom 59 were boys. The study was designed to explore the relationship between reading comprehension and field dependence-independence. Cohn reports an attempt to eliminate the following variables: lack of familiarity with English; sensory impairment; poor health and emotional upset; and problems in word analysis. It is not clear how this was carried out. The Sangren-Woody Reading Test and the Embedded Figures Test were used. It was hypothesized that a significant positive correlation would exist between field independence and achievement in reading comprehension tasks. Multiple regression analysis was applied to the data. Field independence was positively and significantly correlated with those subtests in comprehension that required the reorganization of a field to solve a problem. When the solutions had to be found through student initiated cognitive activity rather than through reliance upon experience or on external authority, then the field independent child fared much better than the field dependent child. The results of this study are more definitive. Students who were high in degree of differentiation showed higher achievement in reading.

b) Mathematical Ability Related to Degree of Differentiation.- Witkin and his associates relate overcoming of an embedded context to analytical abilities. Ability to overcome embeddedness increases with the development of greater articulation toward field independence. As the capacity to overcome embeddedness increases the subject will become more effective in the execution of complex operations required in mathematics (Witkin et al., 1962, p. 68). Reference is made to Haggard's study in which the author examined some of the personality characteristics of persons who showed high achievement in arithmetic (Witkin et al., 1962, pp. 200-201). These students viewed the environment with curiosity and

felt capable of mastering any problems which they might encounter ... (They) were emotionally controlled and flexible ... In their relations with authority figures and peers, they were more assertive, independent and self-confident. (Witkin et al., 1962, p. 201)

These are characteristics of children with an analytical field approach. Children with a high degree of differentiation will then be better able to handle the types of skills required in arithmetic. That children high in degree of differentiation tend to have a superior ability in mathematics is extensively documented in the literature, e.g., Rosenfeld (1958), Cummings (1967), Satterly (1968), Frehner (1972). Attention will be directed to the studies of Frehner and Rosenfeld.

Frehner.- The purpose of Frehner's study (1972) was to determine whether the existence of cognitive styles in students influenced their academic achievement. It was hypothesized that achievement in certain subject areas would vary because the characteristics of each subject area tended to be either compatible with or run contrary to a student's cognitive style. The subjects consisted of a random sample of 162 students, seventy-eight boys and 84 girls, derived from 904 eligible sixth grade students in nine elementary schools and twenty-six sixth grade classrooms in the Clark County School District in Nevada. It was stipulated that the students should have no unusual visual, neurological, emotional or language problems. Among others the Metropolitan Achievement Tests, Intermediate Form F, and the Embedded Figures Test were administered.

There was a significant correlation between achievement in mathematics and the field dependence-independence dimension. It was concluded that the field independent cognitive style was compatible with higher ability in mathematics concepts while a field dependent cognitive style was non-compatible with higher achievement in mathematics concepts.

Rosenfeld.- Rosenfeld (1958) used one hundred grade 7 students as his sample. A major purpose was to determine

whether mathematical ability was related to perceptual field dependency. The Embedded Figures Test and eight mathematics subtests of the Progressive Achievement Test were administered.

The results clearly indicated that field independent students had significantly higher scores in mathematics than field dependent students.

c) Degree of Differentiation Related to Self Concept.-

If a positive or negative self concept is related to degree of differentiation, it would be expected that a subject high in degree of differentiation would experience a clearer self concept than a subject low in degree of differentiation. This expectation would emerge from the fact that people with a high degree of differentiation experience their bodies as

articulated (rather than as a vague "mass," not clearly segregated from its surroundings). If the "outside" is experienced as articulated the "inside" tends to be so experienced as well. (Witkin et al., 1962, p. 133)

People who experience their surroundings analytically also tend to have an articulated concept of self. One aspect of this concept is the sense of separate identity. For the person with a high degree of differentiation there are stable internal frames of reference for self definition and for interpreting and reacting to the environment. "Body and self are experienced as segregated from the field, with their "parts" discrete and structured." (Witkin et al., 1962, p. 156) Because people with a high degree of differentiation

have more sophisticated defence mechanisms, they would also be more capable of maintaining a particular self view. These mechanisms would facilitate the modulation and mediation of feelings of aggression (Witkin et al., 1962, p. 170). The greater self confidence and self assurance expressed by subjects high in degree of differentiation would tend to be consonant with a more positive self concept. An investigation of this relationship will now be examined.

Trites (1965) was concerned with an investigation of the relations between degree of differentiation and degree of feeling of satisfaction/dissatisfaction with various parts of the body and the self. In an unnecessary confusion of terms he refers to these latter dimensions as "differentiation of the self" based on Werner's and Witkin's theses but defined by the tests of Secord and Jourard (1953). The tests are really one form of self report and are used as a measure of self concept. It is noted that such utilization has certain general limitations.

His sample consisted of 150 college students. As a measure of differentiation he used the Embedded Figures Test. He controlled for intelligence using the Shipley Institute of Living Scale scores. His measures of feeling of satisfaction or dissatisfaction with various parts of the body and of the "differentiation" of phenomenological self were two tests designed by Secord and Jourard, Body Cathexis and Self

Cathexis. Cathexis was defined as "the feeling of satisfaction or dissatisfaction with various parts or processes of the body and self". (Trites, 1965, p. 38)

He hypothesized that "greater ability for perceptual differentiation would be related to greater differentiation of the phenomenological self and body image". (Trites, 1965, p. 30) This means that he hypothesized a positive relationship between a higher degree of differentiation and feelings of satisfaction with parts and processes of the body and of the self. Since the self report is assessed as a measure of self concept, he expected higher degrees of differentiation to be related to feelings of satisfaction with the self concept.

Pearson r correlations were computed between EFT scores and variability scores on the Secord and Jourard Tests.

The results supported the hypothesis for the female sample. More highly differentiated females showed more favourable reactions to their body and self images than did less differentiated females. The hypothesis was not supported for the male sample and the null hypothesis could not be rejected.

Trites controlled for intelligence using the Shipley Institute of Living Scale Scores, a test of general intelligence. He used the EFT as a measure of

differentiation. Witkin has related EFT scores to total intelligence test scores but has found the relationship carried, by specific non-verbal factors. Since Trites controlled for intelligence using total intelligence test scores, he tended to reduce the possibility of finding the hypothesized relationship. Had he not thus proceeded, he would perhaps have discovered that the null hypothesis for males could also have been rejected.

3. Summary of Relevant Theoretical Aspects and Findings

A. Unique Status of Study

In a summary conjuncture of the review of the literature the status of the proposed study is placed in clear perspective.

The results of studies which contrived to have persons interact whose degree of differentiation was known reveals that there are differences in the ways in which dependent and independent therapists and patients interact; there are differences in the nature of the interaction between independent and dependent mothers and children and that there are differences in the way in which independent and dependent teachers and students interact. One study found a significant relationship between specifically defined cognitive ability patterns and achievement in chemistry. Other studies related achievement in reading and achievement in mathematics to

degree of differentiation. Self concept has also been related to degree of differentiation.

The present study is primarily based on the hypothesis that there will be differences in student-teacher interpersonal perceptions, student achievement, and student self concept when there are differences in the relationships established between students and teachers whose degrees of differentiation are matched and mismatched. It therefore appears clear that significant reference must be made to DiStefano's work in which teachers and students matched and mismatched in degree of differentiation showed differences in their interpersonal perceptions.

In this interaction, DiStefano's teachers rated their students on a semantic differential scale of perception of students. The students were in grades ten, 11, and 12 and they were on a specific rotary program of high school instruction. Degree of differentiation was assessed by using the Embedded Figures Test. Only ten teachers were involved.

Cleare's study related achievement in chemistry to matching "cognitive styles" of teacher and student. It is only in association with many other variables of cognitive style in collectivity that the flexibility of closure factor was related to student achievement when student-teacher pattern similarity was determined.

In Trites' paper relating positive self concept to higher degrees of differentiation, though his interest lay in relating degree of differentiation to various measure of "degree of satisfaction with various parts of the body and the self", he again used the Embedded Figures Test as a measure of degree of differentiation.

The only study which used the Sophistication-of-Body Concept Scale was that conducted by Wineman in relating higher degrees of differentiation to achievement in reading.

Witkin considers the Sophistication-of-Body Concept Scale as the most "effective, accurate and appropriate" assessment of degree of differentiation for a larger number of subjects².

It is evident from the review of the literature that no study has been conducted which investigated differential effects of student-teacher degree of differentiation match-mismatch using the Sophistication-of-Body Concept Scale as a measure of degree of differentiation. No study has considered the effects of teacher-student match using children who were younger than sixteen years of age. The matching-mismatching effects have not been considered in the situation where

2 Personal communication with author, September, 1973.

students had one teacher for all subjects. No study has used a larger number than ten teachers in assessing student-teacher match-mismatch effects. There is no evidence that matching-mismatching effects have been considered in relation to interpersonal perceptions when the child evaluated his teacher's feelings toward him rather than the teacher making that rating. Finally no study has related teacher-student match-mismatch and the effects on the student's self concept.

B. Theoretical Summation

In an interaction between teacher and student whose degrees of differentiation are similar, both teacher and student may communicate better with one another and may view each other in more positive terms than teacher and student whose degrees of differentiation are mismatched. Relative to their degree of differentiation, teachers appear to prefer certain methods of instruction over others. Students with a low degree of differentiation have responded more favourably to some teacher methods; students with a high degree of differentiation have responded more favourably to others. Because students and teachers whose degrees of differentiation are matched communicate better, have similar interests, and common personal characteristics, they are more likely to get along better together. The teacher, sensitive to the student's needs and feelings, can better assist him with his academic

problems. The student who feels at ease with his teacher and has confidence in his ability as a pedagogue may respond to the instructional program in a favourable manner.

This compatible and productive interaction may pervade teacher-student relationships when degrees of differentiation of student and teacher are matched. Students thus matched with their teacher are expected to have more positive interpersonal perceptions than those who are mismatched. Over time this effect would contribute to a change toward a more positive self concept. These conditions would then tend to promote higher achievement in mathematics and in reading for students matched with their teacher in degree of differentiation.

Students with a high degree of differentiation can be expected to have more positive self concepts than students with a low degree of differentiation. This is because of their increased sense of separate identity, their greater self-assurance and confidence, and their sophistication in the development of defence mechanisms. They are also expected to have more positive student-teacher interpersonal perceptions than students low in degree of differentiation.

Students with a high degree of differentiation can be expected to achieve better results in mathematics than students low in degree of differentiation. This is because of their greater facility with analytic skills derived from

a more sophisticated ability to overcome an embedding context. They are thus better equipped to handle complex operations.

With a more intellectually active approach and ability to discover relations and abstractions required in reading comprehension tasks, the student with a high degree of differentiation can be expected to show higher achievement in reading than the student with a low degree of differentiation.

C. Statement of the Research Problem and Theoretical Hypotheses

The research problem can be stated as follows. When the degree of differentiation of teacher and student is optimally matched, will student-teacher interpersonal perceptions be more favourable, student self concept more positive and student achievement in mathematics and in reading higher than when the degree of differentiation of student and teacher are radically mismatched?

There are two theoretical hypotheses:

1. There will be a significant interaction between the degree of differentiation of student and the degree of differentiation of teacher effecting student-teacher interpersonal perceptions, student self concept, achievement in mathematics and achievement in reading.
2. Students high in degree of differentiation will have more positive student-teacher interpersonal perceptions, more positive self concepts, and higher achievement in mathematics and in reading than students low in degree of differentiation.

CHAPTER III

RESEARCH METHODOLOGY

The present chapter has four parts. In the first the research population will be discussed. In part two the measuring instruments will be examined. The research procedure is described in part three and the form of data analysis is explained in part four.

1. Research Population

The research population consisted of two groups of subjects, teachers and students. School boards in Ontario were contacted and permission to carry out a testing program was requested. Contact was based on ease of accessibility. All five school boards contacted gave permission for the testing program to proceed and specified the schools in which access was granted to teachers and students. A public school board gave permission to proceed with the testing program in the month of June but this was too late in the year and the offer was declined. A school board in the national capital, two in the suburban area surrounding the capital, and 1 in the metropolitan area of the City of Toronto were eventually used for the collection of data. Access was granted to eighty-six schools.

Arrangements were then made to meet with all grade six teachers who met two specifications: they were not teaching in a rotary program of instruction involving English or Mathematics; they taught in a traditional classroom with one group of students as their primary responsibility. Consequently 154 teachers were assessed in degree of self-nonselself-differentiation. Of these, sixteen who were high in degree of self-nonselself-differentiation and 16 who were low in degree of self-nonselself-differentiation were asked to participate further by allowing the testing program for their students to proceed. All thirty-two teachers agreed to do so.

The students in the classes of these teachers were then asked to take the battery of tests. There were 962 students involved. It was specified that students had to be with their teachers from the fall of 1973 until May of 1974. A total of 835 students met this specification. At the request of parents two students did not take the battery.

2. Measuring Instruments

The Sophistication-of-Body Concept Scale used for the assessment of the degree of self-nonselself-differentiation will be reviewed first. The instruments used for the measurement of the dependent variables will then be examined. They are the Davidson Lang Check List of Traits, the Modern Mathematics Supplement and the Reading Comprehension Subtests of the

Canadian Tests of Basic Skills, and the Attitude to Mathematics and Attitude to Reading Inventories.

A. The Sophistication-of-Body Concept Scale

This scale measures the degree of primitivity or sophistication of human figure drawings. It was developed to check on the hypothesized relation between mode of field approach and the articulation of body concept, a relationship anticipated through the association of perception of body position and articulation of body concept. Drawings of a group of ten year old children were first grouped on the basis of an overall impression of level of sophistication. The specific features which provided the basis for this general impression were then identified. There were three of these: form level, extent of identity and sex differentiation, and level of detailing. The characteristics of drawings reflecting level of articulation are presented in Appendix 2. A five point rating scale based on detailed definition of these characteristics was then formed. A description of the characteristics to be considered in assessing children's drawings appears in Appendix 3.

Marlens (cited in Witkin et al., 1962) first developed the scale with children of ten years of age. It has been applied successfully to drawings of children between nine and 12 years of age. In a subsequent modification, the children's version of the scale was adapted for

use with drawings of college students. The adaptation involved modification of the scoring criteria to make the scale more appropriate for the range of drawings obtained from adults. It has been used successfully with adults, seventeen to 60 years of age. The modified characteristics for rating adult drawings are presented in Appendix 4. The actual adult rating scale is included in Appendix 5.

The most articulated drawings are rated as one. The scale ranges to a score of five for the most primitive drawings.

Four figures, two representing adult ratings of 5 and two representing adult ratings of 1 are included as Appendix 6. Appendix 7 consists of four drawings, two with children's ratings of 5 and two with children's ratings of 1.

A considerable amount of information is available on the reliability of the instrument. Figure drawings obtained from a group of thirty ten year old boys were scored independently by two judges under Witkin's direction. A correlation coefficient of .84 was obtained between ratings of the two judges (Witkin et al., 1962). He also obtained figure drawings from a group of sixteen male college students which were scored independently by each of four judges using the adult modification of the scale. Correlations between the ratings of each pair of judges were .83, .87, .88, .88, .91 and .92.

Figure drawings from thirty boys and 30 girls were obtained when they were ten years of age, 14 years of age and 17 years old in an investigation by Corah (1965). For girls, the correlation between scores at ten years of age and at 14 years of age was .70; between ten years of age and 17 years of age .86, and between fourteen years of age and 17 years of age .83. For boys the correlation between scores at ten years and at 14 years was .92; between 10 years and 17 years .74 and between fourteen years and 17 years .70.

To establish validity, the Sophistication-of-Body Concept Scale was applied by Marlens (cited in Witkin et al., 1962) to the drawings of twenty-three 10 year old boys. Scores for the scale correlated .71 with perceptual index scores. Perceptual index scores are obtained by computing the means of the separate indices for RFT, BAT and EFT. In a second validation study using fourteen 10 year old boys, Marlens (cited in Witkin et al., 1962) obtained a correlation of .67 between Sophistication-of-Body Concept Scale scores and perceptual index scores. Silberman (cited in Witkin et al., 1962), working with two groups of 12 year old boys obtained correlations of .76 and .44 between Sophistication-of-Body Concept Scale scores and EFT scores. Marlens (cited in Witkin et al., 1962) applied the adult version to forty-one college students. Sophistication-of-Body Concept test scores correlated .50 with perceptual index scores.

A correlation of .53 was obtained between Sophistication-of-Body Concept scores and perceptual index scores for a group of twenty-four male psychiatric patients (Witkin et al., 1962).

The Sophistication-of-Body Concept Scale has been used as a measure of degree of differentiation in many studies. Wineman (1971) used the Scale as a measure of degree of differentiation in his study relating cognitive style to reading ability. His hypothesis that students high in degree of differentiation would have superior reading ability was supported.

Based on the above data, the validity and reliability of the instrument appears adequate for present research purposes.

B. Davidson Lang Check List of Traits

This instrument was used as a measure of student self concept and student-teacher interpersonal perceptions. There are two forms of the instrument. Form one is an adjective check list which gives a measure of a child's self concept. It consists of thirty-five descriptors of a person and a subject has to decide if the descriptor applies to him most of the time, half of the time, or seldom or almost never (see Appendix 8). In its second form, the thirty-five descriptors of a person are retained. The subject has to decide if he

thinks that his teacher considers that the descriptor applies to him (the student) most of the time, half of the time, or seldom or almost never. The score on this test gives a measure of the child's perception of his teacher's perception of him (see Appendix 9).

Davidson and Lang (1960) developed their scale by selecting words on the basis of the following criteria:

1. The words should be those commonly used to describe how people feel toward and how they think of others especially in the student-teacher interaction. The lists of Hartshorne and May (1930), Allport (1936) and Gough (1955) were utilized as one source of descriptors.
2. The words should be easy enough for children in the ten-16 year age range to read and comprehend. The Thorndike-Lorge Frequency Count was used to eliminate words that would be too difficult.
3. The list should contain about an equal number of words connoting positive and negative feelings.

From an initial pool of two hundred trait names, 135 remained after the application of criteria 1 and 2. Each word was then rated by fifty junior highschool pupils and 35 teachers as favourable, unfavourable or neutral. If the word was judged favourable or unfavourable by 80% of the teachers and 80% of the students it was retained. All other words were eliminated. There were fifty remaining. A further

fifteen words were rejected because of duplication in meaning with other words. The final scale therefore consists of thirty-five words.

To assess reliability Davidson and Lang (1960) administered the test twice to four classes comprising 105 junior high school students at a time interval of from four to 6 weeks. A correlation of .85 was obtained between the two sets of scores for form 1, and .78 for form 2.

Because of the nature of the procedures used in forming the check list it was considered to have logical validity. To obtain a measure of empirical and concurrent validity for form two, Davidson and Lang (1960) administered a modified version of the de Groat and Thompson Teacher Approval and Disapproval Scale to ninety-three children. The de Groat and Thompson Scale consisted of eight positive statements and 8 negative statements (de Groat and Thompson, 1949). For each statement students were asked to name one to 4 of their classmates to whom the characteristics applied. They could also name themselves. Of the ninety-three children, fifty-six received 5 or more votes on one or more of the teacher approval or disapproval statements. For these fifty-six children a teacher approval score was established by subtracting the number of unfavourable statement on which five or more votes were received from the number of favourable statements on which five or more votes were

received. A correlation of .51 was obtained between the student's teacher approval score and his score on the Davidson Lang Check List, form two.

Both forms of the check list are scored in the following manner. A favourable word is assigned a score of three when it is checked in the most of the time column and a score of one for the column seldom or almost never. For an unfavourable word the scoring is reversed. A check in the medial position is given a score of two. The range of scores is thirty-five to 105. The higher the score in form one, the more positive is the student self concept. In form two, the higher the score the more positive is the student-teacher interpersonal perception.

The check lists have been used by Davidson and Lang (1960) to investigate the relation between children's perceptions of their teachers' feelings toward them and the variables self perception, academic achievement and classroom behaviour. The hypotheses that there would be a positive correlation between children's perceptions of their teachers' feelings toward them and children's perceptions of themselves and that there would be a positive relationship between favourable perception of teachers' feelings and higher academic achievement were supported.

C. Reading Comprehension Subtest and the Modern Mathematics
Supplement of the Canadian Tests of Basic Skills

These instruments were used as measures of achievement in reading and mathematics. The Canadian Tests of Basic Skills are modifications of the Iowa Tests of Basic Skills normed on a Canadian population. They are widely used throughout Canada as objective measures of achievement in reading and in mathematics. The items constituting the tests have been critically selected for content and discriminating power from a much larger number of original items. Textbooks, courses of study, and instructional materials were assessed throughout Canada and an analysis made of the skills taught most frequently. The tests are concerned only with general intellectual skills and abilities, and not with specific content in a subject area. As support for their validity, the tests are used by the Peel Board of Education in 144 public schools for the assessment of student progress in both the junior and intermediate grades.

The Reading Comprehension Test for grade six, Form A (see Appendix 10) consists of eight passages with a total of 76 comprehension questions. Students are given fifty-five minutes working time for this test.

Odd even reliability was calculated from 4,217 test answer sheets (King, 1968). The reliability for the grade six level was .92. On a study to ascertain stability data

on the Reading Comprehension Test the correlation between scores on a grade six sample using Form A and scores from that sample at the end of grade seven on Form B was .86 (King, 1968).

The Canadian Test of Basic Skills Modern Mathematics Supplement for grade six consists of forty-five questions (see Appendix 11). The students are allowed thirty minutes working time. In a validity study by King (1968) correlation between scores on the Modern Mathematics Supplement and the Canadian Test of Basic Skills Mathematics Concepts Subtest was .78 for the grade six level. There were 504 subjects in the sample. A reliability coefficient of .83 at the grade six level was computed for the Modern Mathematics Supplement Test using the Kuder-Richardson formula 20 with 504 students (King, 1968).

D. Attitude to Mathematics and Attitude to Reading Inventories

The attitude inventories were included because in the reasoning which led to the hypotheses stated in Chapter II there were two phases in the development of the effects predicted. It was proposed that a more positive student self concept and more positive student-teacher interpersonal perceptions would precede higher student achievement in mathematics and reading. It was considered possible, however, that though student self concept and student-teacher

interpersonal perceptions might change, the effects might not be pervasive enough to effect student achievement. An intermediate phase consisting of the assessment of student attitude to mathematics and to reading was therefore incorporated into the testing battery. The instruments developed for this purpose will be examined in the present section. In order to assess the attitude of the student to reading and to mathematics, the researcher selected ten word pairs from the list of 50 bipolar adjectives compiled by Osgood et al. (1957) on the basis of his semantic differential construct. They were selected because of their appropriateness in describing mathematics and reading classes and their meaningfulness to students at a grade six level. Of the word pairs, two represented the potency dimension, two the activity dimension and six the evaluative dimension. Their order in the inventory was determined by random selection, and the word pairs were arranged so that scoring was reversed for some items. For the reading inventory there was an introductory sentence, "my reading classes this year were ...". The ten word pairs followed and the subject had a seven point scale on which to rate his reading classes (see Appendix 12). For the attitude to mathematics inventory the introductory sentence read, "my mathematics classes this year were ..." (see Appendix 13).

The researcher administered the instruments to 407 grade six students in public and separate schools in the City of Ottawa. To establish that they were measuring attitude, the scores were factor analyzed using an oblique rotation with squared multiple correlations on the diagonal (see Table I). The items loaded somewhat differently on the two scales. However it was considered desirable to use the same pairs of evaluative words for both instruments. There were five pairs of evaluative words which appeared to make a distinction between negative and positive attitudes on both attitude inventories (see Table I). The range of scores is from five to 35. There is extensive reliability and validity data to support the use of Osgood's Semantic Differential technique as a measure of attitude (Homan, 1969; Maguire, 1973; McDowell, 1975).

3. Procedure

The researcher decided to use sex of teacher as a blocking factor because there is evidence in the literature that sex may be related to some of the dependent variables (Meyer & Thompson, 1956; Davidson & Lang, 1960). On the basis of their degree of self-nonselF-differentiation, sixteen male teachers and 16 female teachers were selected. Using the basic rating criteria (see Appendix 5) eight males and 8 females were assessed as high in degree of differentiation

Table I.- Factor Analytic Loadings on Ten Word Pairs for Attitude to Mathematics and Attitude to Reading Inventories.

Variable	Factor Loadings			Factor Loadings		
	Attitude to Mathematics			Attitude to Reading		
A 1	-0.03159	0.12829	-0.68332	0.35581	0.49076	-0.08925
E 2*	0.37975	0.15803	0.06054	0.57897	0.14592	0.16811
E 3*	0.75457	0.00477	0.04031	0.88582	-0.05546	0.24421
E 4*	0.42377	0.36426	0.09602	0.91317	-0.09458	0.02030
A 5	0.33282	0.33765	0.14036	0.77498	0.05619	-0.11003
E 6*	0.82699	-0.02177	-0.04880	0.82295	0.07074	0.09301
E 7*	0.60921	0.08380	0.04836	0.67944	0.15984	-0.01369
P 8	0.23440	-0.10901	0.27151	-0.02282	0.41357	0.01190
P 9	-0.05103	0.73766	0.13361	0.63551	0.02192	-0.20488
E 10	0.18671	0.57829	-0.06879	0.76756	-0.07219	-0.15016

A - activity E - evaluative P - potency
 * Denotes word pairs selected for the assessment of attitude to mathematics and attitude to reading.

and eight males and 8 females were assessed as low in degree of self-nonselF-differentiation. The Sophistication-of-Body Concept scores for the male and for the female figure drawings were added so that the actual range of scores was from two to 10. This was done to provide an adequate middle group so that misclassification of subjects as low or as high in degree of differentiation was less likely to occur. Subjects with scores of two, 3 or 4 were considered high in degree of differentiation. Subjects with scores of eight, 9 or 10 were considered as low in degree of differentiation. Assessment of the degree of differentiation of these teachers concluded when eight teachers had been identified in each category. Scores in degree of self-nonselF-differentiation for male and female teachers are presented in Appendix 14.

The battery of tests was given to 833 students in the classes of these teachers. These consisted of the Sophistication-of-Body Concept Scale, both forms of the Davidson and Lang Check List of Traits, the Attitude to Mathematics and Attitude to Reading Inventories, the Reading Comprehension Subtest and the Modern Mathematics Supplement of the Canadian Tests of Basic Skills. The tests were administered to the students according to a prearranged schedule which separated in time tests which were of a similar nature and gave the students a paced program of activity during the testing period (see Appendix 15). There were four exceptions to this schedule

due to school activities which conflicted with the proposed testing periods. In these situations some instruments were administered on one day and others at a later date.

The researcher decided to use sex of student as a blocking factor because extensive evidence also exists that sex of student is related to a number of the dependent variables (Davidson & Lang, 1960; Iscoe & Carden, 1961; Brophy & Good, 1970). On the basis of their scores on the Sophistication-of-Body Concept Scale, 361 students were identified as high in degree of self-nonsel-differentiation (scores of two, 3 or 4) or low in degree of self-nonsel-differentiation (scores of eight, 9 or 10). The distribution of these male and female students high in degree of differentiation and low in degree of differentiation with male and female teachers high in degree of differentiation and low in degree of differentiation is shown in Table II.

It can be seen from the Table that while there are approximately the same number of boys and girls in the study, there are over twice as many girls as boys who have been rated as high in degree of differentiation. About twice as many boys as girls have been rated as low in degree of differentiation. Faterson and Witkin (1970) have found a similar unexpected reversal using the Sophistication-of-Body Concept Scale as a measure of degree of differentiation. They explain the reversal by indicating that the instrument emphasizes a

Table II.- Number of Male and Female Students for Each Level of Differentiation with Male and Female Teachers for Each Level of Differentiation.

		Teachers High in Differentiation		Teachers Low in Differentiation	
		Male	Female	Male	Female
Students High in Differentiation	Male	9	17	17	13
	Female	24	36	35	28
Students Low in Differentiation	Male	46	28	26	22
	Female	18	10	13	19

special investment in the social appearance of figures, e.g. adornments such as jewellery, details of clothing and hair, and concludes that such an emphasis is much more characteristic of human figures drawn by girls than by boys. While this may seem inconsistent with other measures of self-nonselldifferentiation, the construct validity of the Sophistication-of-Body Concept Scale, as discussed earlier, appears adequate.

4. Data Analysis

The hypotheses were tested using a multivariate analysis of variance with four independent variables. Two of these, degree of differentiation of teacher and degree of differentiation of student, were specified in the research hypotheses. The other two variables were sex of teacher and sex of student used as blocking variables for the reasons outlined above.

There were six dependent variables: student self concept and student-teacher interpersonal perceptions; student attitude to reading and student attitude to mathematics; student achievement in reading and student achievement in mathematics.

It was originally planned to order the dependent variables into two groups. These consisted of student self concept and student-teacher interpersonal perceptions because it was expected that these two variables would be closely

related. Within the second group, student attitude to reading, student attitude to mathematics, student achievement in reading and student achievement in mathematics, the variables were expected to be closely related. However, an inspection of the intercorrelations, Table III, clearly indicates that this grouping is not justified.

On the basis of the intercorrelations among the variables it was felt desirable to establish three a priori sets. These were self concept and interpersonal perceptions; attitude to reading and to mathematics; student achievement in reading and in mathematics.

A multivariate analysis of variance was then used with each of the three sets of variables. The hypotheses were tested through the use of the computer program devised by Finn (1974). Class means, not individual student scores, were used as the basis for the analysis of data. The level of significance was set at .05.

Because a logical a priori ordering of the variables was possible, the step down analysis was considered as the most appropriate post hoc procedure. With step down analysis it is possible to consider variables in a predetermined order. The first variable of the set of variables is subjected only to univariate analysis. The second and succeeding variables are tested holding the first and other variables that have been considered as co-variates. By taking out the

Table III.- Correlations Among the Dependent Variables

	Self Concept	Interpersonal Perceptions	Attitude to Mathematics	Attitude to Reading	Achievement in Reading
Interpersonal Perceptions	0.42				
Attitude to Mathematics	0.07	0.12			
Attitude to Reading	0.11	0.18	0.39		
Achievement in Reading	0.19	0.18	-0.02	0.03	
Achievement in Mathematics	0.24	0.25	0.10	0.02	0.62

effects of the first variable of a pair of variables it is possible to establish if the second is making a unique contribution. If the first variable is significant on univariate analysis then it too is considered as making a contribution to the observed effects. For these post hoc tests the level of significance will be .025 in order to establish greater control over the error term.

For the first set of variables, self concept and interpersonal perceptions, self concept was considered as more enduring and stable while interpersonal perceptions were assessed as more susceptible to change and were transitory. In using self concept as a co-variate in step down analysis, the unique effects, if any, of interpersonal perceptions can be assessed.

For the second set of dependent variables, attitude to reading and attitude to mathematics, the logical ordering placed attitude to reading as the co-variate. Mathematics problem exercises require a prerequisite capability in reading skills and attitude to reading would probably influence attitude to mathematics.

Achievement in mathematics and achievement in reading were considered as the last set of variables grouped together. A similar reasoning to that for attitude ordering suggested that achievement in reading should be used as a co-variate in step down analysis for that set.

CHAPTER IV

PRESENTATION AND DISCUSSION OF RESULTS

The results of the analysis will be considered in the following order. First the mean scores for the dependent variables will be presented and then the results of the multivariate analysis for the three ordered pairs of variables. The results and discussion of the test of hypothesis one will then be appraised in relation to the three groups of dependent variables. The effects on these variables of the degree of differentiation of the student will then be examined (hypothesis two). Finally other significant effects will be discussed.

The mean scores for the six dependent variables for each of the sixteen cells are presented in Table IV. Tables V, VI, and VII indicate the results of the multivariate analysis for the three ordered pairs of variables.

1. Results and Discussion of the Test of Hypothesis One

It has been hypothesized that there would be an interaction between the degree of differentiation of the student and the degree of differentiation of the teacher which would effect student self concept, student-teacher interpersonal perceptions, student attitude to reading,

Table IV.- Table of Mean Student Scores on Six Dependent Variables. Independent Variables are Sex of Student and Degree of Differentiation of Student and Sex of Teacher and Degree of Differentiation of Teacher.

			Degree of Differentiation of Teachers			
			High		Low	
			Male	Female	Male	Female
Students High in Degree of Differentiation	Male	Self Concept	89.75	90.15	85.40	86.06
		Interpersonal Perceptions	86.88	88.81	83.49	64.69
		Attitude to Mathematics	29.19	28.58	28.90	26.83
	Female	Attitude to Reading	29.56	30.71	27.74	23.81
		Achievement in Reading	41.86	50.19	41.27	45.17
		Achievement in Mathematics	25.66	28.89	25.44	29.10
Students Low in Degree of Differentiation	Male	Self Concept	88.60	89.46	90.01	91.54
		Interpersonal Perceptions	86.89	87.44	86.91	86.01
		Attitude to Mathematics	27.97	29.83	27.84	28.87
	Female	Attitude to Reading	30.69	32.22	29.25	29.89
		Achievement in Reading	44.54	48.97	40.90	38.70
		Achievement in Mathematics	24.84	29.76	25.06	23.73

Table V.- Results of Multivariate Analysis with Student Self Concept and Student-Teacher Interpersonal Perceptions as Dependent Variables. Sex of Student, Degree of Differentiation of Student, Sex of Teacher and Degree of Differentiation of Teacher are the Independent Variables.

Source of Variance	Approximate F Ratio	Probability Less Than
Sex of Teacher	.1675	.8460
Differentiation of Teacher	.4042	.6686
Sex of Student	5.2829	.0065*
Differentiation of Student	23.3429	.0001*
Sex of Teacher and Differentiation of Teacher	.6576	.5201
Sex of Teacher and Sex of Student	1.0353	.3585
Sex of Teacher and Differentiation of Student	5.6083	.0048*
Differentiation of Teacher and Sex of Student	.9741	.3808
Differentiation of Teacher and Differentiation of Student	8.1346	.0006*
Sex of Student and Differentiation of Student	2.4079	.0947
Sex of Teacher, Differentiation of Teacher and Sex of Student	2.9441	.0568
Sex of Teacher, Differentiation of Teacher and Differentiation of Student	4.3603	.0151*
Sex of Teacher, Differentiation of Student and Sex of Student	1.0064	.3689
Differentiation of Teacher, Sex of Student and Differentiation of Student	4.5900	.0122*
Sex of Teacher, Differentiation of Teacher, Sex of Student and Differentiation of Student	.5348	.5873

* Significant.

Degrees of Freedom for each of the sources indicated are 2, 111.

The Critical F at the .05 level of significance is 3.08.

Table VI.- Results of Multivariate Analysis with Student Attitude to Reading and Student Attitude to Mathematics as Dependent Variables. Sex of Student, Degree of Differentiation of Student, Sex of Teacher and Degree of Differentiation of Teacher are the Independent Variables.

Source of Variance	Approximate F Ratio	Probability Less Than
Sex of Teacher	.7409	.4791
Differentiation of Teacher	.0464	.0003*
Sex of Student	1.5226	.2227
Differentiation of Student	.7252	.0002*
Sex of Teacher and Differentiation of Teacher	2.4117	.0944
Sex of Teacher and Sex of Student	.7088	.4945
Sex of Teacher and Differentiation of Student	.8410	.4340
Differentiation of Teacher and Sex of Student	.2150	.8069
Differentiation of Teacher and Differentiation of Student	2.8756	.0606
Sex of Student and Differentiation of Student	1.8284	.1655
Sex of Teacher, Differentiation of Teacher and Sex of Student	3.5866	.0313*
Sex of Teacher, Differentiation of Teacher and Differentiation of Student	2.0570	.1327
Sex of Teacher, Differentiation of Student and Sex of Student	.4082	.6659
Differentiation of Teacher, Sex of Student and Differentiation of Student	2.0463	.1341
Sex of Teacher, Differentiation of Teacher, Sex of Student and Differentiation of Student	2.7262	.0699

* Significant.

Degrees of Freedom for each of the sources indicated are 2, 111.

The Critical F at the .05 level of significance is 3.08.

Table VII.- Results of Multivariate Analysis with Student Achievement in Reading and Student Achievement in Mathematics as Dependent Variables. Sex of Student, Degree of Differentiation of Student, Sex of Teacher and Degree of Differentiation of Teacher are the Independent Variables.

Source of Variance	Approximate F Ratio	Probability Less Than
Sex of Teacher	.1596	.8527
Differentiation of Teacher	3.2056	.0444*
Sex of Student	1.5363	.2198
Differentiation of Student	25.2597	.0001*
Sex of Teacher and Differentiation of Teacher	.2129	.8086
Sex of Teacher and Sex of Student	.0699	.9326
Sex of Teacher and Differentiation of Student	2.6085	.0782
Differentiation of Teacher and Sex of Student	1.6940	.1885
Differentiation of Teacher and Differentiation of Student	.5831	.5599
Sex of Student and Differentiation of Student	.4052	.6678
Sex of Teacher, Differentiation of Teacher and Sex of Student	.1992	.8197
Sex of Teacher, Differentiation of Teacher and Differentiation of Student	.8245	.4412
Sex of Teacher, Differentiation of Student and Sex of Student	1.2045	.3038
Differentiation of Teacher, Sex of Student and Differentiation of Student	1.9465	.1477
Sex of Teacher, Differentiation of Teacher, Sex of Student and Differentiation of Student	1.4057	.2496

* Significant.

Degrees of Freedom for each of the sources indicated are 2, 111.

The Critical F at the .05 level of significance is 3.08.

student attitude to mathematics, student achievement in reading and student achievement in mathematics.

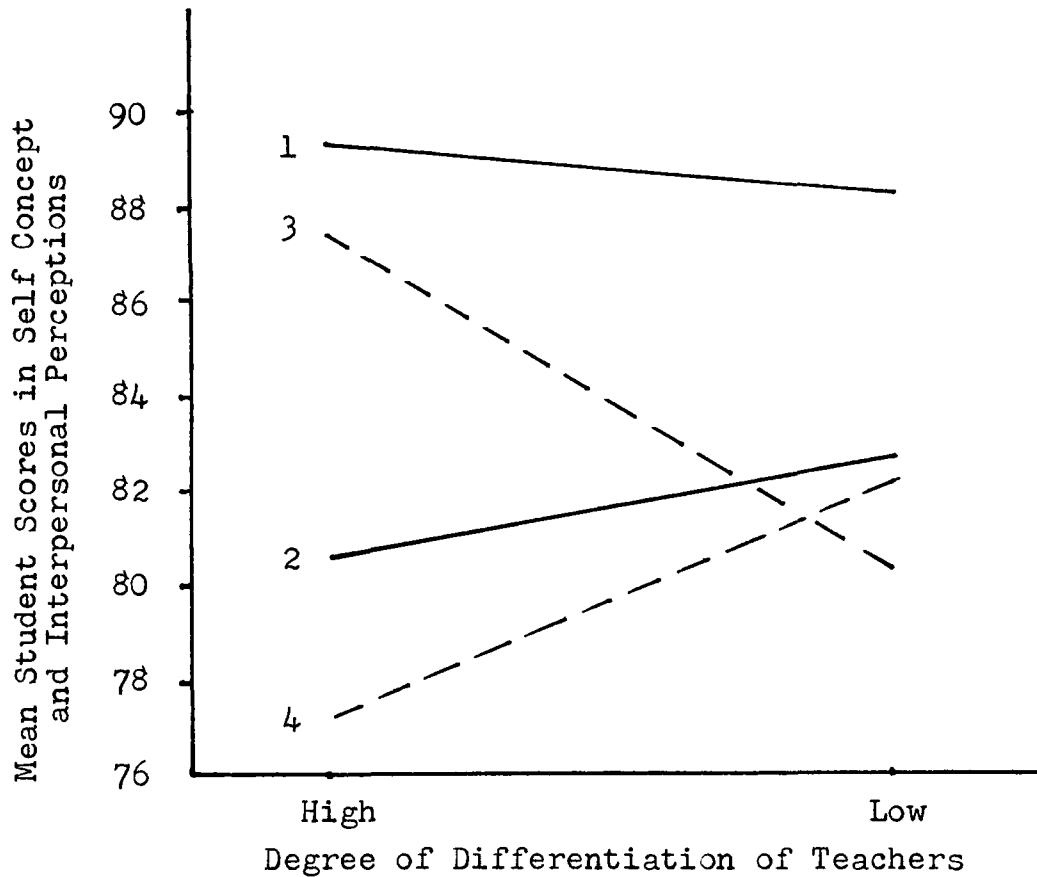
There were significant interaction effects on the set of variables student-teacher interpersonal perceptions and student self concept.

An inspection of the means in Table VIII indicates that in matched student-teacher dyads there are more positive interpersonal perceptions and student self concept is also more positive. In the step down procedure the effects of the variable self concept did not reach significance. The observed univariate F was 1.9995 and the probability .1606. The effects of interpersonal perceptions using self concept as a co-variate contributed uniquely to the interaction, observed F 14.0420, probability .0003. The effects are not carried by the self concept variable. This would be expected on the basis of the argument that self concept is more stable and is less likely to change than interpersonal perceptions. The interaction is presented graphically in Figure 1. The greatest variations in student interpersonal perceptions occur in the interactions of students with teachers who are high in degree of differentiation.

The effects of matching and mismatching students and teachers in degree of differentiation did not reach significance for the dependent variables attitude to reading and attitude to mathematics though they were in the expected

Table VIII.- Mean Scores for Six Dependent Variables with Differentiation of Student and Differentiation of Teacher as Independent Variables.

	Teachers High in Differentiation		Teachers Low in Differentiation	
	Self Concept	Interpersonal Perceptions	Self Concept	Interpersonal Perceptions
Students High in Differentiation	89.49	87.50	88.26	80.27
Students Low in Differentiation	80.93	77.29	82.61	82.38
	Attitude to Reading	Attitude to Mathematics	Attitude to Reading	Attitude to Mathematics
Students High in Differentiation	30.80	28.89	27.67	28.11
Students Low in Differentiation	27.19	24.63	24.29	27.16
	Achievement in Reading	Achievement in Mathematics	Achievement in Reading	Achievement in Mathematics
Students High in Differentiation	48.89	27.29	41.53	25.83
Students Low in Differentiation	34.61	20.53	32.77	21.04



1. Self concept of students high in degree of differentiation.
2. Self concept of students low in degree of differentiation.
3. Interpersonal perceptions of students high in degree of differentiation.
4. Interpersonal perceptions of students low in degree of differentiation.

Figure 1.- Line graph of two levels of student differentiation showing mean student scores for self concept and interpersonal perceptions plotted against teacher level of differentiation.

direction (see Table VIII). They also did not reach significance for the variables achievement in reading and achievement in mathematics.

It was anticipated that the effects of matching teacher and student in degree of differentiation would progress through three stages. First student-teacher interpersonal perceptions would become more positive. Student self concept would then change if a sufficiently intense and enduring relationship between teacher and student occurred. Attitude to mathematics and attitude to reading were expected to be influenced by more positive student-teacher interpersonal perceptions and an enhanced self concept. The cumulative effects of positive student attitude, positive student self concept and more positive student-teacher interpersonal perceptions were then expected to influence student achievement.

It is consistent with this reasoning that when attitude to reading and attitude to mathematics were not effected by matching student and teacher in degree of differentiation, then the effects on student achievement in reading and in mathematics would not be significant either. It may be that the extent of student-teacher interaction was of insufficient duration to facilitate a change in self concept, in attitude, and in achievement.

Though DiStefano (1969) did not hypothesize that student achievement would be higher in matched student-teacher dyads, he indicated that this did in fact occur¹. It must be restated that DiStefano used subjective teacher evaluations of students as measures of achievement and in the present study objective measures of the students progress were used. This comparison presents an interesting question of whether a student's higher achievement in matched dyads is actual or perceived.

2. Results and Discussion of the Test of Hypothesis Two

The second research hypothesis stated that the degree of differentiation of the student would effect his self concept, student-teacher interpersonal perceptions, attitude to reading, attitude to mathematics, achievement in reading, and achievement in mathematics.

The mean scores in the three sets of dependent variables for students high in degree of differentiation and students low in degree of differentiation are presented in Table IX. For each of these three sets of dependent variables the differentiation of the student has a significant effect.

¹ Personal communication with the author, November 1973.

Table IX.- Mean Student Scores and Step Down Analysis for Three Groups of Dependent Variables with Differentiation of the Student as the Independent Variable.

	Degree of Differentiation of Students		Step Down Analysis		
	High	Low	Dependent Variables Tested	Observed F	Probability
Self Concept	88.27	81.77	Self Concept	47.0437	.0001
Interpersonal Perceptions	83.89	79.84	Interpersonal Perceptions	.0437	.8348
Attitude to Reading	29.23	25.74	Attitude to Reading	14.6475	.0003
Attitude to Mathematics	28.50	25.85	Attitude to Mathematics	4.3632	.0391
Achievement in Reading	43.97	33.70	Achievement in Reading	31.7006	.0001
Achievement in Mathematics	26.56	20.83	Achievement in Mathematics	14.8880	.0002

For the first set of dependent variables, self concept and interpersonal perceptions, self concept was significant using the step down procedure. The variable interpersonal perceptions is seen to make no unique contribution (Table IX). Students with a high degree of differentiation had a more positive self concept than students with a low degree of differentiation.

For the second set of dependent variables, attitude to reading and attitude to mathematics, attitude to reading was significant using step down analysis. The variable attitude to mathematics, while approaching significance, made no unique contribution using attitude to reading as a co-variate (Table IX). Students with a high degree of differentiation had a more positive attitude to reading than students with a low degree of differentiation.

With the third set of dependent variables, achievement in reading and achievement in mathematics, achievement in reading was significant using step down analysis. When achievement in reading was used as a co-variate, the variable achievement in mathematics made a unique contribution (see Table IX). Students with a high degree of differentiation had higher achievement in mathematics and in reading than students with a low degree of differentiation.

It is possible that the results of the test of hypothesis two can be explained on the basis of the progression

effects that were earlier predicted. First the student who has a high degree of differentiation has a more positive self concept. This influences his attitude to reading and to mathematics and with a positive attitude his achievement in mathematics and in reading is higher than that of a student who has a low degree of differentiation. However, this interpretation does not explain why the variable interpersonal perceptions is not significant. A more tenable argument would possibly be that the more highly differentiated student has an enduring record over the years of success in mathematics and in reading. Such long term effects of success would effect his attitude to mathematics and to reading. It has been stated in the discussion of the results of the test of hypothesis one that for attitude to change a longer exposure within favourable conditions is necessary. A student high in degree of differentiation will have had consistent higher achievement, and this can and seemingly does effect his attitude in the two subject areas. Following Purkey's reasoning (1970), it would then be expected that a more positive self concept would result from the record of better achievement and more positive attitude to important subject areas.

For the dependent variable, interpersonal perceptions, the description less stable and transitory has been applied, and at first observation it would seem that it too should

change. When the effects of the level of differentiation of the student are considered, it is clear that there are an approximately equal number of student-teacher matches and mismatches in terms of each level of differentiation. It makes good sense that the variable interpersonal perceptions in this situation should make no significant contribution to the effects noted for the self concept and interpersonal perceptions group of variables.

This interpretation can be conjoined with the earlier discussion of the results of the test of hypothesis one to support the position adopted at that time. It will be recalled that in the interaction effects in which teachers and students were matched in degree of self-nonselldifferentiation and in which teachers and students were mismatched in degree of differentiation the variable interpersonal perceptions made a unique contribution to the effects noted. That result represented a comparison between groups of students matched with their teachers in degree of differentiation and others mismatched with their teachers in degree of differentiation. Within the terms of the analysis and results of hypothesis two, it is most noteworthy that when there are an equal number of match-mismatch situations, the variable interpersonal perceptions is not significant and makes no unique contribution as seen in the results of step down analysis.

3. Other Significant Results

Two main effects which were significant will be discussed first and then interaction effects which were significant will be presented and an effort made to interpret the effects of these interactions.

The differentiation of the teacher had a significant effect on student attitude to mathematics and to reading and on student achievement in mathematics and in reading. The mean scores for the dependent variables are presented in Table X with step down analysis results for the two groups of variables.

For the first group, attitude to reading and attitude to mathematics, attitude to reading was significant using the step down procedure. Using attitude to reading as a co-variate, attitude to mathematics was seen to make a unique contribution. Students who have teachers with a high degree of differentiation have a more positive attitude to mathematics and to reading than students who have teachers with a low degree of differentiation.

With the second set of dependent variables, achievement in mathematics and achievement in reading, achievement in reading was not significant using the step down procedure. When achievement in reading was used as a co-variate, the variable achievement in mathematics made a unique contribution

Table X.- Mean Student Scores and Step Down Analysis for Two Groups of Dependent Variables with Differentiation of Teacher as the Independent Variable.

	Degree of Differentiation of Teachers		Step Down Analysis		
	High	Low	Dependent Variables Tested	Observed F	Probability
Attitude to Reading	28.99	25.98	Attitude to Reading	10.8849	.0014
Attitude to Mathematics	31.71	26.64	Attitude to Mathematics	6.6581	.0112
Achievement in Reading	40.60	37.15	Achievement in Reading	1.2690	.2624
Achievement in Mathematics	23.96	23.44	Achievement in Mathematics	5.1299	.0245

(see Table X). Students who have a teacher with a high degree of differentiation have higher achievement scores in mathematics than students who have teachers with a low degree of differentiation.

Degree of differentiation of the teacher affects student attitude and student achievement. It may be that the more highly differentiated teacher presents the subject matter in a more organized fashion. The student may find the acquisition of the material easier under these conditions. If the material is well presented by the teacher and the student acquires an understanding of content and skill more readily than with a teacher low in degree of differentiation, the student may develop a more positive attitude to the subject matter. Because of his success his attitude may become more positive.

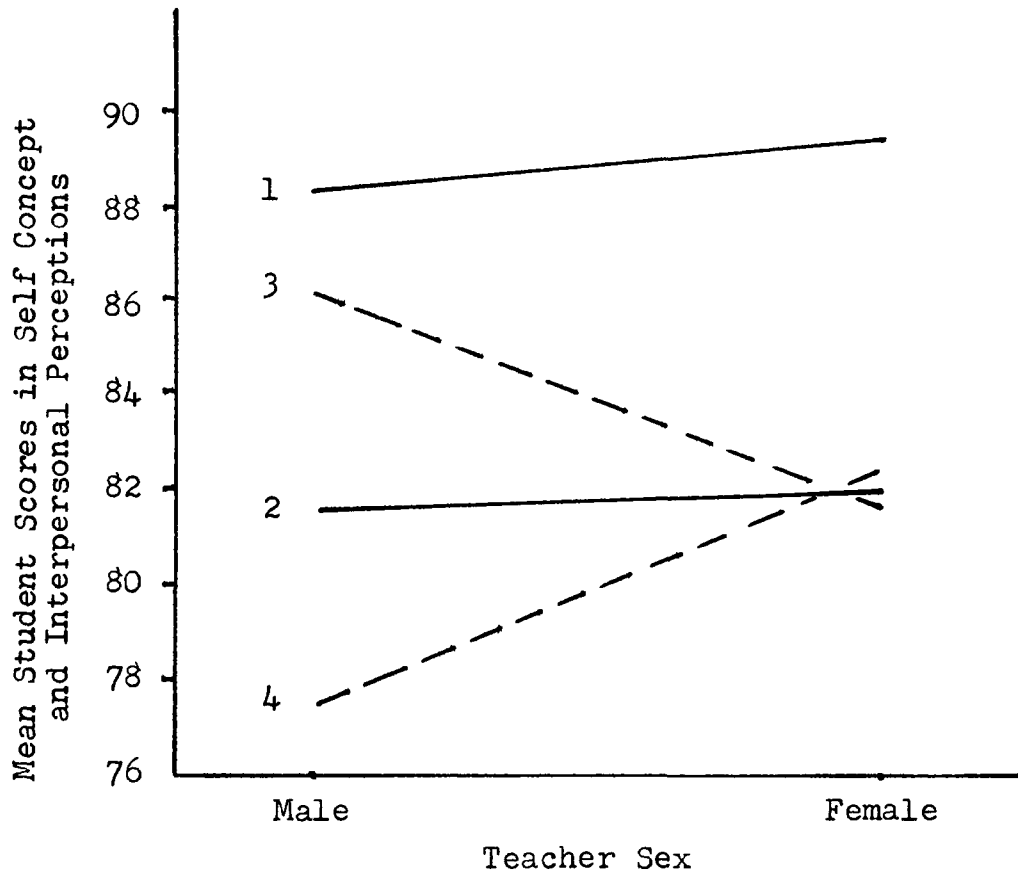
The highly differentiated teacher has students who are high and students who are low in degree of differentiation. The equal number of matches and mismatches of students and teachers in degree of differentiation may cancel out the effects of teacher differentiation on student self concept and student-teacher interpersonal perceptions. Following Purkey's argument (1970) it would, however, be expected that higher achievement in two important subject areas would be associated with a more positive self concept.

The sex of the student had significant effects on the set of dependent variables, self concept and interpersonal perceptions. Mean scores for self concept and interpersonal perceptions respectively for male students are 83.78 and 79.98. For female students these scores are 86.85 and 83.74. In step down analysis the self concept variable by itself was significant. The interpersonal perceptions variable made no unique contribution. This is to be expected for there are an equal number of match-mismatch situations when sex of the student is the independent variable.

There are significant interaction effects between the sex of the teacher and the degree of differentiation of the student related to self concept and interpersonal perceptions. In step down analysis the variable self concept was not significant. When self concept was used as a covariate, interpersonal perceptions made a unique contribution. The mean scores for self concept and interpersonal perceptions and step down analysis results related to male and female teachers and students high and low in degree of differentiation appear in Table XI. The interaction is represented graphically in Figure 2. Examination of the graph shows that the greatest variations occur with male teachers. Students high in degree of differentiation have a more positive student-teacher interpersonal perception with male teachers

Table XI.- Mean Student Scores and Step Down Analysis for the Dependent Variables Self Concept and Interpersonal Perceptions with Sex of Teacher and Differentiation of Student as Independent Variables.

Dependent Variables	Male Teachers		Female Teachers		Step Down Analysis	
	Differentiation of Students		Differentiation of Students		Observed F	Probability
	High	Low	High	Low		
Self Concept	88.44	81.62	89.31	81.90	.0717	.7894
Interpersonal Perceptions	86.18	77.48	81.74	82.15	11.1384	.0012



1. Self concept of students high in degree of differentiation.
2. Self concept of students low in degree of differentiation.
3. Interpersonal perceptions of students high in degree of differentiation.
4. Interpersonal perceptions of students low in degree of differentiation.

Figure 2.- Line graph of two levels of student differentiation showing mean student scores for self concept and interpersonal perceptions plotted against teacher sex.

than students low in degree of differentiation with male teachers. It would be expected that since the variables self concept and interpersonal perceptions have a correlation of .42 that a similar pattern to that for self concept would emerge for interpersonal perceptions.

In general terms, women tend to be less highly differentiated than men. An inspection of the means in Appendix 14 shows that though the criteria for selecting teachers as high in degree of differentiation or low in degree of differentiation were the same for both sexes, those females who were high in degree of differentiation were higher than the male teachers. Students low in degree of differentiation would be expected to have less positive interpersonal perceptions with the teachers who were highest in degree of differentiation. Some explanation for the finding probably rests in the nature of the instrument used in the measurement of degree of differentiation.

It is possible also that the role of the female in our society is substantially different from that of the male and that these role characteristics interplay with the degree of differentiation of students.

An examination of Table II shows that among the research subjects of this study there are more male students who are low in degree of differentiation from female students who are low in degree of differentiation. It is

possible that the effects most evident with male teachers are influenced by the higher proportion of male students in the category of students low in degree of differentiation. Further discussion of this interaction will occur after presentation of the next significant effect.

Significant interaction effects occur between the sex of the teacher, the degree of differentiation of the teacher and the degree of differentiation of the student relating to student self concept and student-teacher interpersonal perceptions. The means for the two dependent variables and results of step down analysis are recorded in Table XII. The interaction is portrayed graphically in Figure 3. Using the step down procedure self concept by itself was not significant. When self concept was used as a co-variate, the variable interpersonal perceptions made a unique contribution.

When the results of this interaction are examined in conjunction with those of the interaction of sex of teacher and degree of differentiation of student, previously presented, further clarification occurs of the interpretative difficulty encountered then.

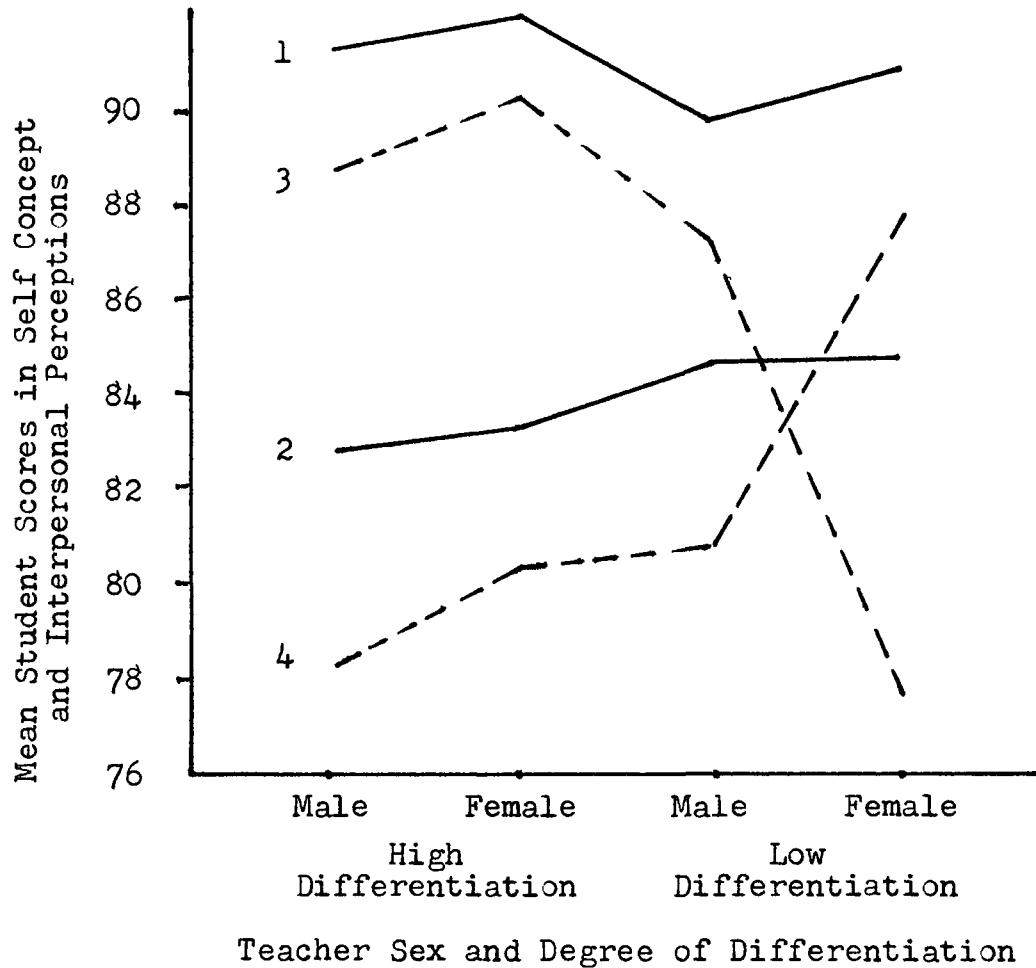
If the interaction hypothesis presented earlier relating to the effects of student-teacher match and mismatch is valid, then because the group of male teachers (Figure 2) has an approximately equal number of matched and

Table XII.- Mean Student Scores and Step Down Analysis for the Dependent Variables Self Concept and Interpersonal Perceptions with Differentiation of Student, Differentiation of Teacher and Sex of Teacher as Independent Variables.

Dependent Variables	Teachers High in Differentiation				Teachers Low in Differentiation				Step Down Analysis	
	Male		Female		Male		Female		Observed F	Probability
	High	Low	High	Low	High	Low	High	Low		
S.C.	89.18	80.74	89.81	81.11	87.79	82.51	88.81	82.73	.0209	.8853
I.P.	86.89	76.21	88.13	78.37	85.20	78.84	75.35	85.92	8.6982	.0039

S.C., Self Concept.

I.P., Interpersonal Perceptions.



1. Self concept of students high in degree of differentiation.
2. Self concept of students low in degree of differentiation.
3. Interpersonal perceptions of students high in degree of differentiation.
4. Interpersonal perceptions of students low in degree of differentiation.

Figure 3.- Line graph of two levels of student differentiation showing mean student scores for self concept and interpersonal perceptions plotted against teacher sex and degree of differentiation.

mismatched students there should not be these large variations in mean student scores for interpersonal perceptions. The variation is minimal for students who have female teachers. An examination of Figure 3 and the means in Table XII shows that with male teachers who are low in degree of differentiation, mean student scores for interpersonal perceptions in a situation of student-teacher match are lower than mean student scores for a student-teacher mismatch.

The unexpected results for this group of male teachers low in degree of differentiation would seem to indicate that it is with this group that something unexpected is happening in these last two interactions. The researcher cannot provide an explanation for why these unexpected results occur. It could be that the particular instrument used for measuring degree of differentiation is not as appropriate for male subjects as it is for female subjects.

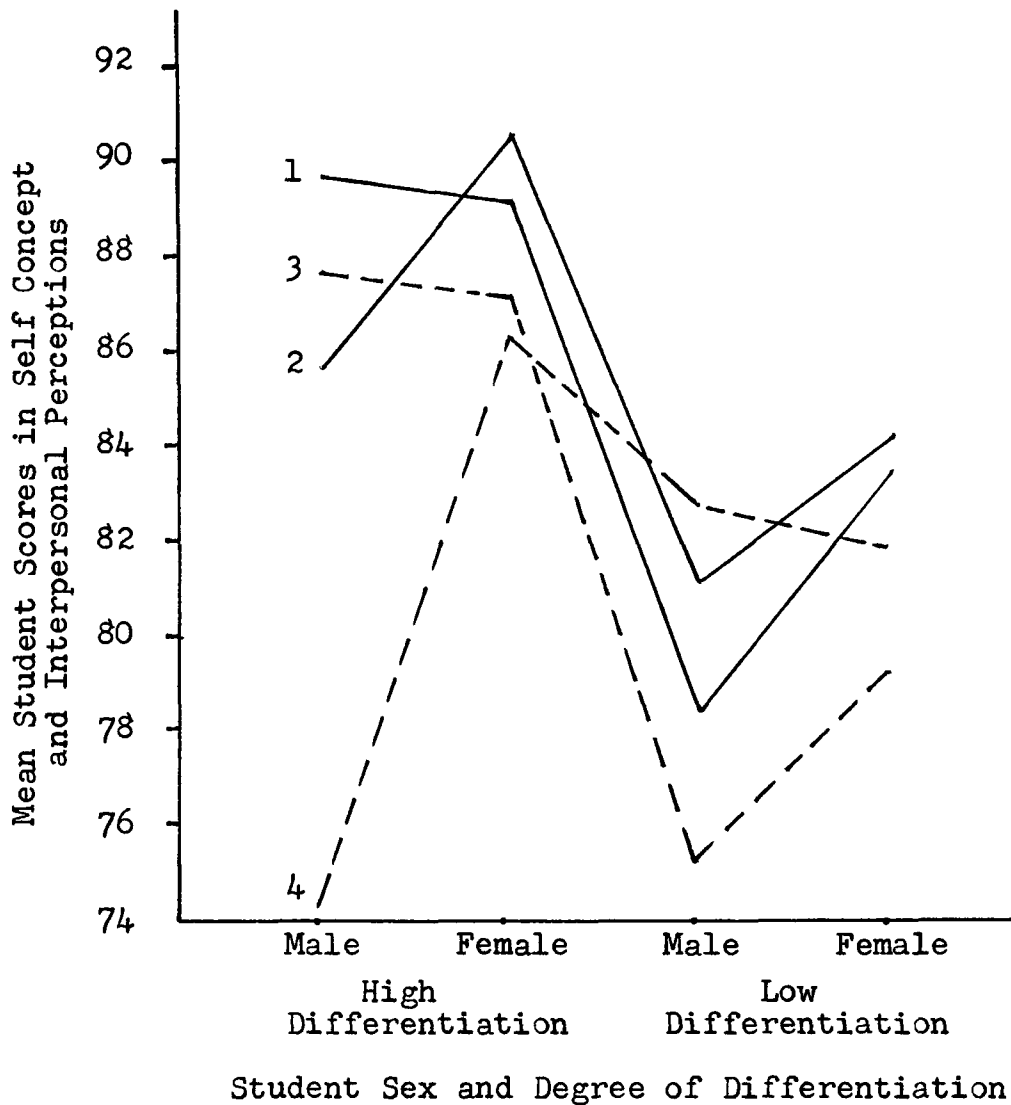
There was a significant interaction effect between the degree of differentiation of the teacher, the sex of the student and the degree of differentiation of the student in terms of student self concept and student-teacher interpersonal perceptions. The means and step down analysis are recorded in Table XIII and the interaction is clarified in the graph in Figure 4. The dependent variable self concept was not significant in univariate analysis. In step down

Table XIII.- Mean Student Scores and Step Down Analysis for the Dependent Variables Self Concept and Interpersonal Perceptions with Sex and Differentiation of Student and Differentiation of Teacher as the Independent Variables.

Dependent Variables	Teachers High in Differentiation				Teachers Low in Differentiation				Step Down Analysis	
	Student Differentiation				Student Differentiation				Observed F	Probability
	High		Low		High		Low			
	Male	Female	Male	Female	Male	Female	Male	Female		
S.C.	89.95	89.03	78.38	83.48	85.73	90.78	81.06	84.17	3.6953	.0572
I.P.	87.85	87.17	75.23	79.36	74.09	86.46	82.78	81.98	5.3414	.0227

S.C., Self Concept.

I.P., Interpersonal Perceptions.



1. Self concept of students with teachers high in degree of differentiation.
2. Self concept of students with teachers low in degree of differentiation.
3. Interpersonal perceptions of students with teachers high in degree of differentiation.
4. Interpersonal perceptions of students with teachers low in degree of differentiation.

Figure 4.- Line graph of two levels of teacher differentiation showing mean student scores for self concept and interpersonal perceptions plotted against student sex and degree of differentiation.

analysis using self concept as a co-variate, interpersonal perceptions made a unique contribution. The graph in Figure 4 indicates that the greatest variations in interpersonal perceptions were with male students high in degree of differentiation. Male students high in degree of differentiation had the least positive student-teacher interpersonal perceptions with teachers who were low in degree of differentiation.

There were significant interaction effects on student attitude to reading and student attitude to mathematics with sex of teacher, differentiation of teacher and sex of student as dependent variables. The means and step down analysis are presented in Table XIV. The interaction is represented graphically in Figure 5.

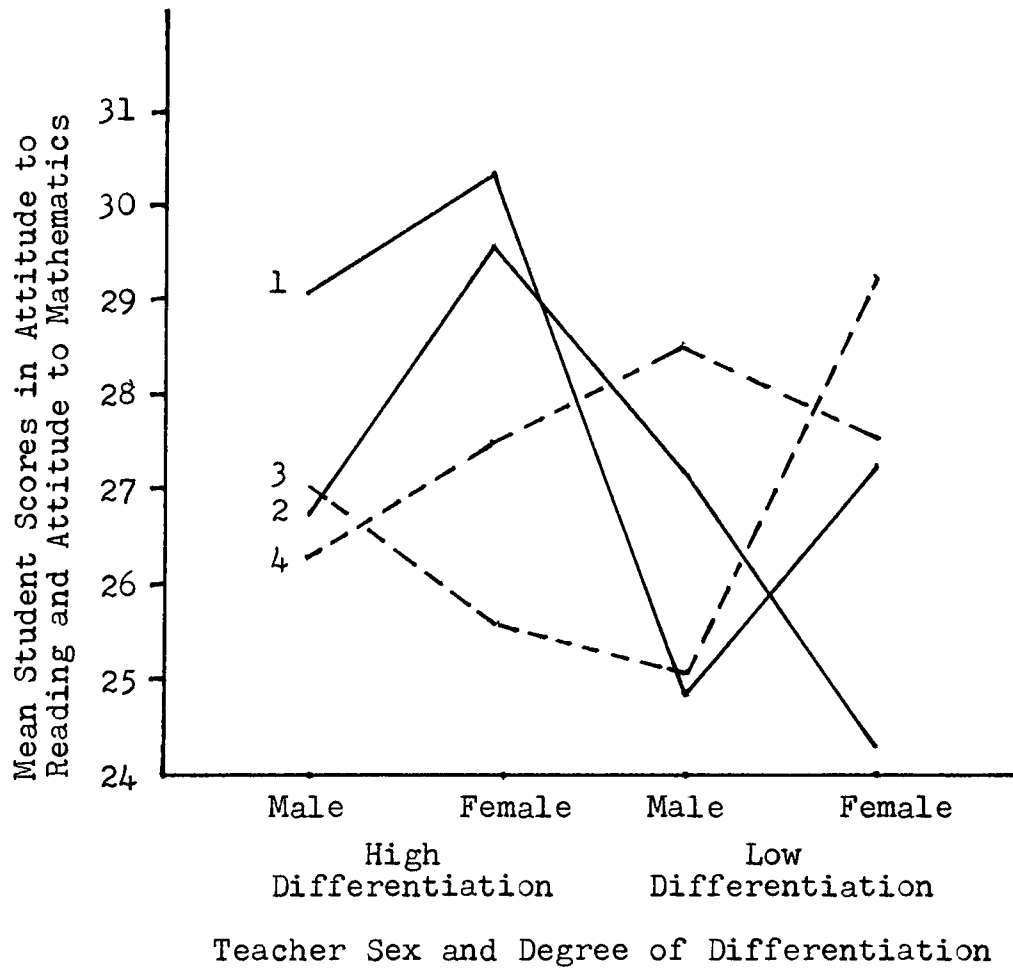
The variable attitude to reading was not significant in post hoc analysis. Using attitude to reading as a co-variate, attitude to mathematics made no unique contribution. The nature of the effects results from the interaction of the two variables.

No explanation can be found to account for these results. It would appear necessary to repeat the study to discover if these interactions still hold or whether they were unique to the research population or the circumstances of research.

Table XIV.- Mean Student Scores and Step Down Analysis for the Dependent Variables Attitude to Reading and Attitude to Mathematics with Teacher Sex and Differentiation and Student Sex as the Independent Variables.

Dependent Variables	Teachers High in Differentiation				Teachers Low in Differentiation				Step Down Analysis	
	Male		Female		Male		Female		Observed F	Probability
	Sex of Student		Sex of Student		Sex of Student		Sex of Student			
	Male	Female	Male	Female	Male	Female	Male	Female		
Att.R.	26.88	29.01	29.61	30.43	27.21	24.92	24.45	27.35	3.2252	.0753
Att.M.	26.49	27.11	29.51	25.73	28.53	25.06	27.59	29.36	3.8654	.0518

Att.R., Attitude to Reading.
Att.M., Attitude to Mathematics.



1. Attitude to reading of male students.
2. Attitude to reading of female students.
3. Attitude to mathematics of female students.
4. Attitude to mathematics of male students.

Figure 5.- Line graph of student sex showing mean student scores for attitude to reading and attitude to mathematics plotted against teacher sex and level of differentiation.

SUMMARY AND CONCLUSIONS

The major finding of the study was that the interaction of the variables, degree of differentiation of teacher and degree of differentiation of student effected student-teacher interpersonal perceptions and that the degree of differentiation of the student effected his self concept, attitude to reading and achievement in mathematics and in reading.

The results of the study support Witkin's theory in two ways. They show that students high in degree of differentiation have a more positive self concept and higher achievement in reading and in mathematics. They confirm the contention that people who are matched in degree of differentiation with those with whom they interact, have more positive interpersonal perceptions than subjects mismatched in degree of differentiation.

DiStefano indicated that a post hoc examination of student means in his student-teacher study showed that on the basis of teacher assigned marks in a number of subject areas, students who were matched in degree of differentiation with their teachers had higher scores than students who were mismatched in degree of differentiation with their teachers¹.

¹ Personal communication with the author, November 1973.

This observation may extend the effects of teacher expectancy because when standardized test measures of student achievement are used in the present study, this effect is not observed.

It is of particular interest to consider the results of the tests of hypotheses one and two together. The interaction predicted in hypothesis one effects only the set of variables self concept and interpersonal perceptions with interpersonal perceptions making a unique contribution and self concept not being significant in step down analysis. Consistent with the theoretical reasoning, student-teacher interpersonal perceptions were expected to change most readily. The other five dependent variables have a more stable character and it is not surprising that they did not change. The emphasis here is clearly on the interpersonal effects.

The degree of differentiation of the student effects these five more stable variables and does not effect student-teacher interpersonal perceptions. That there are significant effects for these five variables is understandable when a reverse argument, involving a long period during which highly differentiated students have enjoyed success, is used. The results of hypothesis one and the explanation given are therefore complimented by the results and explanation presented in hypothesis two.

One aspect of the findings which clearly requires further elaboration is the effects of the sex variable. There is also a need to pursue in longitudinal study how sex effects in student-teacher interaction may change as a student grows older. A seventeen year old boy would be expected to react differently, on the basis of the sex factor alone, to a young female teacher as compared to the reaction of a male grade six student.

The effects related to the male teacher group low in degree of differentiation should be reexamined. It would be desirable to repeat the study using a different instrument for measuring the degree of differentiation of student and teacher. In this reexamination teacher-made test measures of student achievement could also be obtained to compare with those of standardized measures.

The most important study in extension of the present findings would appear to be one in which a longer time period of student-teacher exposure is permitted so that it can be established whether or not achievement in mathematics and in reading is eventually higher for students matched in degree of differentiation with their teachers. This would require that either the teacher moved to the next grade level with his students or that students had teachers in successive years who had a similar degree of differentiation.

It is hoped that the findings of this investigation in conjunction with the suggestions for further study will promote extension and clarification of the Witkin construct of self-nonsel-differentiation as it is related to an educational setting.

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APPENDIX 1

Summary of Selected Findings Regarding Degrees of Differentiation (after DiStefano, 1969)

A. Sociability and Social Dependence

1. Low Degree of Differentiation:

more gregarious, affectionate and dependable

view themselves, and viewed by others, as socially dependent

less discriminating and selective in friendships

more considerate

more attentive to subtle social cues from others

more able to recall human faces, recognize own features

discriminate less sharply between most and least-preferred co-workers

less concern for philosophical problems and intellectual, impersonal approaches to solutions

less able to separate from family

women more often rely on external constructs to describe others

2. High Degree of Differentiation:

more socially remote and independent, aloof

more discriminating and selective in friendships

less need for, interest in, people

less considerate

less attentive to subtle social cues from others

less able to recall human faces, recognize own
features

discriminate more sharply between most and least-
preferred co-workers

greater concern with philosophical problems

tend to intellectual, impersonal approaches to
problems

more able to separate from family

women more often refer to internal constructs when
describing others

more active initiators (girls)

more popular (boys)

B. Conformity and Suggestibility to Influence

1. Low Degree of Differentiation:

children tend to rely on examiner for task
definition

more dreaming overtly about laboratory experiences,
experimenter

less ability to establish, maintain attitudes,
judgments, sentiments without continuous reference
to outside standards

less active attitude

less stability of self-view across situations

greater tendency to experience body as vague
mass, not clearly segregated from surroundings
more influenced by factors involving self-view

2. High Degree of Differentiation:

less reliance on examiner for task definition
less dreaming overtly about laboratory experiences,
experimenter

greater ability to establish, maintain attitudes,
judgments, sentiments without continuous reference to
outside standards

rate selves more self-confident, self-assured and
behave that way

more concerned with mastery over environment
more active attitude

greater stability of self-view over various
situations

experience bodies as more articulated

less influenced by factors involving self-view

Characteristics of Drawings Reflecting
Level of Articulation (Witkin, 1974)

A. Form level

1. Primitive features

- a. circles or ovals for body and limbs
- b. triangular or rectangular body with limbs stuck on
- c. other forms lacking attempt at human shape
(e.g., absence of waist, shoulders, etc.)
- d. limbs in form of sticks or ovals, shapeless,
ending in pronglike or clawlike fingers; no
shaping of hands; pronglike or clawlike toes
- e. contact point of limbs to trunk involving
overlapping or transparent joining; limbs stuck
on or detached (as opposed to integrated body
parts)
- f. grossly unequally sized arms, legs, ears,
fingers, etc., combined with primitive form,
uncontrolled lines
- g. indiscriminately attached or misplaced body
parts (e.g., arms attached at center of trunk)

2. Articulated features

- a. definite, shaped body outline; head, neck,
shoulders well integrated into body outline and
lead into trunk and appendages

- b. attempt at human-like shape, proportioning
 - c. adequate profiling (e.g., trunk and legs facing in same direction, etc.)
- B. Identity and sex differentiation
- 1. Primitive features
 - a. objectively interchangeable male and female figures
 - b. difference between figures only in hair and/or hat treatment
 - c. minimal inadequate trunk differentiation (i.e., triangle trunk for female, oval for male, but otherwise identical; or belt for male and buttons for female as only difference)
 - 2. Articulated features
 - a. marked and adequate role assignment, expressed in clothing and/or shape (also expressed in hair, features, appropriate accessories, uniforms, etc.)
- C. Level of detailing
- 1. Primitive features
 - a. body parts omitted (e.g., absence of neck, nose, ears, or eyebrows; fingers attached directly to arms with hands omitted)
 - b. no clothing indicated
 - c. facial features expressed by dots or ovals
 - d. inadequate or inconsistent clothing (e.g., buttons but no neckline, cuffs or hemline; hat,

but no other clothing; toes shown in otherwise clothed figure; tie, but no neckline, etc.)

2. Articulated features

- a. consistent, well-rationalized detailing; clothing; facial expression; shoes
- b. figure cast in role with good attempt at presentation of action
- c. figure cast in role with presentation of accessories consistent with this role (e.g., cowboy with smoking gun, etc.)

Witkin Sophistication-of-Body Concept Rating Scale
Children's Version

Ratings

1. Most articulated drawings: These manifest high form level (e.g., waistline, hips, shoulders, chest or breasts, shaped or clothed limbs, etc.); appendages and details represented in proper relation to body outline, with some articulation in mode of presentation; appropriate, even imaginative, detailing (e.g., young girl in evening clothes, well-dressed man with cigarette, etc.)
2. Moderately articulated drawings: Drawings which show a definite attempt at role assignment (with regard to age, activity, occupation, etc.) through adequate detailing, shaping, clothing; with continuity of outline (i.e., integration of parts) attempted.
3. Drawings intermediate in level of articulation: Drawings in which identification of sex is evident, attempts at shaping and a fair level of integration of parts are manifest and a minimum of detailing is present.

4. Moderately primitive drawings: Drawings which essentially lack features of differentiation through form, integration, identity, or detailing; however, these drawings show slightly more complexity in some respect (e.g., presence of one body part that is unusual in most primitive drawings, such as the neck) than drawings rated 1.
5. Most primitive and infantile drawings: These manifest a very low level of form (ovals, rectangles, sticks, stuck on to each other); no evidence of role or sex identity (same treatment of male and female with, at most, difference in hair treatment, no facial expression, little shaping or clothing).

Modifications of the Sophistication-of-Body Concept Scale
for Use with Drawings by Adult Subjects (Witkin, 1974)

Characteristics of Drawings Reflecting Level of Articulation

A. Form Level

The most differentiating indicator of articulation of form level in this group of adults was not only the general body shape, as in the children's drawings and in the more primitive adult drawings, but rather form level in terms of good integration of reasonably shaped body parts and articulation in the representation of the head and facial features, ranging from childish circle-oval head and eyes-nose-mouth, to a more differentiated and integrated head contour with subtlety of facial expression and features.

1. Primitive Features

The occurrence of any of the 7 items (a through g) under this heading in the children's scale (see Appendix 2) would automatically place the adult subject in a relative position of "most primitive," i.e., a "5" rating.

2. Articulated Features

Items (a - c) of children's scale (see Appendix 2):
The standard for "shaped body outline" is, of course,

much higher, with more than an "attempt" at human shape and good proportioning and integration necessary at the "articulation" end of the continuum.

B. Identity and Sex Differentiation

The items (a - c) of the children's scale (see Appendix 2) in this entire category helped only in the gross differentiation of the very primitive drawings; i.e., "marked and adequate" differentiation of drawings with respect to sex and roles, which in the children's drawings was found to be an indication of some articulation, was evident in all adult drawings with exception of a few of the "most primitive" (and bizarre). However, the level of sex differentiation still contributed to the ratings: the higher the level of articulation, the more superior the integration of emphasized differentiating sex characteristics, and/or roles.

C. Level of Detailing

This third category, which overlaps with the preceding two, is in a way the most differentiating one in the evaluation of the drawings, especially in the intermediate groups. This was so in the rating of the 10-year-olds as well as the older group. The items, as outlined in the original scale, essentially are applicable to the older group as well, though, of course, the standards are raised considerably.

Witkin Sophistication-of-Body Concept Rating Scale
Adult Version

Rating of 5

This group consists of the most primitive drawings; these drawings characteristically manifest most of the following signs of absence of differentiation (reflecting either complete lack of development and extreme immaturity, or disintegration of a depressive nature):

A. Primitive integration

1. body parts stuck on to each other (head, neck, rump, limbs), appendages stuck on to torso or superimposed upon body outline (i.e., transparencies of limbs).
2. disintegration of figure or appendages, i.e., discontinuing of body and/or appendages, fading out into confused scribbles or nothingness.
3. arms (and/or feet) abruptly ended by claws.
4. sex characteristics and other features arbitrarily superimposed, e.g., square representing female torso with two circles for breasts or dot for bellybutton; circles on limbs representing joints, etc.

5. scribbled hair, or hat, stuck on to the top of head outline.
- B. Primitive forms, shape
1. circle or oval heads, with no attempt at shaping hairline, etc.
 2. facial features represented by ovals, circles, dots, with no attempt at expression.
 3. no, or very poor, attempt to approximate human shape, predominant use of rectangles and circles or ovals, representing all body parts. Unarticulated use of scribbles, sticks, for limbs.
- C. No attempt at realistic or symbolic representation by means of detailing
1. empty drawings, bare outlines.
 2. no representation either of clothing or of nude body, or inconsistency in representation (e.g., buttons, but no other indication of clothing, no neckline, cuffs, etc.).
 3. gross body outlines, representation of barest essentials, i.e., head, torso, appendages, with all minor and many major omissions.
 4. barest essentials of facial features, i.e., eyes, nose, mouth, often eyebrows, occasionally ears, all represented by primitive forms.
- D. Unmodulated, uncontrolled line

Rating of 4

This group consists of slightly less primitive drawings. While still quite undifferentiated in nature and quality, drawings in this group show a markedly higher level of integration of body parts (all subjects at least attempt to integrate arms, legs, neck, and head, though some succeed very poorly). Some attempt at representation of the human body shape is manifest, with either some indication of clothing or some isolated basic detail of the bare body. Facial features are generally more detailed, a bit less primitive, with some drawings in this group showing definite facial expression. There are no omissions of basic features (all figures have ears, neck, hands, or at least a somewhat rationalized omission of only one of these features). Lines are more consistent and deliberate.

Rating of 3

This group consists of drawings which are intermediate in all the areas evaluated in the primitivity-articulation scale. Characteristically, these drawings are adequate in level of integration, form, detailing, and individual facial expressions. These productions manifest no relatively outstanding articulation or complexity on the one hand, nor signs of extraordinary lack of differentiation or of disintegration on the other.

Rating of 2

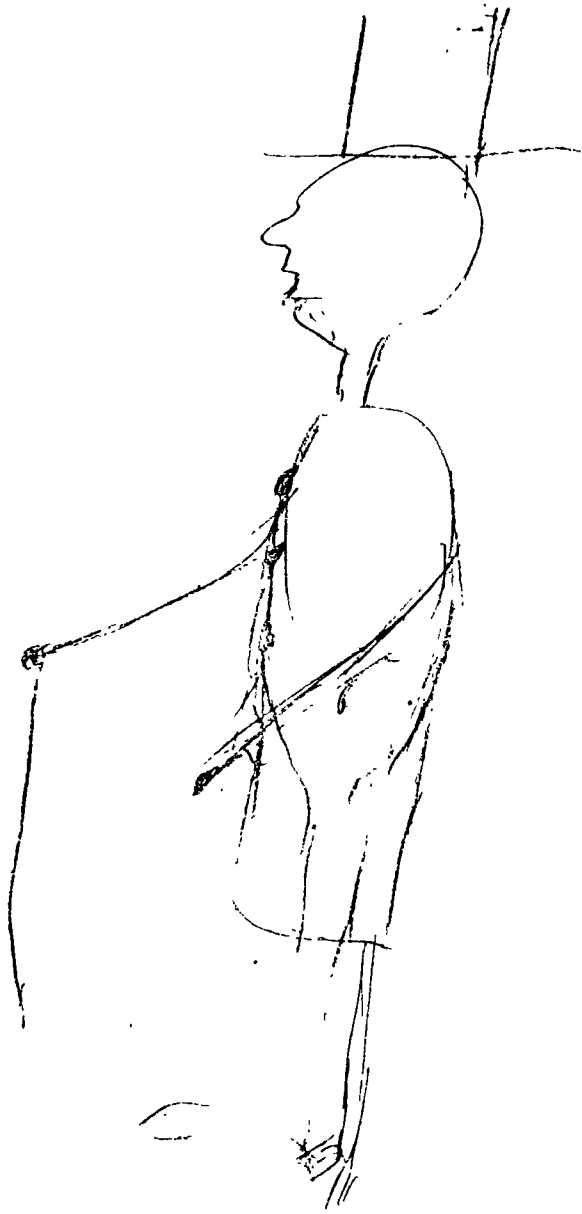
This group contains drawings which, while not superior in all areas of the rating scale, show a relatively high degree of articulation in one or several aspects. The level of integration is good and the attempt at representation of the human shape and of realistic proportions is marked; there is an emphasis on detailing and facial expression. However, the end product appears less deliberate, the lines less decisive, the drawings less skillful and in particular the head treatment is less articulated than that of drawings placed in Group 1.

Rating of 1

This group consists of the most articulated drawings. These drawings are characterized by great emphasis on detail of head, face, expression, as well as clothing and/or body features, shape, and sex characteristics, (often excessively narcissistic), combined with not only an attempt at, but very skillful achievement of rational, consistent integration of body parts, clothing, and accessories, decisively and purposefully drawn.

Human Figure Drawings of Adults

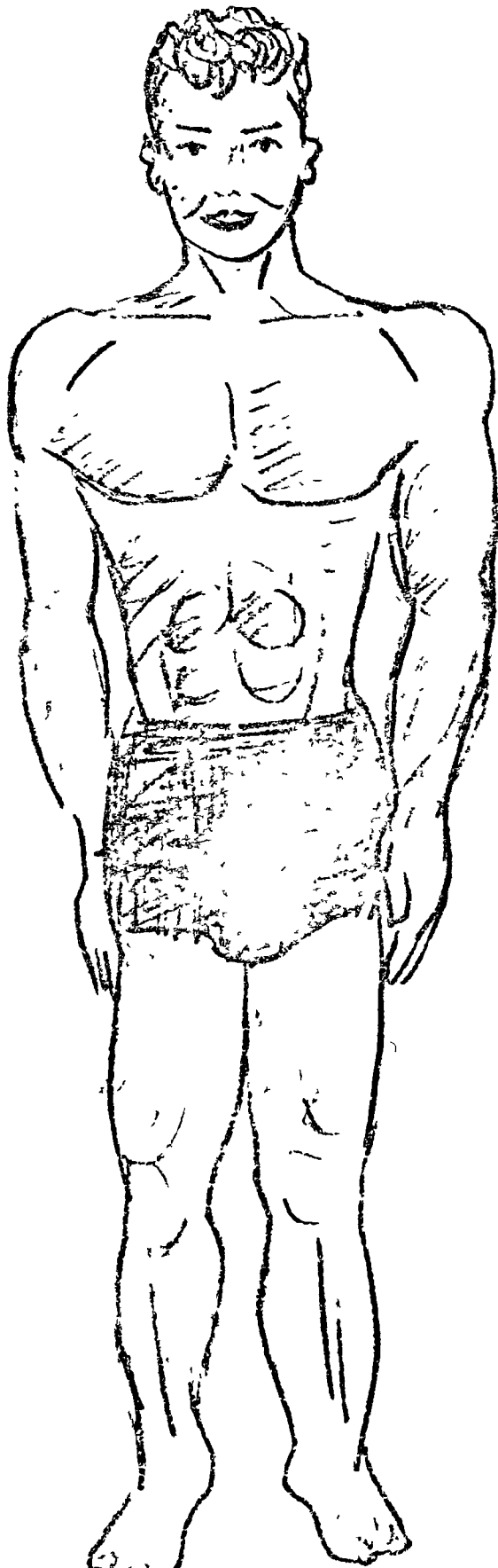
The first two are given ratings of 5;
the latter two ratings of 1.



Adult Rating: 5



Adult Rating: 5



Adult Rating: 1



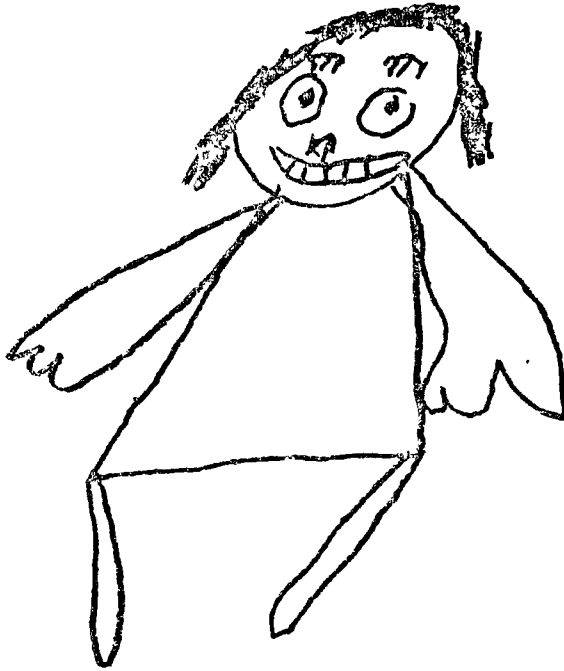
Adult Rating: 1

Human Figure Drawings of Children

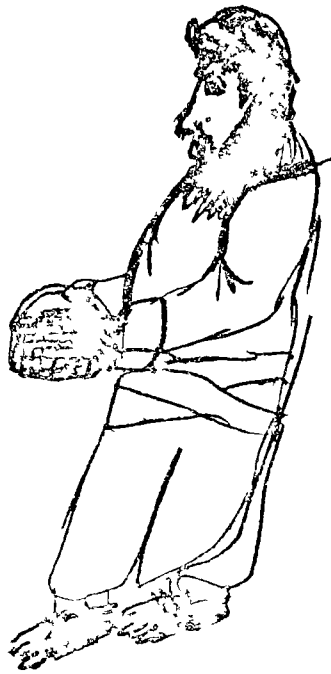
The first two are given ratings of 5;
the latter two ratings of 1.



Child Rating: 5



Child Rating: 5



Child Rating: 1



Child Rating: 1

Davidson Lang Check List of Traits, Form One

NAME SCHOOL

I think I am:

	Most of the time	Half of the time	Seldom or almost never
Fair
A nuisance
Afraid
Cheerful
A time waster
Neat
Not eager to learn
A leader
Unhappy
Loving
A hard worker
Bad
A good sport
Considerate
Not eager to study
Helpful
Careless
Sociable
Clever
Not alert
Outstanding
Loud
Generous
Nervous
Sensible
Polite
Lazy
Forgetful
Smart
Silly
Kind
Shy
A sloppy worker
Dependable
A day dreamer

Davidson Lang Check List of Traits, Form Two

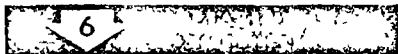
NAME SCHOOL

My teacher thinks I am:

	Most of the time	Half of the time	Seldom or almost never
Fair
A nuisance
Afraid
Cheerful
A time waster
Neat
Not eager to learn
A leader
Unhappy
Loving
A hard worker
Bad
A good sport
Considerate
Not eager to study
Helpful
Careless
Sociable
Clever
Not alert
Outstanding
Loud
Generous
Nervous
Sensible
Polite
Lazy
Forgetful
Smart
Silly
Kind
Shy
A sloppy worker
Dependable
A day dreamer

Canadian Test of Basic Skills

Reading Comprehension



Some Indian tribes on the northwestern coast had a curious custom that was known as the "potlatch." A potlatch was a feast or gathering at which presents were given.

These Indians were rich compared with most others. Fish from the ocean were plentiful, mountain game were abundant, and berries and seeds grew everywhere. The nearby forests gave the Indians wood for houses, canoes, and other uses. They thought it was a good thing to be rich, and each one tried to become richer. That was the purpose of the potlatch.

A potlatch might be given by a chief or other wealthy Indian brave, or even by a boy of ten or twelve if he belonged to a rich family. The boy would invite a number of boys his own age for a feast. After the feast, he gave everyone gifts. Usually these were blankets made of cedar bark. The more blankets he gave away, the greater would be his name. Also, the greater would be his gain, for each boy who was given blankets at the feast must return two, three, or more blankets for each one he received. If a boy could not do this, he showed himself to be less important than the boy who had given the potlatch.

When a chief gave a potlatch, it was usually for the chief of another tribe. The gift he had for the visitor was often a copper plate, one of the greatest treasures among these tribes. For such a gift the rival chief had to return many blankets or something else of greater value than the plate. Often the members of the tribe helped their chief to make the return gift great enough.

Anyone who returned at least as much as he was given at a potlatch could then himself give a potlatch and become richer and greater.

61. What is the best description of these Indians?

- 1) They loved to give parties and have fun.
- 2) They liked to be rich and important.
- 3) They were good hunters and fishermen.
- 4) They wanted everyone to be rich.

62. Who was supposed to benefit the most from a potlatch?

- 1) The Indian giving the potlatch
- 2) The guests at the potlatch
- 3) Everyone in the tribe
- 4) One cannot tell from this story.

63. Why were these Indian tribes rich?

- 1) They held potlatches
- 2) They had much copper.
- 3) They raised big crops.
- 4) They had many natural resources.

64. Where did the Indians get material for blankets?

- 1) From sheep
- 2) From goats
- 3) From trees
- 4) From grasses

65. Why would a chief give a potlatch for a chief of another tribe?

- 1) To show honour or respect
- 2) To demonstrate his power and importance
- 3) To become even richer and more important
- 4) To exchange copper for useful articles

66. Which of these was probably regarded as of greatest value by the Indians?

- 1) Three blankets
- 2) A copper plate
- 3) Many fish
- 4) A canoe

67. What does the story show about women and small children of the tribes?

- 1) They did not give potlatches.
- 2) They lived in separate villages.
- 3) They did all the work for a potlatch
- 4) None of them belonged to wealthy families.

68. Which word best describes the Indians who gave potlatches?

- 1) Stingy
- 2) Unselfish
- 3) Loving
- 4) Greedy

69. Which of these common expressions best describes the custom of the potlatch?

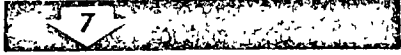
- 1) "Running around in circles"
- 2) "Biting off more than you can chew"
- 3) "Keeping up with the Joneses"
- 4) "Hitching your wagon to a star"

Go on to next page

Six boys came over the hill half an hour early that afternoon, running hard their heads down, their forearms working their breath whistling. They swept by the house and cut across the stubblefield to the barn. And then they stood self-consciously before the pony, and then they looked at Jody with eyes in which there was a new admiration and a new respect. Before today Jody had been a boy, dressed in overalls and a blue shirt—quieter than most, even suspected of being a little cowardly. And now he was different. Out of a thousand centuries they drew the ancient admiration of the footman for the horseman. They knew instinctively that a man on a horse is spiritually as well as physically bigger than a man on foot. They knew that Jody had been miraculous, lifted out of equality with them, and had been placed over them. Gabilan put his head out of the stall and sniffed them.

70. Who are the six boys mentioned in the first sentence?
- 1) Jody's playmates
 - 2) Jody's brothers
 - 3) Strangers to Jody
 - 4) The new owners of the pony
71. Why were the boys earlier than usual?
- 1) School closed early
 - 2) Jody was chasing them
 - 3) They had run all the way
 - 4) They started early
- Make no marks in this booklet*
72. Why were the boys in such a hurry?
- 1) They wanted to help Jody with his chores
 - 2) They wanted to see the new pony
 - 3) They wanted to play with Jody
 - 4) They wanted to be on time
73. What kind of a boy was Jody?
- 1) Quick-tempered
 - 2) Intelligent
 - 3) Courageous
 - 4) Timid
74. Which words best describe the new attitude of the boys toward Jody?
- 1) Cool but courteous
 - 2) Superior and scornful
 - 3) Envious and suspicious
 - 4) Respectful and admiring
75. What caused the change in the attitude of the boys toward Jody?
- 1) He had grown taller than the others
 - 2) He had liked a boy bigger than himself
 - 3) He had become the owner of a new pony.
 - 4) His disposition had improved a lot
76. What kind of crop had been planted in the field between Jody's house and the barn?
- 1) Onions
 - 2) Gram
 - 3) Turnips
 - 4) Potatoes
77. From which of the following is this paragraph most likely to have been taken?
- 1) A story about a boy and his pony
 - 2) A magazine article about famous race horses
 - 3) A book about King Arthur and his knights
 - 4) An account of the writer's boyhood
78. When did the incident described in this paragraph probably take place?
- 1) Just before lunch
 - 2) After school
 - 3) At dusk
 - 4) During the evening
79. In the writer's opinion, what explains the new feeling toward Jody?
- 1) Men on horseback have always been recognized as having an advantage over men on foot
 - 2) Men who are suspected of being cowards sometimes turn out to be the bravest men of all
 - 3) Frequently, the better we know a person the better we like him.
 - 4) A good horse has always made a good rider.





When Lewis Macfarlane was still in high school, his name became known to astronomers all over the world. Every night Lewis would carefully train his telescope on the sky. It was a homemade telescope with a lens only eight inches in diameter, but with its aid Lewis discovered a new comet. It was named Comet 1955F because it was the sixth comet discovered in 1955.

Young Macfarlane had been watching the sky for some time. One of his best friends and a fellow sky-watcher was Karl Krienke, a young mathematics teacher at Seattle Pacific College. One clear night early in the summer when Macfarlane and Krienke were watching the sky from the Macfarlane back porch, Krienke spotted a dim object neither of them could identify no matter how hard they studied the star charts. They saw the same object the next night. The third night was a rainy one but when the clouds finally broke, they could still see the mysterious object. They checked and rechecked their information. Then they rushed word of their find to the Harvard Observatory. "I was so excited," Macfarlane admitted, "I could hardly dial the telegraph office." Back came congratulations from the astronomers at Harvard. They had indeed found a new comet!

The Seattle stargazers were understandably thrilled about their discovery. They were a little disappointed to learn a few days later that they were going to have to share honours with a professional astronomer in Russia who had reported seeing the comet several hours before they did. Because of the difference in time between Russia and the western United States, the comet was visible in Russia seventeen hours before it could be seen in Seattle.

The two amateur astronomers bought a new ten-inch lens and put together a bigger telescope to replace the old eight-inch one. They continued to keep watch on Comet 1955F and to record its speed, appearance, and location.

Macfarlane glowed with enthusiasm when he talked about astronomy. "It's something — all those billions of miles of unknown space out there. And the comet — that's just about the most beautiful thing I ever saw!"

80. Who receives the most attention from the writer of this story?

- 1) Lewis Macfarlane
- 2) Karl Krienke
- 3) The Harvard astronomer
- 4) The Russian astronomer

81. Who probably saw the comet first?

- 1) Lewis Macfarlane
- 2) Karl Krienke
- 3) A Harvard astronomer
- 4) A Russian astronomer

82. What is the best description of Macfarlane's interest in astronomy?

- 1) It was his profession.
- 2) It was his hobby.
- 3) It was part of his school work.
- 4) It was a way of earning money.

83. What was Krienke's occupation?

- 1) Stargazing
- 2) Building telescopes
- 3) Teaching
- 4) Studying

84. Why was the comet not reported the first night Krienke and Macfarlane saw it?

- 1) They did not know where to report.
- 2) They wanted to recheck their observation.
- 3) It was too cloudy to see well.
- 4) They were too excited to dial the number.

85. How was the discovery reported to Harvard?

- 1) In a short-wave radio message
- 2) Through the newspapers
- 3) By letter
- 4) By telegram

86. Why did Macfarlane and Krienke continue to watch Comet 1955F after their discovery had been confirmed?

- 1) To get more information about the comet
- 2) To see the beauty of the comet
- 3) To make sure it was really a new comet
- 4) To find other undiscovered comets

87. Which agency officially confirmed the discovery?

- 1) Harvard University
- 2) Telegraph office
- 3) The *Seattle Times*
- 4) The Russian government

88. What evidence showed that Macfarlane would keep on studying the stars?

- 1) The newspapers reported his interest.
- 2) He planned to attend Harvard.
- 3) He knew where to report the discovery.
- 4) He built a new telescope.

Go on to next page

89. Why was the **F** used in the comet's name?
- 1) **F** stands for the Russian astronomer's name.
 - 2) **F** is the sixth letter in the alphabet.
 - 3) **F** stands for the word "found."
 - 4) **F** is the code letter for comets.

90. In what way is Macfarlane's story unusual?
- 1) He was a good sport.
 - 2) He had a cheap telescope.
 - 3) He was very persistent.
 - 4) He was a school boy.

91. How many people took active part in discovering Comet 1955F?
- 1) One
 - 2) Two
 - 3) Three
 - 4) Four

Jack-Be-Nimble

Summer is a candle
In a golden stick
A yellow, yellow candle
With a poppy wick.

A yellow, yellow candle
That burns a lovely while
Till autumn comes a-running
Down a purple mile.

Till autumn comes a-running
With a windy shout,
And vaults the golden candle-stick
And blows the poppy out

92. Why is "Jack-Be-Nimble" a good name for this poem?
- 1) There is a character in the poem named Jack-Be-Nimble.
 - 2) Summer comes quickly and goes quickly.
 - 3) An action described in the poem is similar to that performed by Jack-Be-Nimble in the nursery rhyme.
 - 4) Autumn has to be nimble to run a mile.

93. Which of these is the poet describing in the second and third stanzas?

- 1) A change of season
- 2) A summer storm
- 3) An obstacle race
- 4) A bonfire

94. Which of the following sentences best expresses the idea presented in the last line of the poem?

- 1) The race is finished.
- 2) Summer is over.
- 3) Night is falling.
- 4) The fire is out.

Make no marks
in this booklet.

95. Which kinds of words does the poet use most effectively to point up the difference between summer and autumn?

- 1) Gay words for summer, sad words for autumn
- 2) Familiar words for summer, strange words for autumn
- 3) Quiet words for summer, busy words for autumn
- 4) Long words for summer, short words for autumn

96. How should one read the verses to best bring out the effect of this poem?

- 1) Slowly throughout the poem
- 2) Fast throughout the poem
- 3) Quite slowly at first, faster toward the end
- 4) Quite fast at first, slowly toward the end

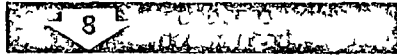
97. The tone of the poem appears to suggest which attitude on the part of the poet?

- 1) He can hardly wait for autumn to come
- 2) He likes one season of the year about as well as another.
- 3) He sees no reason for any change of seasons.
- 4) He wishes that summer might last longer.

98. What is the "poppy wick" in the first stanza?

- 1) Bright summer flowers
- 2) Red autumn leaves
- 3) The summer sun
- 4) A firefly





Q 1 A baby born in Canada today has a good chance of living to be 70 years old. This is a great gain in life expectancy. A baby born in this country in 1900 could expect to live only 48 years. Since that time the average length of life here has increased more than 20 years.

Q 2 According to experts at a large life insurance company, life expectancy has improved markedly. Thousands of years ago nobody kept records of how long people lived, but studies of bones that have been dug up show that way back in the Bronze Age a baby had a life expectancy of only 18 years. A child born two thousand years ago in the Roman Empire could count on living for 22 years. In the Middle Ages the figure rose to 35. There was no noticeable change from then until 1838 when life expectancy in England hit 40.

Q 3 How long we live depends to a considerable extent on where we are born. Norway, Sweden, Denmark, Holland, and England have rates much the same as that of Canada and the United States, with the other European nations close behind. India has the lowest rate. A baby born there today has a life expectancy of only 32 years. India, by the way, is the only country where a boy baby has a higher life expectancy than a girl baby. Other countries with low rates include Egypt, where the average length of life is 35; Mexico, where it is 39; and Puerto Rico, where it is 40. No recent figures are available for Russia.

Q 4 The experts arrive at life expectancy figures by averaging a population's death ages. The biggest single reason for the increase in life expectancy has been the decrease in the number of deaths among babies and young children. Better medical care and carefully planned diets today are saving the lives of many children who would formerly have had little or no chance of survival.

- 99** Where was the information for this article obtained?
- 1) From the Canadian Medical Association
 - 2) From the Bureau of Statistics
 - 3) From the World Health Organization
 - 4) From a life insurance company

- 100** A baby born in England a century ago could expect to live about how many years?
- 1) 25
 - 2) 45
 - 3) 55
 - 4) 70

- 101** What is the present life expectancy rate for France?
- 1) A little more than 70 years
 - 2) Just 70 years
 - 3) A little less than 70 years
 - 4) Lower than that of any other country of Western Europe

- 102** A baby born today in Denmark can be expected to live about how much longer than a baby born in Mexico?
- 1) 1 year
 - 2) 10 years
 - 3) 30 years
 - 4) 50 years

- 103** Why can boys born in India expect to live longer than girls?
- 1) Boys are naturally stronger than girls
 - 2) Girls have to work harder than boys in India
 - 3) There are more boy babies than girl babies born in India
 - 4) The article does not tell

- 104** What information must the experts have before they can calculate life expectancy rates for a particular population?
- 1) The ages at which members of the population die
 - 2) The diseases responsible for deaths in the population
 - 3) The number of babies born each year
 - 4) The nationality of the parents of all newborn babies

- 105** What is the purpose of the writer in paragraph 3?
- 1) To compare life expectancy rates of various countries
 - 2) To explain why people live longer today than they used to
 - 3) To explain why the life expectancy rates differ in different countries
 - 4) To show that life expectancy is higher for girls than for boys

- 106** Which of the following has contributed most to lengthening life expectancy?
- 1) The discovery of new drugs
 - 2) The absence of wars in recent times
 - 3) Improved care of babies and children
 - 4) The decline in automobile accidents

- 107** Why does the writer give no figures on life expectancy in Russia?
- 1) The writer does not know how to read the Russian language
 - 2) The Russians have not given out any recent information on the subject
 - 3) The Russians do not keep records of births and deaths
 - 4) The article does not tell

- 108** What is the best title for this article?
- 1) "Lengthening Life Expectancy"
 - 2) "New Facts About Life Insurance"
 - 3) "What the Experts Say About Life and Death"
 - 4) "Why Canada Is the Best Place to be Born"

- 109** What is "life expectancy"?
- 1) An official record of births and deaths in a particular community
 - 2) The average length of life that is expected for particular population
 - 3) The standard of living that a particular population may expect to enjoy at a particular time
 - 4) The amount of work that an individual may expect to accomplish during his lifetime

Q 1 How would you like to have a job in the House of Commons when you are fourteen years old? It sounds impossible? Well believe it or not boys of this age are working regularly for a good salary in the House of Commons. These boys are pages or messenger boys. It is their duty to make themselves useful to Members of Parliament. They sharpen pencils, fill inkwells, deliver mail, bring newspapers and see that Members of Parliament have all the supplies they need. They pass out copies of proposed laws and other documents that Members need in order to follow discussions in the House of Commons. They run errands all over the Commons and the federal office buildings. Often a page is sent hurrying to the Archives for a certain book or piece of information that is required on short notice.

Q 2 The pages are required to work from 1 to 6 p.m. and from 8 to 11 p.m. Every afternoon at 2:45 p.m. they are lined up and marched into the House of Commons. There they take up their positions and remain during the sittings. When a Member of the House of Commons snaps his fingers or waves a paper or shouts "Page!" he expects a boy to be at his side almost instantly. The pages are always watching the Members of Parliament so that they may respond immediately to a signal for help.

Q 3 The page boys in the House of Commons are all sons of widowed mothers and generally of war widows. Each is a boy who is in need of a job. About half of the boys are English and the other half French. Most of the boys live in or near Ottawa. Each boy must have a certificate permitting him to be absent from school during Parliament. As soon as Parliament is over, all the boys must return to school. In selecting the sixteen pages from many applicants, preference is given to boys who are intelligent, neat and courteous. Boys with good features are preferred but good looks are not the most important consideration. After a few months most of the page boys have changed from shy, awkward boys into well-groomed, poised young men. The average dura-

tion of an appointment as a page boy is two years but it may be for as long as three sessions.

Q 4 Years ago the boys wore knickerbockers which were the style then. On duty the pages now wear an Eton suit. Fancy ties, coloured shirts, or bright hued socks are not permitted. The clothing and behaviour of the pages are closely watched by the chief page who is an older man and a regular employee of the House of Commons.

Q 5 The page boys have their own traditions. Soon after they are employed a group picture is taken. Down in the basement of the House of Commons the page boys have their own rooms. On the walls of these rooms the group pictures are hung. Among the "Old Boys" are well-known athletes, soldiers, journalists and government officials. One ex-page was even elected as a Member of Parliament in later life. Warm and lasting friendships are formed during the brief career of a page boy. Sometimes Members of Parliament entertain the pages.

Q 6 Former pages also enjoy getting together to talk about special events they shared. One of the most memorable occasions for some of the pages was the Royal Visit in 1939. King George VI and Queen Elizabeth noticed the page boys and His Majesty walked over and shook hands with each one. On another occasion the Earl of Avon, former British Prime Minister Anthony Eden, specially noted the pages in a visit to the House of Commons. Since he had attended Eton College himself, he quickly recognized the Eton suits and went over to speak to the page boys.

Q 7 No matter how unusual the request or how difficult the errands, pages must keep smiling and remain courteous at all times. This is not hard to do as most of them enjoy their work. All too soon the career as a page is ended. When a page is too big for his suit, he has outgrown both his suit and his job.

121. On what basis is a page selected for his job?
 1) Application
 2) Election
 3) Written examination
 4) School commendation
122. Which of these is most important for success as a page?
 1) Aggressiveness
 2) Imagination
 3) Alertness
 4) Charm
123. From what income group do the pages come?
 1) All groups
 2) High
 3) Middle
 4) Low
124. What is the length of the pages' working day?
 1) About one hour
 2) About eight hours
 3) About five hours
 4) It varies
125. Which word best describes the pages' clothing?
 1) Western
 2) Flashy
 3) Old-fashioned
 4) Conservative
126. When do pages enter the House of Commons?
 1) At an appointed time
 2) When they are called by a Member
 3) At 1.00 p.m.
 4) When they are ready
127. Who is responsible for the behaviour of the pages?
 1) A special employee of the House of Commons
 2) The secretary of the political party
 3) The Speaker of the House
 4) The doorkeeper
128. Which of these is not a factor in selecting pages?
 1) Family situation
 2) Language spoken
 3) Height
 4) Place of residence
129. Who are the "Old Boys" in this selection?
 1) Members of the House of Commons
 2) Men who were once pages
 3) Retired soldiers
 4) Former hockey players
130. Which of these does not describe the job of a page?
 1) Permanent
 2) Profitable
 3) Exacting
 4) Interesting
131. Which of these is discussed last?
 1) The work schedule of pages
 2) What pages wear
 3) How pages get their jobs
 4) The duties of pages
132. In an outline, what might be a good heading for the first paragraph?
 1) "Jobs in Government"
 2) "Boys in the House of Commons"
 3) "The Requirements of a Page"
 4) "The Duties of a Page"
133. What are the two main ideas of paragraph 3?
 1) Getting a job, keeping a job
 2) How pages are selected, where pages come from
 3) Belonging to the right party, coming from the right family
 4) What pages are like, a job for deserving boys
134. Which of the following topics is not discussed in paragraph 3?
 1) Number of pages
 2) Length of appointment
 3) Political party
 4) School attendance
135. Paragraph 5 points up the fact that pages
 1) enjoy their work.
 2) often become Members of Parliament.
 3) often do well in later life.
 4) have some peculiar customs.
136. Which paragraph might be omitted with least loss to the main purpose of the story?
 1) Paragraph 1
 2) Paragraph 2
 3) Paragraph 6
 4) Paragraph 7



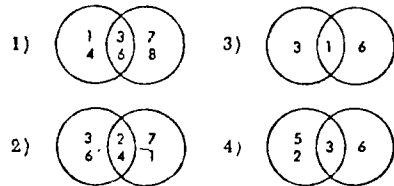
Canadian Test of Basic Skills

Mathematics Supplement

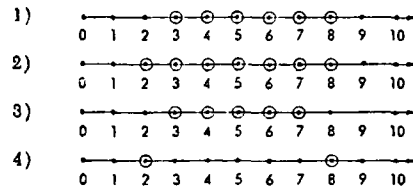
66. In which set of fractions are the elements equivalent?

- 1) $\left\{\frac{1}{2}, \frac{4}{8}\right\}$ 3) $\left\{\frac{1}{3}, \frac{2}{3}\right\}$
 2) $\left\{\frac{3}{4}, \frac{3}{5}\right\}$ 4) $\left\{\frac{5}{8}, \frac{8}{5}\right\}$

67. In which diagram below are the numerals 3 and 6 in the intersection of the two circular regions?



68. Which graph shows the whole numbers greater than 2 and less than 8?



69. The heights of four girls are given below. Which girl is the closest to five feet tall?

- 1) Mary — 58 inches
 2) Jane — 4 feet, 8 inches
 3) Sue — $4\frac{1}{2}$ feet
 4) Ann — 1 yard, 1 foot, 3 inches

70. Which of the following fractions is *not* a name for a whole number?

- 1) $\frac{3}{2}$ 3) $\frac{8}{4}$
 2) $\frac{0}{6}$ 4) $\frac{1}{2}$

71. Mr. Evans covered the top of a rectangular table with tiles that were 1 inch square. The table was 22 inches long and 10 inches wide. How many tiles did he use to cover the table?

- 1) 32 3) 110
 2) 64 4) 220

72. Which expression below is equivalent to 16×34 ?

- 1) $(10 \times 34) + (6 \times 34)$
 2) $(10 \times 6) + (30 \times 4)$
 3) $10 \times 16 + 34$
 4) $(16 + 30) \times (16 + 4)$

73. Which of these fractions can be expressed as a mixed numeral?

- 1) $\frac{3}{4}$ 3) $\frac{4}{6}$
 2) $\frac{5}{5}$ 4) $\frac{3}{2}$

74. Which of the following would be the best way to estimate the product of 317 and 691?

- 1) 300×600 3) 400×600
 2) 300×700 4) 400×700

75. Which of the following is a common denominator for the set of fractions $\left\{\frac{1}{2}, \frac{1}{4}, \frac{1}{8}\right\}$?

- 1) 6 3) 12
 2) 8 4) 16

76. How would you write 9 hundredths as a decimal?

- 1) .009 3) .9
 2) .09 4) 900

77. What pair of numerals should replace the \square and the Δ in the number sentence $103 = (\square \times 5) + \Delta$?

- 1) 2 and 3 3) 20 and 0
 2) 20 and 3 4) 5 and 3

78. Which of the following is a set of equivalent fractions?

- 1) $\left\{\frac{1}{4}, \frac{2}{4}, \frac{3}{4}\right\}$ 3) $\left\{\frac{1}{2}, \frac{2}{4}, \frac{3}{6}\right\}$
 2) $\left\{\frac{2}{3}, \frac{2}{5}, \frac{2}{7}\right\}$ 4) $\left\{\frac{1}{2}, \frac{2}{3}, \frac{3}{4}\right\}$

79. What is the ratio of 1 inch to 2 feet?

- 1) $\frac{1}{24}$ 3) $\frac{1}{10}$
 2) $\frac{1}{12}$ 4) $\frac{1}{2}$

80. Which of these is a way to find a fraction equivalent to $\frac{4}{5}$?

- 1) $\frac{4 \times 2}{5 \times 2}$ 3) $\frac{4 + 2}{5 \times 2}$
 2) $\frac{4 - 2}{5 - 2}$ 4) $\frac{4 + 2}{5 + 2}$

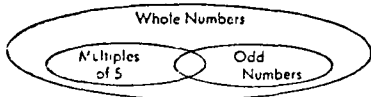
81. Which plane figure below has more than 4 interior angles?
- | | |
|------------------|-------------|
| 1) Parallelogram | 3) Square |
| 2) Rectangle | 4) Pentagon |

82. Which value of n will make the number sentence $12 - n > 5 \times 1$ true?
- | | |
|------|------|
| 1) 6 | 3) 3 |
| 2) 4 | 4) 2 |

83. Which of the following is greater than $\frac{1}{2}$ and less than $\frac{3}{4}$?
- | | |
|-------------------|------------------|
| 1) $\frac{5}{12}$ | 3) $\frac{5}{6}$ |
| 2) $\frac{5}{8}$ | 4) $\frac{5}{2}$ |

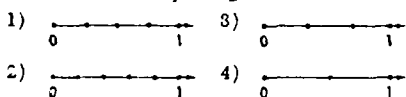
84. Which of these objects is the best model of a sphere?
- | | |
|--------------|---------------|
| 1) A tin can | 3) A baseball |
| 2) An egg | 4) A plate |

85. Which statement does the diagram below show to be false?



- | |
|---|
| 1) All odd numbers are whole numbers. |
| 2) Some multiples of 5 are odd numbers. |
| 3) Some whole numbers are odd numbers. |
| 4) All odd numbers are multiples of 5. |

86. Which number line below could best be used to show the sum of $\frac{1}{4}$ and $\frac{1}{2}$?



87. If $a \times 23 = b$, what is $b \div a$?
- | | |
|------------------|------------------|
| 1) $23 \times b$ | 3) 23 |
| 2) $23 + b$ | 4) None of these |

88. What is the greatest multiple of 10 that makes the number sentence $n \times 6 < 200$ true?
- | | |
|-------|-------|
| 1) 30 | 3) 34 |
| 2) 33 | 4) 40 |

89. Which of the following is greater than 45?
- | | |
|----------|---------|
| 1) .363 | 3) .447 |
| 2) .4409 | 4) .5 |

90. What should replace n in the equation $5 \times \frac{n}{5} = 8$?
- | | |
|------|-------|
| 1) 1 | 3) 8 |
| 2) 5 | 4) 15 |

91. The average of 3 numbers is 6. What is their sum?
- | | |
|-------|------|
| 1) 18 | 3) 9 |
| 2) 12 | 4) 2 |

92. The temperature early one morning in Montreal was -5 degrees. By noon the temperature had risen 18 degrees. What was the temperature at noon?
- | | |
|------------------|---------------|
| 1) -23 degrees | 3) 18 degrees |
| 2) 13 degrees | 4) 23 degrees |

93. Which of these is the best estimate of $1\frac{9}{10} \times 3\frac{1}{10}$?
- | | |
|-----------------|-----------------|
| 1) 2×3 | 3) 2×4 |
| 2) 1×3 | 4) 1×4 |

94. The net income of a certain motel chain in a recent year was \$2,242,342. Which of these is the closest approximate expression for this amount of money?
- | | |
|------------------------------|------------------------------|
| 1) \$2 $\frac{1}{2}$ million | 3) \$2 $\frac{1}{4}$ million |
| 2) \$2 $\frac{2}{3}$ million | 4) \$2 $\frac{1}{6}$ million |

95. If n is a whole number, which number sentence below is not always true?
- | |
|--------------------------------|
| 1) $(3 + 7) + n = 3 + (7 + n)$ |
| 2) $8 + n = n + 8$ |
| 3) $2 \times a = a \times 2$ |
| 4) $8 \div n = n \div 8$ |

96. If x represents the distance in miles from Ottawa to Sault Ste. Marie, what could the expression $2x + 25$ represent?
- | |
|--|
| 1) The distance from Ottawa to Vancouver |
| 2) A distance more than twice the distance from Ottawa to Sault Ste. Marie |
| 3) A distance less than twice the distance from Ottawa to Sault Ste. Marie |
| 4) Twice the distance from Ottawa to Sault Ste. Marie |



Attitude to Reading Inventory (after Osgood, 1957)

NAME SCHOOL

DATE OF BIRTH TEACHER

My Reading classes this year were:

- | | | | | | | | | |
|---------------|-----|-----|-----|-----|-----|-----|-----|-----------|
| 1. Slow | --- | --- | --- | -0- | --- | --- | --- | Fast |
| 2. Fair | --- | --- | --- | -0- | --- | --- | --- | Unfair |
| 3. Unpleasant | --- | --- | --- | -0- | --- | --- | --- | Pleasant |
| 4. Good | --- | --- | --- | -0- | --- | --- | --- | Bad |
| 5. Sharp | --- | --- | --- | -0- | --- | --- | --- | Dull |
| 6. Awful | --- | --- | --- | -0- | --- | --- | --- | Nice |
| 7. Sad | --- | --- | --- | -0- | --- | --- | --- | Happy |
| 8. Long | --- | --- | --- | -0- | --- | --- | --- | Short |
| 9. Weak | --- | --- | --- | -0- | --- | --- | --- | Strong |
| 10. Valuable | --- | --- | --- | -0- | --- | --- | --- | Worthless |

Attitude to Mathematics Inventory (after Osgood, 1957)

NAME SCHOOL
 DATE OF BIRTH TEACHER

My Mathematics classes this year were:

- | | | | | | | | | | |
|-----|------------|-----|-----|-----|-----|-----|-----|-----|-----------|
| 1. | Slow | --- | --- | --- | -0- | --- | --- | --- | Fast |
| 2. | Fair | --- | --- | --- | -0- | --- | --- | --- | Unfair |
| 3. | Unpleasant | --- | --- | --- | -0- | --- | --- | --- | Pleasant |
| 4. | Good | --- | --- | --- | -0- | --- | --- | --- | Bad |
| 5. | Sharp | --- | --- | --- | -0- | --- | --- | --- | Dull |
| 6. | Awful | --- | --- | --- | -0- | --- | --- | --- | Nice |
| 7. | Sad | --- | --- | --- | -0- | --- | --- | --- | Happy |
| 8. | Long | --- | --- | --- | -0- | --- | --- | --- | Short |
| 9. | Weak | --- | --- | --- | -0- | --- | --- | --- | Strong |
| 10. | Valuable | --- | --- | --- | -0- | --- | --- | --- | Worthless |

Mean Scores for Male and Female Teachers
High in Degree of Differentiation
and Low in Degree of Differentiation

	Male Teachers	Score	Female Teachers	Score
High	1	2	1	2
	2	4	2	2
	3	2	3	3
	4	4	4	4
	5	4	5	4
	6	3	6	4
	7	3	6	4
	8	4	8	2
	Mean	3.38	Mean	3.13
Low	1	8	1	8
	2	8	2	8
	3	10	3	8
	4	8	4	8
	5	8	5	8
	6	8	6	8
	7	8	7	10
	8	8	8	10
	Mean	8.25	Mean	8.50

Schedule of Testing Program

9:05 - 10:00	Reading Comprehension Test
10:10 - 10:25	Attitude to Reading Inventory
10:45 - 11:00	Davidson Lang Check List of Traits, Form One
11:05 - 11:20	Sophistication-of-Body Concept Scale, Part One
11:25 - 11:40	Attitude to Mathematics Inventory
11:45 - 12:00	Davidson Lang Check List of Traits, Form Two
1:30 - 2:00	Modern Mathematics Supplement to the Canadian Tests of Basic Skills
2:05 - 2:20	Sophistication-of-Body Concept Scale, Part Two

Student Scores in Each of the Six Dependent Variables

With Male Teachers High in Degree of Differentiation

High Male Students						Low Male Students						High Female Students						Low Female Students					
SC	IP	AM	AR	AcR	AcM	SC	IP	AM	AR	AcR	AcM	SC	IP	AM	AR	AcR	AcM	SC	IP	AM	AR	AcR	AcM
69	83	31	29	28	13.5	76	88	32	35	21	19.5	82	76	24	34	20	10.5	70	80	29	31	21	13.5
87	95	34	34	26	27	57	45	18	8	29	10.5	93	99	32	30	59	31.5	89	75	33	28	26	22.5
												89	73	23	32	53	9						
												78	74	24	27	26	15						
												71	80	27	29	48	22.5						
99	89	28	20	56	28.5	73	78	25	5	43	18	81	75	31	25	50	16.5	78	67	22	20	29	9
						81	76	14	29	54	19.5	94	86	25	24	53	21	84	70	31	30	23	14.5
						64	68	10	32	20	16.5												
						79	62	29	15	53	28.5												
						88	87	32	25	29	21												
92	90	35	35	27	20	75	73	18	23	48	35	98	97	28	27	57	31	99	93	22	35	51	18
						85	71	18	16	41	24	98	99	29	32	60	34						
						81	87	27	18	19	15	96	99	30	32	38	35						
						82	67	22	30	40	17												
						77	81	17	25	66	26												
						91	74	28	5	11	19												
						86	84	18	18	39	28												
						88	87	11	22	39	17												
						77	79	10	26	51	36												
95	95	25	35	42	30	67	57	21	20	25	24	92	98	33	35	40	30	83	86	26	20	24	17
						79	72	17	27	20	13												
						72	78	28	17	29	31												
						78	68	25	16	22	27												

With Male Teachers High in Degree of Differentiation Continued

High Male Students						Low Male Students						High Female Students						Low Female Students					
SC	IP	AM	AR	AcR	AcM	SC	IP	AM	AR	AcR	AcM	SC	IP	AM	AR	AcR	AcM	SC	IP	AM	AR	AcR	AcM
97	93	28	34	36	20	76	80	33	16	41	39	88	87	30	29	56	28	74	87	31	28	56	26
						65	52	20	31	22	14	84	76	30	31	63	31	78	66	27	25	37	13
						84	83	28	24	45	24							89	81	34	35	45	26
						84	81	31	34	46	34							87	85	24	31	45	32
						70	69	27	31	38	25							85	91	19	25	26	9
						88	81	20	21	18	13							74	78	23	19	38	25
						79	40	18	35	46	29												
						72	59	14	35	24	16												
82	74	34	23	37	22.5	80	71	16	15	46	28.5	81	75	20	32	17	13.5	80	57	23	21	25	19.5
						68	59	12	13	51	36	84	81	24	30	30	15	75	69	18	21	21	13.5
						64	55	28	22	34	22.5							82	82	27	28	51	25.5
						88	75	35	19	29	10.5												
						95	72	19	23	51	15												
						79	72	22	27	19	21												
89	91	28	35	62	36	91	87	34	32	41	18	91	89	28	34	29	26	83	80	34	33	42	31
						94	93	35	35	49	28	83	70	19	31	57	29						
						81	79	25	31	49	20	89	87	29	35	55	39						
						91	86	29	31	67	41	93	89	34	29	55	40						
						80	94	28	31	40	23	97	97	35	35	45	23						
86	74	23	23	48	28	77	67	34	35	51	33	91	94	25	30	37	20	88	84	29	18	48	29
						89	68	24	19	25	27	92	98	32	32	33	19	80	76	14	35	49	22
						84	73	26	34	41	24	88	82	25	35	50	24						
						76	72	25	33	41	26	90	89	25	31	43	32						
						75	87	25	32	54	32												
						76	71	19	32	50	27												
						73	72	27	27	36	35												

With Male Teachers Low in Degree of Differentiation

High Male Students						Low Male Students						High Female Students						Low Female Students					
SC	IP	AM	AR	AcR	AcM	SC	IP	AM	AR	AcR	AcM	SC	IP	AM	AR	AcR	AcM	SC	IP	AM	AR	AcR	AcM
79	69	20	20	27	23	97	91	30	19	34	26	99	93	23	19	59	37	97	97	28	28	23	23
85	85	22	29	50	40	73	79	23	6	38	36	92	90	25	23	47	27						
						99	81	24	24	23	22	95	83	31	17	52	42						
						97	96	32	32	49	34	97	92	25	33	30	23						
						93	93	27	5	30	28	95	95	34	5	40	36						
						96	87	28	15	34	26	81	87	33	34	45	29						
						97	97	22	25	26	26	94	90	35	28	27	29						
												95	80	33	10	52	36						
												99	97	35	35	49	38						
												94	89	25	33	41	16						
												81	87	28	32	67	41						
												91	83	18	35	35	33						
84	83	23	35	57	30	77	78	32	39	34	35	93	88	24	19	54	40	92	77	15	5	23	15
89	86	28	33	47	35	67	88	34	34	25	27	99	93	35	31	38	29						
						59	62	24	31	45	18	80	83	23	20	52	32						
						78	71	20	19	11	10												
						91	88	35	35	54	35												
						96	95	33	29	53	40												
79	84	33	30	36	25	87	82	31	32	29	18	97	90	22	20	28	22	74	78	25	22	35	19
												95	91	24	29	31	20	74	60	21	18	44	24
												97	90	28	26	56	30						
												86	74	28	31	36	18						
												91	83	23	19	35	23						

With Male Teachers Low in Degree of Differentiation Continued

High Male Students						Low Male Students						High Female Students						Low Female Students					
SC	IP	AM	AR	AcR	AcM	SC	IP	AM	AR	AcR	AcM	SC	IP	AM	AR	AcR	AcM	SC	IP	AM	AR	AcR	AcM
83	76	35	29	24	6	83	84	33	31	28	10	86	91	33	33	26	22	85	79	19	20	32	22
81	78	35	32	29	10	63	62	17	5	17	21	89	92	25	34	42	12						
						67	66	29	9	28	9												
						83	76	33	35	38	15												
94	93	30	25	52	31	84	82	25	26	53	21	97	93	32	31	36	24	97	87	34	34	30	23
						80	85	30	35	36	19	84	88	32	30	71	39	72	71	20	34	40	24
						91	95	32	34	49	17	88	80	33	30	53	33						
												99	98	35	35	31	23						
												86	93	31	29	41	30						
												90	87	33	34	40	31						
87	94	27	30	44	28	84	91	21	23	28	18	78	66	17	33	51	15	76	68	13	9	44	21
80	86	31	34	29	13	73	58	23	27	43	28	82	87	26	31	42	22						
81	76	31	22	50	29																		
78	82	22	35	55	40																		
91	96	31	31	61	36																		
93	82	30	17	37	24	79	86	25	29	41	18	96	95	32	35	38	28	64	42	30	26	31	18
						62	62	35	26	28	24	99	83	31	33	34	25	87	89	33	30	35	25
																		81	88	35	27	32	23
81	86	30	31	36	18	82	83	29	28	34	23	92	84	21	29	38	22	84	73	19	18	29	20
82	86	26	28	45	27							87	88	29	26	36	18	88	81	22	24	36	21
87	80	29	33	40	22							84	87	31	33	32	20						

With Female Teachers High in Degree of Differentiation

High Male Students						Low Male Students						High Female Students						Low Female Students					
SC	IP	AM	AR	AcR	AcM	SC	IP	AM	AR	AcR	AcM	SC	IP	AM	AR	AcR	AcM	SC	IP	AM	AR	AcR	AcM
93	99	14	19	61	39	85	84	31	5	11	9	87	77	35	35	62	36	97	99	21	22	17	16
						98	78	31	32	25	7							86	86	26	26	45	18
						82	87	33	25	28	14												
						88	70	22	22	26	16												
						94	77	34	35	34	24												
						79	92	25	35	16	16												
						74	80	29	35	28	11												
99	99	35	35	37	22	58	56	25	21	20	13	95	95	28	26	39	35	90	86	28	27	47	11
85	99	25	31	48	26	94	94	31	32	32	27	92	96	32	29	46	28						
86	75	32	32	49	26							86	92	31	35	44	33						
86	82	27	26	51	16	72	58	25	32	44	13	93	93	29	35	45	25	83	83	24	30	53	20
						78	65	26	25	33	21	90	90	34	32	47	28						
						75	77	27	35	25	19	79	93	33	34	38	25						
						60	60	22	21	37	17	97	97	32	35	66	33						
91	79	31	34	35	20	76	72	25	26	26	27	96	99	32	35	42	25	73	74	24	35	33	17
99	91	35	35	60	35							94	96	26	35	55	30						
												84	79	23	25	36	23						
												88	79	25	35	50	37						
												99	99	35	35	59	33						
												94	97	24	28	35	18						

With Female Teachers High in Degree of Differentiation Continued

High Male Students						Low Male Students						High Female Students						Low Female Students					
SC	IP	AM	AR	AcR	AcM	SC	IP	AM	AR	AcR	AcM	SC	IP	AM	AR	AcR	AcM	SC	IP	AM	AR	AcR	AcM
90	80	35	35	34	23	76	83	23	35	25	28	92	97	31	30	36	24	86	74	19	29	36	24
87	76	34	35	47	29	97	96	29	31	30	15	80	85	29	30	49	28						
						82	81	35	34	37	31	95	96	34	33	41	26						
												92	93	33	33	55	32						
												85	91	24	25	45	30						
												93	97	25	28	26	12						
												93	98	31	33	36	20						
												91	87	34	35	51	33						
												93	92	32	35	58	39						
												98	98	35	34	30	25						
89	89	35	35	35	13	82	90	27	29	34	24	99	99	35	35	42	38	86	61	15	35	34	15
78	92	29	31	51	24							97	99	34	35	62	36	79	73	26	19	19	19
91	89	27	30	45	37							72	77	23	31	17	23						
82	80	35	33	31	31							85	87	24	23	51	33						
												97	93	34	27	50	39						
												80	81	23	22	26	24						
												96	95	34	31	38	24						
												80	71	30	33	33	25						
96	98	33	32	65	45	91	60	27	26	32	19	93	93	31	35	57	35	73	70	26	22	34	24
						88	75	30	34	42	32	84	74	33	33	59	35						
						83	81	30	29	44	35												
						78	63	29	31	58	40												
						88	88	34	35	44	24												
						91	90	25	35	24	23												
						85	83	35	35	43	29												
						87	81	32	35	29	19												
91	85	26	35	52	22	62	56	19	20	26	14	86	76	23	34	53	26	87	86	8	35	24	10
86	81	26	35	51	27	77	89	17	31	26	23	87	78	17	26	49	19						
83	91	23	32	51	31																		

With Female Teachers Low in Degree of Differentiation

High Male Students						Low Male Students						High Female Students						Low Female Students					
SC	IP	AM	AR	AcR	AcM	SC	IP	AM	AR	AcR	AcM	SC	IP	AM	AR	AcR	AcM	SC	IP	AM	AR	AcR	AcM
76	67	22	18	48	35	75	71	32	19	25	16	78	83	34	34	35	11	76	77	25	21	23	12
73	57	25	8	25	20	65	66	23	22	22	4	82	85	31	33	32	17						
89	97	31	19	45	28	91	91	30	30	48	35	95	82	22	23	38	15						
												80	70	24	25	37	13						
												83	80	33	35	37	31						
												74	85	30	26	61	31						
94	46	23	21	61	41	92	99	27	11	53	37	99	98	33	31	57	50	92	89	35	15	28	21
						63	63	31	25	26	14	99	99	34	35	65	41	98	94	33	19	33	18
												94	95	34	29	35	31	94	89	33	22	27	30
												91	87	27	32	38	27						
												88	83	31	25	34	29						
												97	99	31	32	21	18						
												92	86	31	27	52	31						
												84	77	20	20	45	28						
95	96	34	28	30	20	80	91	32	35	35	20	99	60	28	31	26	20	85	88	35	35	39	28
89	99	29	35	44	27	96	99	35	33	31	21							83	89	31	22	23	18
90	67	29	27	43	27	82	93	23	32	35	16							87	92	32	34	39	12
						84	99	28	31	25	8												
90	69	26	26	36	22	67	86	29	10	47	33	91	93	25	28	37	30	98	97	33	31	44	23
						89	89	31	25	45	31	87	97	23	26	42	16	66	65	33	19	51	28
						96	92	25	24	32	17							84	97	31	24	57	26
						86	80	35	35	32	29							91	91	35	26	19	26
81	90	29	32	50	34	74	79	21	25	26	14	94	91	32	31	47	28	85	86	26	35	31	23
						82	82	34	29	19	14												

APPENDIX 16

With Female Teachers Low in Degree of Differentiation Continued

High Male Students						Low Male Students						High Female Students						Low Female Students					
SC	IP	AM	AR	AcR	AcM	SC	IP	AM	AR	AcR	AcM	SC	IP	AM	AR	AcR	AcM	SC	IP	AM	AR	AcR	AcM
79	76	28	20	35	34	88	92	25	26	34	16	91	90	32	33	26	32	80	88	29	17	26	24
						83	84	27	27	33	25	84	87	31	33	61	26						
												86	88	20	34	37	12						
												92	93	29	35	35	16						
												94	88	33	32	66	35						
												93	98	35	34	14	14						
												88	94	29	32	46	28						
88	67	24	22	42	26	76	79	22	18	31	17	92	89	32	36	34	21	87	87	35	24	26	20
						80	88	33	25	33	19	91	86	36	29	40	25	79	80	21	21	30	16
						79	84	26	24	26	20							82	84	22	26	34	18
																		84	84	30	27	32	22
89	66	31	27	44	26	84	90	28	30	33	23	94	92	27	26	36	21	88	94	35	31	36	26
83	60	25	22	34	21	81	84	31	24	35	20							85	86	30	23	33	19

SC, Self Concept.
 IP, Interpersonal Perceptions.
 AM, Attitude to Matheamtics
 AR, Attitude to Reading.
 AcR, Achievement in Reading.
 AcM, Achievement in Mathematics.

Abstract of

Self-NonselF-Differentiation and Its Relation
To Student-Teacher Interpersonal Perceptions,
Academic Achievement, and Self Concept¹

The research study was conducted to examine some student-teacher effects related to student achievement, attitude, self concept, and student-teacher interpersonal perceptions. Witkin and his associates hold that people differ in the degree of self-nonselF-differentiation, a construct stable over time. The first hypothesis predicted more positive interpersonal perceptions, more positive self concepts, more positive attitudes and higher achievement for students who were matched with their teachers in degree of self-nonselF-differentiation. The second hypothesis predicted that the degree of differentiation of the student would effect his student-teacher interpersonal perceptions, self concept, attitude to mathematics and to reading and his achievement in mathematics and in reading.

A battery of tests was administered to 833 students. It consisted of Witkin's Sophistication-of-Body Concept Scale, Davidson and Lang's Check List of Traits, forms one and 2, Attitude Inventories and Objective Measures of

¹ Russell F. Moore, doctoral thesis presented to the School of Psychology and Education of the University of Ottawa, Ontario, August 1976,

Achievement. These students were in the classes of thirty-two teachers, 16 of whom were low in degree of differentiation. The other sixteen teachers were high in degree of differentiation. Sex of teacher and sex of student were used as blocking variables.

The major finding of the study was that the interaction of the degree of differentiation of teacher and degree of differentiation of student effected student-teacher interpersonal perceptions and that the degree of differentiation of the student effected his self concept, attitude and achievement.

The changes in student attitude and achievement when students were matched with their teachers in degree of differentiation and other students who were mismatched with their teachers in degree of differentiation did not reach significance though the results were in the expected direction. It is probable that they would have reached significance if the teacher-student contact was of longer duration.

There were some unexpected second order interactions involving the sex of teacher which suggest that further clarification of the effects of the sex variable requires investigation.

The results of the study confirm Witkin's theoretical contention that students and teachers matched in degree of differentiation would tend to "get along better together".