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An Investigation of the Role of Individual Differences in Cognitive Growth Explored Within the Context of a Reciprocal Teaching Instructional Environment

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During the last few years, interest in the nature, assessment, and modifiability of higher order thinking skills has increased dramatically. Guided by emergent theoretical analyses of the processes involved in higher order thinking skills, cognitive scientists have designed programs for assessing and training these skills which have resulted in significant improvements in academic and general domains of problem solving. The current literature poses a dilemma with respect to relating assessment to instruction. Should we teach and assess thinking skills within a general independent domain or within a specific academic domain? This dilemma is of considerable importance, since carefully designed tests have potential for allowing us to identify individuals who would be likely to benefit more than others from certain instructional programs. Reciprocal teaching is one frequently cited instructional technique that has been found to be successful in improving comprehension and monitoring skills within a specific academic domain. Dynamic assessment is a method for assessing the potential of individuals for growth in specific cognitive processes, first by guided exposure to problems and processes of thought, and subsequently by a learner's own independent

thoughts. Feuerstein's Learning Potential Assessment Device (LPAD) is a dynamic device which is designed to evaluate individuals' ability to utilize general thinking skills.

The study was designed to integrate knowledge about the learning potential of the individual, which was determined by a dynamic assessment procedure (LPAD and a Test-Teach-Test phase in the realm of reading comprehension), and to connect it directly to the design of an instuctional system (Reciprocal Teaching). The independent variables were: Group (experimental, control), level of modifiability (high gainer, moderate gainer, low gainer) obtained in different domains (general-figural, general-verbal and specific reading comprehension), and phase (pretest, mini intervention, maintenance, intervention, maintenance, follow-up). The dependent variables were achievement scores obtained on reading comprehension passages at the different phases of the study.

Seventy-two freshman high school students enrolled in remedial reading classes participated in the study. Fifty one students served as subjects in the experimental group and were exposed to the reciprocal teaching method, while twenty two students served as a control group and did not receive reciprocal teaching instruction. Experimental group subjects were assigned to three different gain categories, first according to their gain score on general measures of cognitive thinking and then according to their gain score on a reading comprehension measure.

Repeated measure results indicated that there were significant differences across methods of instruction and across levels of modifiability over time on the dependent variable. These results provide support for the use of specific-academic oriented dynamic assessment measures as predictors of optimal achievement, and further document the effectiveness of the reciprocal teaching methodology.

AN INVESTIGATION OF THE ROLE OF INDIVIDUAL DIFFERENCES IN COGNITIVE GROWTH EXPLORED WITHIN THE CONTEXT OF A RECIPROCAL TEACHING INSTRUCTIONAL ENVIRONMENT

by

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VITA

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LIST OF TABLES

Table Page

LIST OF FIGURES

Figure Page

CONTENTS FOR APPENDICES

CHAPTER I

INTRODUCTION

In a rapidly changing environment, it is difficult to predict what knowledge students will need or what problems they will have to solve twenty years from now. What they really need to know, it seems, is how to learn the new information and skills that they will require throughout their lives. Clearly much of the value of education for students' later lives comes from whatever general thinking and learning skills have been acquired along with the specific knowledge that schools impart. Quite appropriately, schools place the highest priority on skills with very general applicability: reading, writing, and mathematics. However, learning and reasoning skills along with general problem skills are neglected by most schools (Chipman, Segal & Glaser, 1985). Many educators have pointed out that schools emphasize the need to acquire information (i.e. content) and from the earliest grades teachers direct their students with instructions to learn information, but little is said to the child about how to go about learning. Recent research focused on reading has shown that explicit instruction in strategies for effective

thinking and learning rarely occurs in classrooms (Beck, 1983; Durkin, 1984; Macginitie, 1984). Many teachers assume that repeated attempts to learn or to solve problems will automatically result in improvement of general ability to reason. This assumption has not been verified as many students have difficulties in learning and do poorly on achievement tests. Studies on the outcomes of schooling show that although elementary skills are improving, higher level processes are being acquired less well (National Assessment of Educational Progress, 1987).

These findings and others have brought a surge in the development of educational programs designed to train students to think more efficiently. These programs include teaching problem solving strategies in the classroom while focusing on the development of thinking skills. This trend is accompanied with a growing commitment to the view that intelligence is not an immutable and fixed entity. What in the past has been seen as innate cognitive ability or aptitude for learning appears to be largely a matter of opportunity to acquire skills critical for success in the school environment. Intervention programs designed to help low functioning students develop the ability to think and learn more effectively have been able to reduce or remove the temporary retardation detected by standardized intelligence tests thus showing the importance of instituting cognitive remedial programs in schools (Das,

1987).

A general goal of instruction is to induce learning. Learning can be enhanced most effectively when certain attributes of the learner act in concert with the type of knowledge one is trying to increase. Cognitive training cannot be the same for all students and in order for it to be effective it must adapt to the characteristics of the learner. In most educational settings, some people learn more readily than others. A major challenge for both practitioners and researchers is to understand why differences in learning occur and to devise procedures that can help less successful students improve their abilities to learn.

Historically, most attempts to train intelligent functioning have been based on a psychometric model of the nature of intelligence. This model of intelligence has not been particularly successful in generating effective programs for training intelligent functioning. Intelligence appears to be a dynamic entity, and a static model such as the factorial one can capture only part of it (Sternberg, 1982). Standard IQ tests (static tests) analyze the student's current level of performance but do not provide direct evidence regarding the direct processes that may have operated or failed to operate to bring about that performance. In other words, the psychometric approach overemphasizes products of intellectual performance at the

expense of underlying processes. The educational value of intelligence tests is also limited, in part, because overall IQ and individual subtest scores are too global to inform instructional efforts (Haywood & Wachs, 1981; McClelland, 1973).

One of the alternative testing methods that has emerged is called dynamic assessment. Dynamic assessment is a method for assessing the potential of individuals for growth within a test-teach-test model. This process of estimating an individuals' readiness for change involves an initial assessment of competence, followed by instruction on the target tasks. Students with high degrees of readiness improve their performance substantially following the intervention, whereas those with less readiness for change show little gain, thus demonstrating that dynamic assessment can detect important individual differences between learners. This measure of gain as a result of instruction is presumed to possess greater predictive utility than the initial, unaided level of performance. Researchers who use this approach typically refer to a mediated theory of cognitive development (e.g., Feuerstein, 1980), and most cite Vygotsky's theory and ideas as central to this work (Vygotsky, 1978). Several advantages result from directly measuring students' responsiveness to instruction; dynamic assessments appear to provide more precise information about cognitive functioning. Instruction can be directed at

specific cognitive skills and the contribution of those skills can be assessed. This increased precision may be used to develop more exact profiles of ability and to guide acceleration and remediation efforts. In addition, dynamic assessments may be conducted with tasks students encounter in school; this possibility would enhance the predictive accuracy of the assessment and might yield suggestions how best to teach cognitive skills. A major goal in the development of dynamic assessment methods is the development of diagnostic methods of assessing individual differences in students' readiness to perform, and the use of the resulting information to guide the design of instructional programs that enhance the academic performance of students exhibiting relatively poor performance.

The Learning Potential Assessment Device (LPAD) is a dynamic approach to assessment which is based upon the theory of Structural Cognitive Modifiability developed by Feuerstein (1979). The basic assumption of this theory is that human beings are open systems, accessible to change throughout their life span. A mediator can bring about change by assessing the degree of modifiability of the learner and the means by which positive changes in cognitive modifiability can be induced and maintained. The assessment procedures are designed to evaluate individuals' ability to utilize general thinking skills such as planning, monitoring, revising approaches etc. Campione and Brown

(1987; in press) whom are advocates of dynamic assessment, claim in contrast to Feuerstein, that the assessment needs to be situated within the context of specific academic domains (i.e., in mathematics or physics or similar academic domains). The current literature poses a dilemma between assessment and instructional emphasis on general domain-independent skills or domain specific skills. This unresolved issue is of critical importance for anyone interested in education of higher cognitive skills, as carefully designed tests with appropriate training would allow the identification of individuals who are likely to benefit more than others from certain intervention programs.

Over the past 10 to 15 years, many schools have implemented programs and textbooks designed to encourage thinking, problem solving and abilities for learning. One main concern in selecting a thinking training program is related to the controversial issue mentioned above: Should thinking be taught as a discrete set of general thinking skills that are supplementary to the curriculum or should the teaching of thinking be incorporated into the specific school subjects? There has been a proliferation of programs designed to teach thinking independently of academic content (Feuerstein, 1979; Lipman, 1980; Whimbey & Lockhead, 1980; DeBono, 1984). However, data to support the relative effectiveness of teaching thinking in a supplementary as opposed to integrated approach are sparse.

Reciprocal Teaching is a remedial instructional program, embedded in a specific academic domain, which has been successful in increasing reading comprehension while promoting thinking skills. This program of instructional techniques was designed by Brown and Palincsar (1982, 1984), based on the social psychology of Vygotsky (1978). Vygotsky has long been recognized as a pioneer in developmental-social psychology. In his book, "Mind in Society-The Development of Higher Psychological Processes", he lays foundations to the view of learning as the internalization of knowledge and processes resulting from a guided instructional interaction. Vygotsky assumed the main loci of intelligence to be within the interaction between the individual and the environment; the child's developing knowledge is organized through interactions with experts who can serve as models and at the same time monitor the state of the student's understanding.

Reciprocal teaching is conducted as a guided group-problem solving activity, in which groups of poor comprehenders (novices), under the guidance of a teacher (expert) take turns leading a dialogue aimed at revealing the meaning of the text. The three major components of the instructional technique are: (a) instruction and practice with executive strategies-questioning, summarizing, clarifying and predicting in the course of reading text-, which enable students to monitor their understanding; (b)

provision, initially by a teacher, of an expert model of these metacognitive processes; and (c) a social setting that enables, joint negotiation for understanding (Glaser, 1990). The students watch, copy and then apply four analytical techniques that good comprehenders (experts) use unconsciously: First they ask questions about the text they are reading; second, they summarize the main points; third, they clarify anything they did not understand; fourth, they try to predict what will come next. By employing these analytical techniques, the students transform reading from decoding into problem solving. Numerous studies have shown that after extensive exposure to reading dialogues, poor readers improve not only in their independent comprehension performance but on standardized tests, too.

The study to be reported in what follows is anchored within the context of past research done in the realm of reciprocal teaching by Ann Brown And Annemarie Palinscar (1982, 1984, 1986). The study was designed to integrate knowledge about the learning potential of the individual, which was assessed by a dynamic assessment procedure (LPAD and an initial Test-Teach-Test phase of the study), and to connect it directly to the design of an instructional system (Reciprocal Teaching). The theoretical implications of this study rest on its potential to add to a growing knowledge base that integrates three areas of psychology (social psychology, cognitive instruction psychology, and

differential psychology). The study has potential for contributing to the field of school psychology since it may generate an assessment-instruction link that leads to optimal achievement in a regular school setting by demonstrating that it may be possible to link important individual differences among students directly to curriculum design.

The study was designed with the following general goals in mind:

1. To determine if the instructional technique of reciprocal teaching has an influence on optimal achievement of reading comprehension.
2. To determine if individual differences in cognitive modifiability (i.e., high gainers, moderate gainers, low gainers) have an influence on optimal achievement.
3. To determine which dynamic technique of assessment has greater predictive utility in estimating readiness for change in the realm of reading comprehension.

Based on the literature and the findings reported above, it was expected that achievement scores as measured by comprehension passages over time, would be different for the two methods of instruction (reciprocal teaching, control). It was further anticipated that the different measures of dynamic assessment (Feuerstein's LPAD measure

and an initial Test-Teach-Test phase of the study) would permit identification of individual differences (high gainers, moderate gainers, low gainers) which would differentially influence achievement scores on the reading comprehension passages. In addition, it was expected that there would be differences in the predictive utility of achievement scores, on the reading comprehension passages, between the different measures of dynamic assessment. Eighty-six freshman remedial students enrolled in the mainstream at suburban high schools near Chicago, were tested on the different measures mentioned above.

In sum, the study was designed to focus mainly on variations in achievement over time when different methods of instruction were used as well as to test the influence of individual differences identified by dynamic assessment measures on achievement.

CHAPTER II

REVIEW OF LITERATURE

Findings from the cognitive analysis of human performance in various domains are guiding development of instructional programs that aim to produce specified forms of competence. Over the past three decades, cognitive science researchers have focused their attention on the structures and processes of human competence and on the nature of the performance as a consequence of learning and development (Glaser, 1990). It is assumed that abilities develop as a function of learning-to-learn and transfer (Hunt, 1961; Ferguson, 1954, 1956). Information processing theory suggests how ability arises from learning and how such ability, once developed, is involved in further learning and thus in further ability development (Snow & Yalow, 1982). From this point of view, intelligence is conceived as learning ability (i.e., the active organization of abilities needed to learn from incomplete instruction) (Campione, Brown, & Ferrera, 1982; Snow & Yalow, 1982). A major challenge for both practitioners and researchers is to understand why differences in learning occur and to devise procedures that can help less successful students improve

their abilities to learn (Bransford & Vye, 1989).

In what follows, a discussion of different conceptions of intelligence and the method of dynamic assessment is presented. Afterwhich, sections describing Feuerstein's theory of structural modifiability, the Learning Potential Assessment Device (LPAD), Instrumental Enrichment (IE), and the basis for the content-free nature of LPAD and IE are introduced. Finally, sections describing the reciprocal teaching method utilized in the realm of reading comprehension and the linkage between dynamic assessment, academic content, and school achievement are presented. An overall attempt was made to portray the dilemma posed in the current literature between the assessment and instructional emphasis given to teaching general domain independent skills versus domain specific skills.

Conceptions of Intelligence

The investigation of intelligence is rapidly becoming central to psychology as a discipline. Few psychological phenomena are as elusive as intelligence. Indeed, psychologists cannot even quite agree as to just what intelligence is, even though this construct has been studied for decades. For many years, the term intelligence has been used in a particular and very pragmatic sense to refer to the level of performance on tests designated as intelligence tests. Intelligence tests were designed to predict performance in schools and they have proven to do that with

considerable accuracy and consistency (Ceci, 1990). It should be noted that this predictive psychometric definition and understanding of intelligence is atheoretical in essence. Today, as in the past, little consensus can be found with respect to what the tests measure, even among the psychologists who are active in developing and promoting the use of the tests (Sternberg & Detterman, 1986).

This lack of consensus was evident in a classic symposium entitled "Intelligence and its Measurement" which was published in 1921 in the Journal of Educational Psychology. At this symposium the most prominent psychological theorists in the area of intelligence addressed two issues:

1. What is intelligence and by what means can it best be measured?
2. What are the most crucial next steps in research?

Responses to the first issue included a profusion of different definitions to intelligence such as: "ability to learn" (Buckingham); "the power of good responses from the point of view of truth or fact" (Thorndike); "the ability to carry on abstract thinking" (Terman); "the ability of the individual to adapt himself adequately to relatively new situations in life" (Pintner); "involving two factors-the capacity for knowledge and the knowledge possessed" (Henmon); "the capacity to acquire capacity"(Woodrow); "the capacity to learn or profit from experience" (Dearborn).

Sternberg and Detterman (1986) repeated the 1921 effort and asked experts in the field of intelligence to respond to the very same questions that were posed to the experts in the 1921 symposium. They pointed out that the theorists in the 1986 symposium identified three main loci of intelligence: intelligence within the individual, intelligence within the environment, and intelligence within the interaction between the individual and the environment. A comparison between the contents of the two symposia reveals some agreement regarding the nature of intelligence. Attributes such as adaptation to the environment, basic mental processes, and higher order thinking (e.g., reasoning, problem solving, decision making) were prominent topics of discussion in both symposia. Sternberg and Berg (1986) indicated that despite the similarities, some salient differences between the two symposia could be found. Metacognition-conceived of as both knowledge about and control of cognition-played a prominent role in the 1986 symposium, but virtually no role in the 1921 symposium. In the 1986 symposium, a greater emphasis had been placed on the role of knowledge and the interaction between this knowledge and mental processes. The 1986 panelists showed greater concern than the earlier ones with the analysis of demands of one's environment and how it interacts with intelligence, with building precise methods of cognitive tasks, toward intelligence. The field of intelligence has

evolved from one that in 1921 concentrated primarily upon psychometric issues, to one that currently concentrates primarily upon information processing, the importance of cultural context, and their interrelationships. Campione, Brown, and Ferrera (1982, 1986)) claim that contemporary research provides the empirical support for traditional claims about the nature of intelligence and the course of cognitive growth. Contemporary research is concentrating on current learning rather than the fruits of past learning, a development recommended in the 1921 symposium by Dearborn, Woodrow, Haggarty, Colvin and others, all of whom made the point that IQ tests, as a measure of past learning, were only indirectly a measure of current learning ability. Such tests provide a good measure of learning ability only if one makes the assumption that all tested persons have had "common opportunities for past learning" (Colvin, 1921). All argued that it would be better to measure learning as it is actually occurring. In other words, the focus of assessment should be dynamic rather than static, prospective rather than retrospective. These views correspond well to the contemporary approaches to learning and dynamic assessment influenced by Vygotsky's (1978) theory of psychosocial development.

Vygotsky's Psychosocial Developmental Theory

Vygotsky's theory of cognitive development rests heavily on the key concept of **internalization.** Vygotsky

(1978) argues that all psychological processes are in genesis essentially social processes, initially shared between people, particularly between children and adults. Children first experience active problem-solving activities in the presence of others and slowly come to perform these functions for themselves. The process of internalization is gradual; first the adult, or knowledgeable peer, controls and guides the child's activity, but eventually the adult and the child come to share the problem solving functions, with the child taking the initiative and the adult correcting and guiding when the child stumbles. Finally the adult transfers control to the child and functions primarily as a supportive and sympathetic audience. In other words, every function in the child's intellectual development occurs twice: first, on the social level, and later on the individual level; first between people **(interpsychological)**, and then inside the child **(intrapsychological)**. Internalization of higher thinking skills is a result of the gradual transformation of an interpersonal process into an intrapersonal one. This transformation is a result of a long series of developmental events. Vygotsky supposes that learning and development are interrelated from the child's very first day and in order for learning to occur it has to be matched to the child's developmental level. Contrary to Piaget who describes cognitive development in terms of universal stages which are identical for all children as a

function of age, Vygotsky claims that a functional system of one child may not be identical to that of another even though there may be similarities at certain stages of development. Vygotsky argues that the historical conditions which determine to a large extent the opportunities for human experience are constantly changing, and as a result there can be no universal schema that adequately represents the dynamic relation between internal and external aspects of development.

Mental development is characterized by two levels at least. The first level which is called the actual developmental level relates to established mental functions which are a result of completed developmental cycles. Problem solving functions that the individual can do on his or her own are indicative of mental abilities which belong to the first level of cognitive development. The second level of development is called the **potential developmental level** which relates to mental functions that are in a state of formation and are just beginning to mature and develop. The individual will not be able to manifest these types of mental functions unless he or she receives the guidance and assistance of a more capable peer. Vygotsky maintains that instruction will be most productive when geared towards the "zone of proximal development" of the individual. "The zone of proximal development (ZPD) is the distance between the actual developmental level as determined by independent

problem solving and the level of potential as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978). In other words for Vygotsky, the fundamental process of development is the gradual internalization and personalization of what was originally a social activity.

From Vygotsky's viewpoint, the zone of proximal development (ZPD) provides psychologists and educators with a tool through which the internal course of development can be understood. It is interesting to note that Vygotsky's interactive theory of learning has had an important effect on the development of clinical testing. Methods of clinical assessment based on Vygotsky's theory of the ZPD make a distinction between children's actual developmental level (i.e., their completed development as might be measured on a standardized test) and their level of potential development, (i.e., the degree of competence they can achieve with aid. Both measures are now seen as essential for the diagnosis of learning disabilities and for the design of remedial programs of instruction (Egorova, 1973; Pevzner, 1972; Campione, 1982; Kosulin, 1986). The zone of proximal development is used as an indication of learning potential. From this perspective clinical assessments of learning potential should be aimed at measuring the substantial improvement over initial responses that is achieved via the interaction of the adult expert and child. These assessment

methods of learning potential are identified in the current literature as Dynamic Assessment.

Dynamic Assessment

The development of learning potential assessment is an alternative strategy to assessment of cognitive functioning. Rather than restricting testing to the child's ability to respond to information supposedly acquired, learning potential assessment procedures are directed at obtaining an estimate of general ability derived from reasoning problems of suitable challenge, which the child has had an opportunity to learn how to solve (Budoff, 1987). Dynamic assessment is a procedure in which instruction of test-relevant skills is incorporated into the testing session. Developers of dynamic assessment methods have modified the testing environment characteristic of static-product oriented tests, in order to make it possible to estimate how readily testees could improve on their unaided performance levels. This modification has taken several forms, including altering the problem formats, providing feedback about performance, encouraging reflection, providing instruction in domain-relevant problem-solving strategies, or teaching more control strategies (Campione & Brown, 1987). Dynamic assessment employs a test-teach-test format which includes the following components: A testing phase in which an estimate of the students' independent performance is established, this is followed by instruction of

appropriate strategies for task solution, and a second test which measures how much each student benefitted from the instruction. Some academically delayed students improve substantially following instruction, whereas others show little gain, thus demonstrating that dynamic assessment can detect individual differences among learners. In a series of studies in which a test-train-test procedure was used, the findings indicated that groups that appeared comparable on the basis of an initial assessment were differentiated following instruction (Brown & Barclay, 1976; Brown & Campione, 1977; Brown, Campione, & Murphy, 1974; Day, 1980, 1986). These findings suggest that an estimate of response to instruction provides important information about the learning ability of students, and reveals more information than their initial level of performance (Campione & Brown, in press). Budoff (1974) made a distinction between "gainers" those who improve from the initial test to a second test following instruction, and "non-gainers", those whose post test performance is not much different from that achieved prior to the instruction. His data supports the view that gainer status is a good predictor of later academic accomplishments, providing information beyond that obtained from a static measure of competence. Additional studies (Bryant, 1982; Bryant, Brown & Campione, 1983) found dynamic scores to be better predictors than static measures of amount of gain individuals achieve due to instruction,

thus strengthening the notion that dynamic assessment provides diagnostic information about individual students and enables us to predict their future performance. Several advantages result from directly measuring students' responsiveness to instruction. The first is the capability of distinguishing poor performance due to impoverished cognitive capacities from poor performance reflecting inadequate opportunities for learning. In addition, the ability to pinpoint the processes distinguishing good from poor performers can provide information that can be used to guide instruction (Campione & Brown, in press). Instruction can be directed at specific cognitive skills and the contribution of those skills to improved performance can be assessed. This increased precision can be used to develop more exact profiles of ability and/or disability to guide acceleration and remediation efforts.

One issue related to the remediation of cognitive skills is whether intelligent performance is influenced by the operation of some general, powerful, domain-independent problem solving skills or whether problem-solving skills are idiosyncratic to a particular task or domain (Newell, 1979). The argument as to whether to train domain-specific or task-independent strategies relates to curriculum design. Programs which teach thinking skills as general strategies are considered to be supplementary to the curriculum, while domain-specific strategies are integrated into the

curriculum and taught as part of the academic content. One of the many programs designed to teach thinking independent of academic content is Feuerstein's Instrumental Enrichment program which represents a specific application of his more general approach to cognition and development.

Feuerstein's Theory of Structural Cognitive Modifiability

Feuerstein's dynamic approach to assessment, is based upon the theory of Structural Cognitive Modifiability. Structural cognitive modifiability describes the unique capacity of human beings to modify the structure of their cognitive functioning in order to adapt to changing demands of life situations. Feuerstein (1969, 1979) assumes that human beings are open systems, accessible to change throughout their life span. He rejects the notion that critical periods of development preclude the capacity of human beings to change. Modifiability of the individual is possible at any developmental stage, providing the quantity and quality of intervention matches the individual's needs. Structural cognitive modifiability is distinguished from biological or maturational changes as well as from fragmentary and transient changes that occur as a result of direct exposure to stimuli that are random and incidental.

From this perspective, the development of differential cognitive functioning and higher mental processes are considered to be a result of incidental and mediated learning. Incidental learning is assumed to occur as a

result of the child's general exposure to his or her changing environment, mediated learning refers to a learning experience where a supportive other is interposed between the organism and the environment and intentionally influences the nature of the interaction. These mediated learning experiences are considered to be an essential aspect of development, beginning when the parent selects significant objects for the infant to focus on and proceeding throughout development with the adult systematically shaping the child's learning experiences. This is the principal means by which children are believed to develop their higher thinking skills that enable them to independently learn. Thus, Feuerstein's theory, like Vygotsky's, is a theory of internalization. By interacting with an adult, who guides problem-solving activity and structures the learning environment, the child gradually comes to adopt structuring and regulatory activities of his or her own (Campione, 1982; Savell, Twokig & Rachford, 1886).

Learning Potential Assessment Device & Instrumental Enrichment: In order to test his theory, Feuerstein (1980) developed two packages: the Learning Potential Assessment Device (LPAD), which is a diagnostic device; and the Instrumental Enrichment (IE) program, which is an intensive intervention curriculum geared to enhance the capacity of the low functioning adolescent to become modified as a

result of exposure to new experiences, via the mediation of a supportive teacher. Instrumental Enrichment has been widely cited as a successful intervention program both in Israel (Feurstein, 1980; Feuerstein et al., 1979) and in the United States (Haywood & Arbitman-Smith, 1979). The LPAD is a dynamic method for assessing the potential of individuals for growth in specific cognitive processes, first by guided exposure to problems and processes of thought and subsequently by their own independent efforts. The two distinguishing features of the dynamic method of the LPAD are: (a) assessment of fluid processes of thought, perception, learning, and problem solving rather than assessment of static faculties and/or the products of prior learning; and (b) carefully structured teaching of cognitive principles and processes followed by assessment of the way this activity modifies subjects in the direction of higher capacity and greater efficiency in solving similar but different problems, as well as the generalization of acquired principles and processes. It is important to note that the respective roles of examiners and subjects are radically changed from those required by traditional psychometric procedures. With the subject-examiner relationship during learning potential assessment becomes one of teacher and student. The neutral attitude of examiners is replaced by the active attitude of teachers who are constantly involved in an interactive process of

supplying appropriate intervention to their students. The instruments of the LPAD battery include: visual-motor and organization tests, instruments involving higher cognitive processes and mental operations, and instruments involving memory with a learning component. Many of the LPAD tasks are variants of common IQ test items such as matrices problems, analytic perception problems, span tasks, and embedded figure-type problems. The tasks of the LPAD test battery assess extremely general processes that could be tapped in any task domain, they do not include items involving sheer knowledge of factual content and do not require the student to call upon knowledge from a specific academic domain.

Basis for the Content Free Nature of LPAD and IE: As mentioned earlier the tasks of the LPAD and the exercises of the intervention program Instrumental Enrichment are relatively content free. The concepts introduced can be understood without a great deal of specialized background knowledge characteristic of most school situations. Feuerstein maintains (1985) that the decision to produce relatively content free materials is derived from the theory of Mediated Learning Experience. This decision is supported by a number of resistances associated with the use of academic content matter in teaching formal modalities of thinking. Feuerstein et al. (1986) notes four sources of resistance to the use of school subject matter content: the

student, the teacher, the familiar phenomenon of students' avoidance of content involving previous failure experiences, and the academic disciplines themselves. Feuerstein maintains that academic knowledge domains, such as literature, mathematics, and social studies cannot be meaningfully responsive to such needs as the correction of deficient cognitive functions, the production of intrinsic motivation through habit formation, or the production of insight. Any attempt to reshape the content of the school curriculum to make it responsive to these needs will be harmful to the subject matter involved. Feuerstein believes, therefore, that it is more advisable to develop the prerequisites of learning in a specially designed intervention program and "wire into" this program all the components necessary for bridging to other constantly expanding areas of interest.

It should be noted that Brown and Campione (1982) disagree with Feuerstein's position that school subject matter learning cannot be molded easily into a suitable vehicle for training. They believe that the material of the assessment and intervention programs suggested by Feuerstein are secondary to the training philosophy that underlies it and that it is possible to train monitoring and autocritical skills within the domain of actual school tasks.

Linking Dynamic Assessment with Academic Content and School Achievement

In contrast to Feuerstein's Learning Potential Assessment Device which is directed at evaluating an individuals' ability to plan, monitor, revise approaches, etc., as domain-general skills, Campione and Brown (in press) have chosen to evaluate the operation of those skills in the context of learning while using domain-specific resources. Campione and Brown (1987) whom have been influenced by Vygotsky's theory of learning and development and his notion of the "zone of proximal development", view dynamic assessment as an estimate of an individuals readiness for change. Students with high degrees of readiness (broad zones of proximal development) in a certain domain should benefit considerably from intervention in that domain, while other students in the same domain, or those students in other domains, may profit less from instruction due to low degrees of readiness (i.e., narrow zones of proximal development). In other words, dynamic assessments situated within specific domains allows for the possibility that some students may be efficient regulators of their learning within some domain but not others.

Campione and Brown (in press) maintain that estimating readiness within a specific domain has two advantages: (a) it should provide more accurate descriptions of individual learners and; (b) the evaluation of processing strengths and weaknesses within a certain content domain should make it much more likely that the assessment can serve to inform

instruction. They believe that the best way of effecting an assessment instruction link is to situate the assessment within a certain domain rather than to target presumably general components of cognitive competence (Brown & Campione, 1986). Dynamic assessment may be conducted with tasks students actually encounter in school. This possibility would enhance the predictive accuracy of the assessment and might yield suggestions on how best to teach school-based academic skills (Day & Hall, 1987).

Reciprocal Teaching of Comprehension Fostering and Comprehension Monitoring Activity

Reciprocal teaching is an instructional technique in which listening and reading comprehension are conceptualized as problem solving activities. The technique is conducted as a group-problem activity, in which students are taught to think while reading and listening to text. Students participating in reciprocal teaching programs acquire specific knowledge and also learn a set of strategies for elaborating and monitoring their understanding that is necessary for independent learning. The knowledge acquisition strategies they learn in working on a specific text are acquired not as skills that are decontextualized, but as skills that are instrumental in achieving domain-specific knowledge (Glaser, 1990).

Comprehension Strategies to Promote Thinking while Reading: Thinking has been described as the search for

meaning and is often contrasted with the mere acquisition of information (Palinscar & Brown, 1988). Similarly, reading comprehension is identified as "a process of constructing meaning from text" (Commission on Reading, 1985). Construction of meaning is the product of three main factors: (1) considerate texts (i.e., easy to read texts) (Anderson & Ambruster, 1982); (2) the compatibility of the reader's knowledge and text content (Anderson, 1978; Mandler, 1983; Stein & Trabasso, 1982); and (3) the active strategies the reader employs to enhance understanding and retention, and to circumvent comprehension failures (Brown, 1980; Collins & Smith, 1982). Theories of comprehension suggest that active learning from texts must involve a flexible repertoire of comprehension-fostering and monitoring activities. Practiced readers, when studying, call into play a whole variety of learning and self monitoring activities. Learning from text demands a split mental focus (Brown,1980; Locke,1975). Learners must simultaneously concentrate on the material they are reading and on themselves as learners, checking to see if the mental activities engaged in are resulting in learning. Effective comprehension strategies are those that serve this dual function; they both enhance comprehension and afford an opportunity for the learner to monitor the level of comprehension. Brown and Palincsar (1987) found empirical support for this position by studying experts and novices.

They anticipated that experts would employ self monitoring activities when studying, while novices would experience particular problems in recruiting active learning strategies. Experimental data support these assumptions. Mature learners question and elaborate their own knowledge and the content of the text. They test their degree of understanding by thinking of counter-examples and test possible generalizations, by attempting to apply their new-found knowledge, and use a variety of "debugging" ploys that force them to correct their misunderstandings (Collins & Stevens, 1982). Novices were found to rarely engage in active learning. Research indicates that students cannot adequately summarize a typical fifth grade academic text until well into high school (Brown & Palinscar, 1987), and remedial readers do not master this ability till after they reach college (Brown, Day, & Jones, 1983). Documentation of students' difficulties generating questions on what they are reading is extensive, and again the problem is particularly acute for the academically delayed student (Andre & Anderson, 1978-1979). There is also considerable evidence that young and poor readers have difficulty evaluating texts for clarity, internal consistency, or compatibility with known facts (Garner, 1981; Markman, 1981). Empirical studies show that when students are tested for retention and comprehension after having the opportunity to read the material they are tested on only once, weaker and younger

students do not perform differently than older or more adequate learners. However, when extra time is given for studying, large developmental and comparative differences emerge because the novices are not using the required strategies spontaneously (Brown & Smiley, 1978; Brown, Smiley, & Lawton, 1978). It appears that the need for explicit instructions in comprehension-enhancing activities is particularly crucial for the academically delayed student (Baker & Brown, 1983, 1984; Brown, Armbruster, & Baker, 1985; Brown and Palincsar, 1982).

In a review of both the traditional reading education literature and theoretical treatments of the problem, Brown, Palincsar, and Ambruster (1984) found six functions which were common to all:

1. Understanding the purposes of reading, both explicit and implicit.
2. Activating relevant background knowledge.
3. Allocating attention so that concentration can be focused on the major content at the expense of trivia.
4. Critical evaluation of content for internal consistency, and compatibility with prior knowledge and common sense.
5. Monitoring ongoing activities to see if comprehension is occurring, by engaging in such activities as periodic review and self-

interrogation.

6. Drawing and testing inferences of many kinds, including interpretations, predictions, and conclusions.

For the purposes of instruction, Palincsar and Brown (1984) selected four concrete activities that novice learners could be engaged in. The four strategies embedded in reciprocal teaching (questioning, summarizing, clarifying, and predicting) incorporate overlapping functions contained in points 1 through 6 above. At the heart of reciprocal teaching is a dialogue about the meaning of the text. The dialogue is structured with the use of the four strategies that promote comprehension of text and monitoring of comprehension.

Reciprocal Teaching as a Theory of Instruction: Teaching requires that the students take turns in leading the group in use of strategies for comprehending and remembering text content that the teacher models for the class. The basic procedure is simple. The dialogue leader begins the discussion by asking a question on the main content and ends by summarizing the general organizing basis of the reading passage. If there is a disagreement, the group rereads and discusses problematic questions and summary statements until they reach consensus. This summarizing process provides a means by which the group can monitor its progress, noting points of agreement and

disagreement, and it helps students establish where they are in preparation for tackling a new segment of text. Attempts to clarify any comprehension problems that might arise, and finally asking for predictions about future content are also an integral part of the discussion. During the discussion, the adult teacher provides guidance and feedback tailored to the needs of the current student expert and his or her respondents (Brown & Palincsar, 1989). Underlying this model of reciprocal teaching is the notion that expert-led social interactions have a prominent role to play in learning and can provide a major impetus to cognitive growth. While this idea is most closely identified with Vygotsky (1978), a number of other theorists, including Binet (1909), Dewey (1910/1933), and Piaget (1967) also emphasized guided learning in social contexts as a key to developmental change. Guided learning occurs through a process of scaffolding (Palincsar & Brown, 1984; Palincsar,1986). Expert scaffolding is a process that enables a child to solve a problem or carry out a task that is beyond his or her unassisted efforts. Scaffolding provides support that is temporary, interactive, and adjustable. Through meaningful dialogue teachers and students interact and share responsibility for learning strategies. Initially the expert acts as a supportive model leading the novices to a level that is a comfortable challenge. Scaffolding provides a setting in which novices

practice their emerging skills without all the responsibility of comprehending the task (Palincsar, 1986). Expert scaffolding forces student interaction but can be removed when help is no longer needed.

Reciprocal Teaching and the Zone of Proximal Development (ZPD): Reciprocal teaching was designed to provide a zone of proximal development (ZPD) within which novices could take on greater responsibility for more expert roles (Brown & Palincsar, 1989). The cooperative feature of the learning group in reciprocal teaching, where students are attempting to arrive at consensus concerning the meaning of text, is an ideal setting for novices to practice their emerging skills. The group's efforts are externalized in the form of a discussion which allows novices to contribute what they are capable of contributing and to learn from the contributions of more capable peers. In this sense, the reciprocal teaching dialogues create a zone of proximal development for their participants, each of whom may share in the activity to the extent that he or she is able (Brown & Palincsar, 1989). Vygotsky (1978) believed that what children can do with the assistance of others "is even more indicative of their mental development than what they can do alone" (p. 85). Mental development is defined as the zone of proximal development which provides a guideline to instructors; "learning should be matched in some manner with the child's developmental status" (p. 85). By observing

learners operating within a zone of proximal development, instructors are able to mark bandwidths of competence (Brown & Reeve, in press) for each individual of the group. At the lower boundaries are cognitive skills which are considered to be "developmental cycles" which have been completed. These skills are believed to be a conservative estimate of the student's current status. At the upper bound are the estimates of emerging cognitive skills that are actually formulated by the interactions of a supportive context. These newly awakened processes are gradually internalized through problem solving under adult guidance, or in collaboration with more capable peers. The adult teacher closely monitors the student leading the discussion and provides feedback that is tailored to the student's existing levels (i.e., lower boundaries of functioning), while encouraging the student to progress gradually to full competence (i.e., upper boundaries of functioning). That is to say this upper bound of today's competence becomes the springboard of tomorrow's achievements (Brown & Reeve, in press).

Research in the Realm of Reciprocal Teaching: Since the original development of the reciprocal teaching method (Brown & Palincsar, 1982), numerous studies have been conducted utilizing the reciprocal teaching method in different settings. Several features are common to many of the studies: (a) students were selected from junior high

schools on the basis of their low scores on reading comprehension; (b) the intervention usually consisted of approximately 20 days; (c) progress was measured not only by observable changes in the students' participation in the discussions but also by daily independent tests of their reading and retention of novel passages; (d) long term maintenance, transfer, and generalization were all measured with improvements in standardized tests scores.

Collapsing findings from across several replications of the intervention, Brown and Palincsar (1989) have found that average seventh grade students score 75% correct on their reading retention of novel passages. Remedial students who participated in reciprocal teaching group discussions began, in general, by scoring 30%-40% accuracy and reached a stable level of 70%-80% accuracy within 4 to 15 days. Ninety-eight percent of the students reached the criterion of 75% accuracy. Most of the students maintained their improved level of performance on the maintenance sessions and on the follow-up sessions that took place 8 weeks after the intervention had ceased. In the original pilot study (Brown & Palincsar, 1982), long term maintenance was examined after a 6-month interval. Performance after 6 months fell from 80% to 60% correct, which was still a reliable improvement on the starting level of 20%, but after one session of the reciprocal teaching method performance again reached the 80% level.

It should be noted that in those studies conducted by

non-volunteer, unselected teachers, in groups varying between 8 to 18 students, the number of students to reach criterion (75% accuracy) was less than in the studies conducted by professional researchers in smaller groups. These studies resulted in significant individual student achievement, even though the circumstances were less than ideal (Palincsar & Brown, 1986; Palincsar, Brown, & Samsel, work in progress). The reciprocal teaching method has been modified so that the essential features can be used in whole class discussion. The students and teacher read approximately four paragraphs silently and then individually compose two questions and a summary statement in preparation for group discussions. Then the students as a group debate the merits of the different questions and summary statements until they reach a degree of consensus on the most appropriate version. When this procedure was utilized in a science class of seventh graders, the students showed marked improvement on their written questions and summaries and on their classroom participation; they also improved significantly (from 30%-70% accuracy) on daily independent tests of comprehension (Palincsar, Brown & Samsel, work in progress).

In order to further test the effectiveness of the reciprocal teaching procedure, comparison studies have been conducted where the method of reciprocal teaching has been tested against a variety of control groups (Brown &

Palincsar, 1982; Palincsar & Brown, 1984; Brown, Palincsar, Samsel, & Dunn, work in progress). In one of the studies (Palincsar & Brown, 1984) groups of closely matched junior high school students were assigned to one of three training conditions or to a control group. The results of the study indicated that all groups improved except the untreated control group. The reciprocal teaching students' performance was significantly better than that of the other two instructional groups. In sum, these findings indicate that the use of the reciprocal teaching method in which students receive instruction, model and practice, and gradually take charge of their own learning, is the most effective form of intervention when compared to alternative methods of instructional intervention (Brown, Palincsar, Samsel, & Dunn, work in progress).

The reciprocal teaching procedure has proved to be a successful method of teaching (Brown & Campione, 1981; Glaser, 1990; Chipman, Segal, & Glaser, in press). This method of instruction was designed to be a simplified, concrete version of essential critical thinking skills, with the teacher modeling the types of processes that expert learners engage in frequently on their own volition. By externalizing the internal dialogues of mature learners, reciprocal teaching procedures are designed to provide weaker students with a model of critical thinking (Brown & Palincsar, 1987).

CHAPTER III

METHOD

Hypotheses

The following null hypotheses were tested:

1. There will be no significant difference in achievement scores on reading comprehension passages between experimental (reciprocal teaching) and control groups (standard remedial teaching) over the phases of intervention.

2. When dimensions of specific cognitive modifiability are obtained by trichotomizing gain scores on the measure of reading comprehension into high, moderate and low gainers, there will be no interaction among these levels of modifiability, reading achievement, and phases of intervention.

3. When dimensions of general cognitive modifiability are obtained by trichotomizing gain scores on the figural and verbal general measures into high, moderate and low gainers, there will be no significant interaction among these levels of modifiability, reading achievement, and phases of the intervention.

4. The categorization of high, moderate, and low

gainers will be independent, resulting in no significant relationship among the various domains of cognitive modifiability.

Subjects

The experimental and control group subjects used in this study were 72 freshman high school students enrolled in Chapter I remedial reading classes selected from two high schools in a suburban school district comprised largely of middle class families. The students enrolled in these Chapter I reading classes were part of the "main stream" of regular education and were regarded as students with average intellectual ability. With respect to their reading skills, these students were considered to be poor comprehenders, but adequate decoders. All participating students performed at least two years below grade level in reading comprehension as determined by standardized test scores and/or recommendations by a reading specialist who individually evaluated each student.

The experimental group (group 1) consisted of fifty three students who were divided into five different reading classes. The control group (group 2) included the remaining twenty-two students from a neighboring high school located in the same school district as the experimental group. The control subjects were divided into three different reading classes. The assignment to the different reading classes was done by the schools' administration prior to the

beginning of the academic school year. It should be noted that the composition of the classes with respect to race and sex was similar across the different groups, even though the reading classes were pre-existing groups.

Measures of Cognitive Competency

As noted in Chapter I, this study is anchored in the past research done in the realm of reciprocal teaching by Ann Brown and Annemarie Palincsar (1982, 1984). The main difference between this study and the previous work of Brown and Palincsar is that in this study the method of reciprocal teaching was used with groups of high school students varying between eight to thirteen students per group, while most of the original studies of Brown and Palinscar were conducted with groups of elementary school students varying between two to six students per group. Preparation of the materials for the intervention and the daily assessment passages followed the procedural guidelines of previous studies.

The measures used to assess cognitive competency are listed and decribed below.

Gates Macginitie Reading Tests - Level E3 (Macginitie, Kamons, Kowalski, Macginitie, & Mackay, 1978): The test consists of two subtests; vocabulary and comprehension. The subtests consist of 45 and 43 items respectively. The vocabulary subtest samples the student's word knowledge rather than a decoding skills. The comprehension subtest

measures the student's ability to read complete prose passages with understanding. The tests were standardized on approximately 5,500 students obtained from a stratified sample based upon the U.S. Census data. Alternate-forms and Kuder-Richardson Formula 20 reliability coefficients were computed for each test level. The Kuder-Richardson coefficient for vocabulary ranged from .90 to.95, while the range for comprehension was .88 to .94.

Passages with Questions: A total of 31 expository reading passages of approximately 300 to 350 words were selected from different books in the Reading Lab: Essential Skills Book 14 (Pauk, 1982); Timed Readings Book Six (Spargo, Williston, 1980); Reading Drills (Fry, 1975)..... The passages included a wide range of topics, for example: snow rangers, flying squirrels, sharks, starfish, alcoholism, Polynesian culture, survival skills, the history of books, hot air balloons etc. The passages conformed to a ninth grade reading level according to the Fry Readability Formula.

Ten comprehension questions per passage were constructed using the Pearson and Johnson (1978) classification of question type. The ten questions included:

1. four text explicit questions- answer is explicitly mentioned in text;

2. four text implicit questions- answer is inferred by

integrating information presented in text;

3. two script implicit questions-answer is inferred by relating text to prior knowledge concerning the topic;

It should be noted that the two script questions were excluded from the statistical analysis of the results because their reliability coefficients were found to be very low. These questions were included in the study as connecting prior knowledge to a learned topic enhances comprehension and is an integral part of the reciprocal teaching method. However, these questions were not considered to assess change over time as previous knowledge is based upon past experiences and is different for each individual.

In all cases, two independent raters (qualified reading specialists) agreed upon the classification and the appropriateness of the questions.

Identification of High Gainers, Moderate Gainers and Low Gainers (i. e., levels of cognitive modifiability) in the specific domain of reading comprehension: Four reading passages were given prior to intervention. A mean score for passages 1 and 3 and passages 2 and 4 was computed. A t-test analysis indicated that there were no significant differences in the mean scores and standard deviations of passages 1 and 3 when compared to passages 2 and 4. Passages 1 and 3 were designated as a measure of reading competency prior to intervention at baseline.

After five days of intervention, three reading passages were administered. Mean scores and standard deviations were calculated for all three passages. The passage with the middle mean score was arbitrarily identified as passage 2. Mean scores were again calculated for passages 1 and 3 combined. Performance on passages 1 and 3 was then used as an indicator of reading comprehension after five days of intervention.

Passages 2 and 4 given prior to intervention and passage 2 administered after 5 days of intervention were used to obtain a gain score in the specific domain of reading comprehension. The gain score was computed by subtracting the combined mean scores of passages 2 and 4 given prior to intervention from the mean score of passage 2 given after five days of intervention. This gain score was used as a dynamic measure of modifiability derived from the specific domain of reading comprehension. The experimental group subjects were then divided into three groups according to their gain scores. The decision to trichotomize was made because the gain scores distributed in an approximately normal pattern with natural breaks occurring at nearly the thirty third and sixty sixth percentiles.

Measures of Cognitive Performance

Raven Progressive Matrices: The Progressive Matrices is a non-verbal test of reasoning ability based on figural materials. The test measures the ability to reason by

analogy and to organize spatial perceptions into systematically related wholes. The examinee is presented with a matrix like arrangement of figural symbols and must select from a group of symbols the appropriate missing one. The test consists of five sets of twelve items each, in which the task is to choose a response that will complete the model from among six to eight given alternatives. The tasks range from filling in a continuous pattern to completing analogies. The rule or principle that will solve each item can either be formulated in verbal terms or be derived from a visual perceptual discovery of the internal structure of the stimulus.

The Progressive Matrices were administered twice to all of the experimental group subjects prior to intervention. A period of instruction was delivered between the two administrations of the Progressive Matrices. The period of instruction included the teaching of principles and strategies which are necessary to solve problems such as those presented on the Progressive Matrices. The second administration of the Raven Matrices was given two weeks after the first one. The scores on the first Progressive Matrices were considered to be a static measure of cognitive performance. The gain score obtained by the difference in scores between the two administrations of the Progressive Matrices was considered to be a dynamic measure of cognitive modifiability in the general figural domain. The

reliability coefficients at different ages, according to a test retest method, were found to be between .83 to .93 (Alfassi, 1986).

Tests from the Battery of Learning Potential Assessment Device: The Learning Potential Assessment Device (LPAD) is a dynamic approach to assessment which is based upon the theory of Structural Cognitive Modifiability developed by Feuerstein (1979, 1980). The basic model of the group testing of LPAD is (a) demonstration, (b) test, (c) learning, and (d) retest. The demonstration phase introduces the subject to the specific nature of the tasks and provides the basic test instructions. The test phase determines basic information regarding the individual's level of functioning and also serves as a baseline for comparative purposes after learning is triggered. During the learning phase the group undergoes a learning process that refers both to the nature of the tasks and to the perquisites deemed necessary in order to solve them. It is important to note that the test items themselves are not used for learning purposes. What is taught are the principles and the strategies that are appropriate for the given problem-solving processes. The retest phase is used to assess the efficacy of the intervention provided during the learning sessions. The difference in performance between test and retest is used as an indicator of the general level of modifiability obtained via an intervention

which is very similar to the regular classroom activity. These measures are also useful in detecting students who may show specific facilities for modifiability or specific difficulties in being modified in group procedures (Rand & Kaniel, 1987).

LPAD Set Variations II: The tasks of the LPAD Set Variations II are constructed on principles similar to those underlying tasks C, D and E of the Raven's Standard Progressive Matrices. LPAD Set Variations II consists of five series (A-E), in each of which there is an initial task, each of which has ten to thirteen variations. The task in LPAD Set Variations II is to complete the pattern by selecting an appropriate response from among eight given alternatives. In all of these series the first matrix is used for extensive mediation while the remaining ones are used to evaluate the benefits of the mediation provided. This test measures the ability of the individual to perceive the underlying principle of the task and to apply it while solving similar items. In this study the LPAD Set Variations II was administered between the two administrations of the Raven's Progressive Matrices and was used as an intervention and practice phase.

Organizer: The tasks of the Organizer consisted of a closed logical system. A series of verbal statements, or premises, were presented within each task. Each premise permitted the extraction of part of the information required

to reduce uncertainty and specify fully and precisely the placement/location of a series of entities (e.g., objects, colors, people) in a given field. In other words, each task consisted of a set of items which were organized and placed in positions relative to one another. The location of each item is not precisely specified within any single piece of information and its placement in an appropriate space must be inferred from data presented about the position of other items or the position of a given item relative to others. The tasks therefore mainly require the generation of information that is not immediately available in the given propositions. The tasks vary in their level of complexity, as defined by two dimensions: 1) The number of units of information involved in the task; 2) The level of inference required to solve them.

The Organizer consisted of a pretest phase (Organizer I), a learning phase, and a test phase (Organizer II). The pretest consisted of two examples followed by ten tasks. During the learning phase, various strategies and mediational processes were taught in the tasks of specifically designed pages. These learning sheets lay out for the subject the different modalities in which the problem can be presented as well as the varying degrees of complexity and levels of inference. The test phase consisted of twenty tasks similar to those in the pretest but which were more complex in their premises.

The functions needed in order to solve the tasks of the Organizer are: precise and complete gathering and retention of data, systematic and analytic exploration of relationships between events, simultaneous use of several sources of information, attention to spatial orientation and control of impulsivity. The cognitive operations required are: decoding, encoding, representation, inferential thinking and negation.

The difference in performance between Organizer I and Organizer II was considered to be an indicator of the level of cognitive modifiability in the general-verbal domain.

Procedure

This study consisted of six different phases:

Phase 1: Pretesting

Prior to the initiation of the study the following measures were administered to all experimental and control group students:

Gates-Macginitie Reading Tests

Four Passages with Questions

The following additional measures were administered only to the experimental subjects.

Raven Progressive Matrices

LPAD Set Variation II

Organizer I

Organizer II

As noted above, experimental group subjects were assigned to

three different categories (High Gainers, Moderate Gainers and Low Gainers) first according to their gain score on the general figural measure and then on their gain score on the general-verbal measure).

Phase 2: Mini Intervention

All experimental group subjects received intervention using a reciprocal teaching method. The instruction was done on a daily basis of five consecutive school days. The daily teaching sessions lasted for forty five minutes. An explanation of the reciprocal teaching method in general, and its use within the context of this study in particular was presented. Each day, one of the four different reciprocal teaching strategies (summary, questioning, prediction and clarification) was introduced accompanied with work sheets.

Phase 3: Maintenance- Post Mini Intervention

At the completion of the five days of intervention all experimental group subjects entered a short maintenance phase. Three reading passages with ten comprehension questions related to each passage were administered. The subjects were then assigned to the three experimental group categories (High Gainers, Moderate Gainers and Low Gainers) according to their gain scores on the reading comprehension measure.

Phase 4: Intervention

The three control group classes continued their regular

curriculum of remedial reading without being exposed to the reciprocal teaching method.

The five experimental group classes received an additional fifteen days of instruction using the method of reciprocal teaching. Each day a new passage was systematically introduced. A segment of text was assigned to a student who read it out aloud. After reading the text, the student asked questions that a teacher might ask on the segment, summarized the content for other students, discussed and clarified any remaining difficulties, and finally made a prediction about future content. All of these activities were embedded within a natural context with the students in each group giving feedback to one another. Initially, the adult teacher modeled the activities but gradually the students became capable of assuming their role as the "expert". Throughout the intervention, the teacher continued to provide guidance and necessary feedback to the student expert.

During the intervention (phase 4), the students were explicitly told that these activities were general strategies designed to help them better understand how to read, and that they should try to do something similar when they read silently in other subjects. It was pointed out that being able to say in one's own words what one has just read, and being able to guess what the questions will be on a test, are sure ways of testing oneself to see if one has

understood.

Each day after approximately 35 minutes of training, the students took an unassisted assessment, where they read a novel passage and answered from memory ten comprehension questions related to it. The answers to the questions were evaluated by two reading teachers. The number of correct answers were recorded on a chart that was handed back to the students the next day together with their answers on the passage. This procedure allowed the students to keep track of and to monitor their daily progress.

Phase 5: Maintenance Post Intervention

At the completion of the fifteen days of intervention all students entered a maintenance phase lasting two days in which they completed the reading assignments and answered ten questions related to each of five different reading passages.

Phase 6: Follow-Up

After a period of four weeks the students in the experimental group completed reading two different passages and answered ten questions to each passage.

Design

Independent Variables=

Groups

1. Experimental group - teaching with the method of reciprocal teaching
2. Control group - continuation of the curriculum of

the remedial reading classes.

Cognitive modifiability in the Specific Domain of Reading Comprehension (measured by gain scores on reading comprehension passages)

Phases

1. Pretest (baseline)
2. Mini Intervention (training for five days)
3. Maintenance - Post Mini Intervention (one day of testing)
4. Intervention (training for fifteen days)
5. Maintenance - Post Intervention (two days of testing)
6. Follow-Up (one day of testing, four weeks after completion of intervention)

Gain Categories in Three Domains

Specific reading	General-figural	General-verbal
1. High Gainer	High Gainer	High Gainer
2. Moderate Gainer	Moderate Gainer	Moderate Gainer
3. Low Gainer	Low Gainer	Low Gainer

<u>Dependant variables=</u>

Achievement scores	Phase
1. Reading comprehension passages	1,2,3,5,6

CHAPTER IV

RESULTS

As previously noted, this study was designed to integrate knowledge about the learning potential of the individual which was defined by dynamic assessment, and connect it directly to the design of an instructional technique (reciprocal teaching). In addition to reconfirming the efficacy of reciprocal teaching as a remedial program, the main purpose of this study was to determine if dynamic assessment administered prior to the intervention would identify which students would benefit most from the reciprocal teaching method. Dynamic assessments were made in three different domains in an attempt to determine which of the three assessments would be most effective with the respect to detecting individual differences that interact with the reciprocal teaching method.

The dependent variables used in this study were achievement scores obtained on reading comprehension passages at four different phases (phases 1,3,5,6) of the investigation. Possible scores on reading comprehension passages could range from 1 to 3. The means, standard

deviations, and sample sizes for the experimental and the control groups at phases 1,3,5 and 6 are presented in Table 1.

Table 1

Means, Standard Deviations, and Sample Sizes of Reading Achievement Scores Across Groups

	Phase			
Groups	1	2	3	4
Experimental Group (n= 47)				
Mean	1.93	1.99	2.37	2.47
SD	.407	.382	.284	.286
Control Group (n= 22)				
Mean	2.06	2.08		
SD	.361	.364		

The independent variables used in this study were method of instruction [experimental group (1), control group (2)], level of cognitive modifiability (high gainer, moderate gainer, low gainer) obtained in different domains (general-figural general-verbal and specific reading comprehension), and phase of investigation (1,3,5,6).

To test the first null hypothesis, a 2 (method of instruction) X 2 (phases) repeated measures multivariate analysis of variance (MANOVA) procedure was performed on the dependent measure of reading achievement with the

independent variables being method of instruction and phases. To test the second and third null hypotheses a 3 (levels of modifiability) X 4 (phases) MANOVA was run on the dependent measure of reading achievement. To test the fourth null hypothesis the categorized (ranked) gain scores on various domains of cognitive modifiability were compared using Spearman correlation coefficients.

Results Related to Testing Null Hypothesis One

The first null hypothesis states that there will be no significant difference in achievement scores on reading comprehension passages across experimental (reciprocal teaching) and control groups (standard remedial teaching) over the phases of intervention.

The first null hypothesis was rejected. The analysis of the results indicated that there were significant interaction effects between experimental and control groups (method of instruction) over time (phases 1 & 5), F (1,73) = 19.56, p = <.0001. The results indicated that there was a significant difference in the mean scores on measures of passage comprehension between the experimental and control groups from the beginning of the investigation (phase 1) to the completion of the intervention (phase 5) with the experimental group obtaining higher scores. The mean achievement scores obtained at phase 1 and phase 5 for the experimental and control groups are displayed in Figure 1.

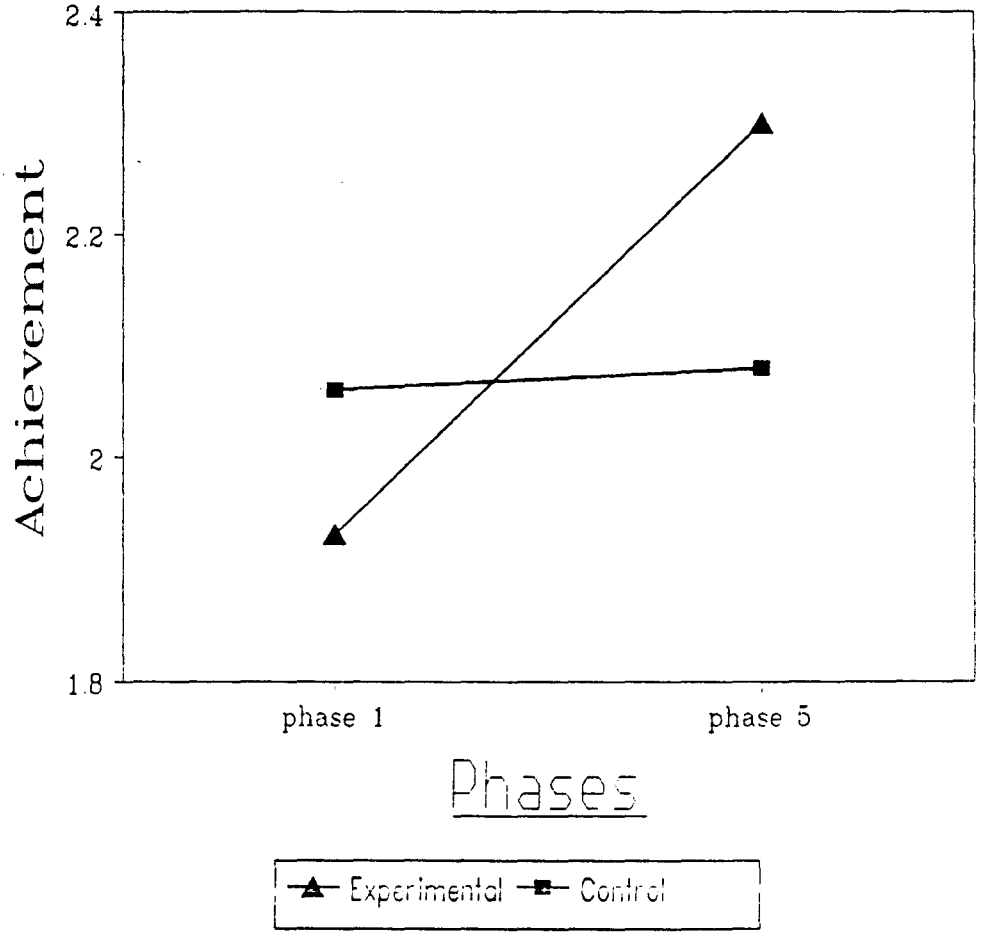

Figure 1: Interaction of achievement scores and phases for experimental and control groups.

Results Related to Testing Null Hypothesis Two

The second null hypothesis states that when dimensions of specific cognitive modifiability are obtained by trichotomizing gain scores on the measure of reading achievement into high, moderate, and low gainers, there will be no significant interaction among these levels of modifiability, reading achievement, and phases of the intervention.

A repeated measures MANOVA analysis indicated that there was a significant interaction effect for the 3 (dimensions of modifiability) X 4 (phases 1,3,5,6) design. $F(6,84) = 4.61$, $p < 0001$. In other words, when students from the experimental group were trichotomized according to their gain scores on the reading comprehension measures (specific domain), there was a significant difference in the mean scores of passage comprehension among the three experimental groups from prior to the intervention (phase 1) to the completion of the investigation (phase 5). Thus, the second null hypothesis was rejected. Figure 2 presents a comparative representation of the mean achievement scores obtained at phases 1, 3, 5, and 6 by the three experimental groups.

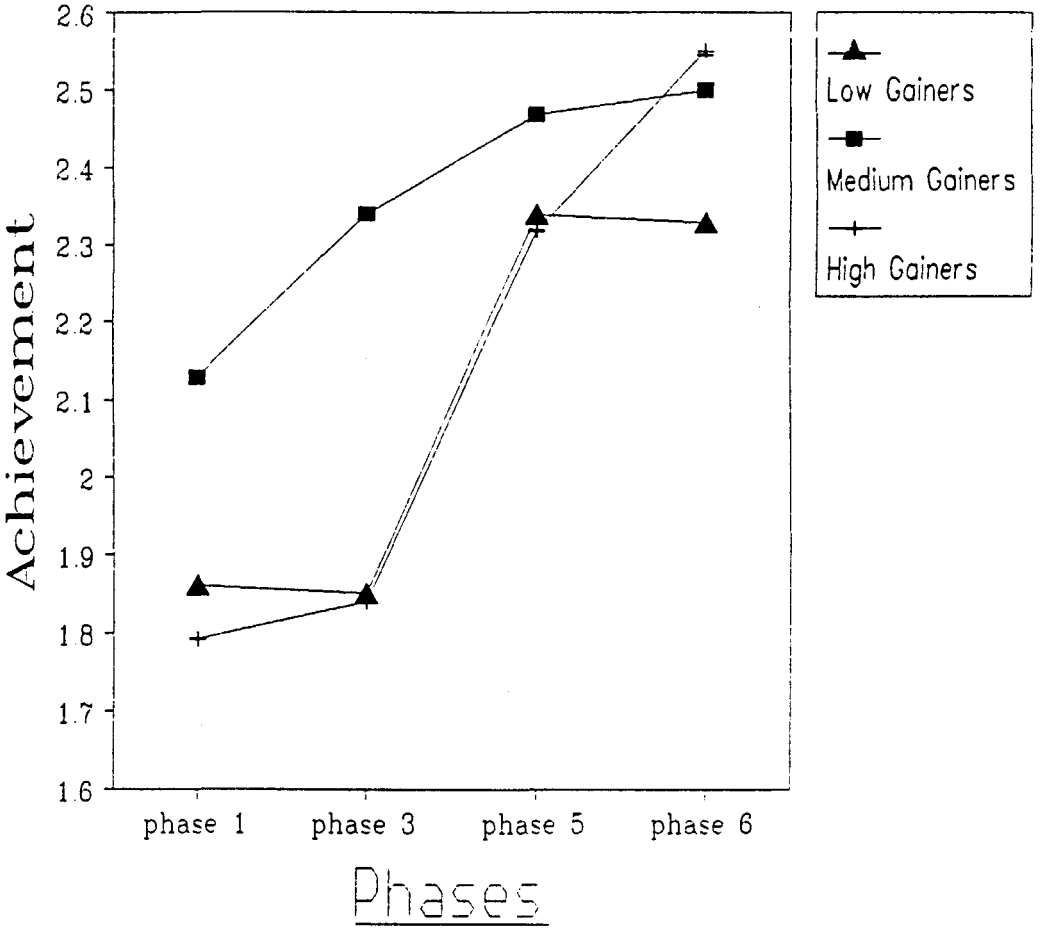

Figure 2: Interaction of achievement scores and phases for Low, Moderate, and High Gainers.

Results Relating to Testing Null Hypothesis Three

The third null hypothesis states that when dimensions of general cognitive modifiability are obtained by trichotomizing the gain scores on the figural and verbal general measures into high, moderate, and low gainers,there will be no significant interaction among these levels of modifiability, reading achievement and phases of the intervention.

Repeated measures MANOVA analyses showed there was no significant interaction effects over time on the dependant achievement measure of reading comprehension for general cognitive modifiability, using either the Ravens Progressive Matrices or the Organizer. Rejection of this null hypothesis was not supported. There was no significant interaction found in the mean scores of achievement measures among the High Gainers, Moderate Gainers, and Low Gainers as defined by their gain scores on the measures of cognitive modifiability in the general domain.

Discussion related to Testing Null Hypothesis Four

The fourth null hypothesis states that the categorization of high, moderate, and low gainers will be independent and as a result, there will be no significant relationship among the various domains of cognitive modifiability.

Spearman Rho coefficients were computed to determine if an individual who gains at a certain level, either high,

moderate or low in one domain tends to gain at that level in the other domains. Results of these analyses indicate that there is a significant correlation [Rho] = .34, $p < .009$ between ranked levels of modifiability on the Ravens Progressive Matrices and the Organizer. No significant relationship between rank level of modifiability on the specific domain of reading comprehension and either general measures of modifiability was found. For additional insight into the correlations among the different levels of modifiability (high, moderate and low) across the various domains of cognitive modifiability (general-figural, general-verbal and specific domain of reading comprehension) see Appendix A.

CHAPTER V

DISCUSSION

The final chapter presents a discussion of the results related to testing each of the four null hypotheses. Overall, this chapter is designed as an attempt to integrate the findings of this study with those reported in Chapter II. A general discussion of the results, how they relate to previous research, and suggestions for future research are also presented here.

The study described here was designed to test for variation in achievement scores across different categories (levels) of cognitive modifiability (High Gainer, Moderate Gainer, Low Gainer) in addition to exploring the way in which different domains of dynamic assessment (General-figural domain, General-verbal domain, Specific-reading comprehension domain) interact with treatment. The focus of the study was directed at examining the utility of using the reciprocal teaching method for reading comprehension with remedial high school students while at the same time determining which students would benefit most from the intervention program.

Discussion related to Null Hypothesis One

Examination of the results of the statistical analyses related to this hypothesis indicated that at the beginning of the investigation, the mean score of the experimental group subjects on the reading comprehension passages was equivalent to a 64.6% level of accuracy. After 20 days of intervention the experimental group subjects improved their level of accuracy to 78.7%, which is considered to be an adequate level of functioning in the realm of reading comprehension. The control group subjects did not manifest any improvement across the phases of investigation. At the beginning of the investigation they were functioning at a 68.8% level of accuracy; after 20 days they were functioning at a 69.5% level of accuracy. These results lend additional support to the many studies (Brown & Palincsar, 1982, 1984, 1986) which indicate that the reciprocal teaching method leads to significant improvement in reading comprehension skills.

As mentioned earlier, this study is anchored in past research conducted by Brown and Palincsar in the realm of reading comprehension, and as a result the methods utilized in this study were deliberately chosen to be similar to those of previous studies. Even so, the setting of the current study in which the reciprocal teaching training was conducted, differed from other settings utilized in most of the studies reported by Brown and Palincsar. In the studies

reported by Brown and Palincsar, the subjects were elementary students (ranging from the first grade to the seventh grade) and the reciprocal teaching training was conducted within groups of two to eight students per group. In the study reported here, the subjects were freshman high school students and the groups consisted of intact classes with the number of students per class ranging between eight to thirteen. The significant improvement in reading comprehension skills manifested by the subjects of the experimental group, clearly demonstrates the effectiveness of utilizing the reciprocal teaching method within an intact classroom setting as part of the overall curriculum.

Discussion related to Null Hypothesis Two

Examination of the experimental group means indicated that at the beginning of the investigation, the performance of the three experimental groups on the reading comprehension measure was significantly different ($p < 00.5$). The High Gainers (group 3) began the investigation with the lowest comprehension score, followed by the Low Gainers, while the Moderate Gainers obtained the highest comprehension score at baseline. After four days of intervention, slight progress was noted in groups 2 and 3 (Moderate and High Gainers) while group 1 Low Gainers) showed no improvement at all. These findings are not surprising as they are a partial outcome of the decision to trichotomize the experimental group according to their gain

scores. After 20 days of intervention all experimental groups manifested significant ($p < .0001$) improvement on the reading comprehension passages. The differences between experimental group mean scores at phase 5 of the intervention were not found to be significant even though significant differences between the group mean scores were noted at phase 1 of the investigation. This finding suggests that the reciprocal teaching intervention is a significant vehicle for change since all participants benefitted from the program and manifested equivalent performance, regardless of their initial competence on the reading comprehension measure and level of modifiability.

The results further indicated however, that after four weeks of maintenance (phase 6), the group mean scores on the reading comprehension measure, were found to be significantly different. Further analysis showed that there was a significant difference in the mean scores among the groups of experimental students between phase 5 (after 20 days of intervention) and phase 6 (maintenance). Examination of the group means indicated that the Low Gainers maintained their mean scores from phase 5 while the Moderate and High Gainers continued to improve, even though the treatment was terminated. At this phase of the investigation, the High Gainers (group 3) had the highest mean passage comprehension score among the groups. By phase 6, students in group 3 had gained most from the intervention

as they demonstrated the greatest change in their performance indicating that level of modifiability may be an attribute to change. In other words, dynamic assessment predicts the readiness for change and defines in Vygotsky's terms the zone of proximal development of the individual in a specific domain, these findings support the assumption that a broader zone of proximal development allows for a greater amount of change and supports the adequacy of the psychometric properties of the dynamic assessment measures.

The findings are also consistent with the review of the literature and are additional support to Feuerstein's theoretical entity of structural cognitive modifiability: "Cognitive modifiability can be defined as structural when changes in a part affect the whole; when there is a transformation of the very process of change itself, its rhythm, its amplitude, and its direction; and when the change is <u>self perpetuating</u> (emphasis added), thereby reflecting its autonomous, self regulatory nature. Structural cognitive modifiability is therefore characterized by the permanence, pervasiveness, and centrality of the changes that occur" (1986, LPAD Manual). This structural cognitive modifiability is most clearly seen in Group 3 students' improved level of performance that was durable, pervasive, and self perpetuating.

It is interesting to note that the significant interaction of groups (High Gainers, Moderate Gainers, and

Low Gainers) by time was only found on the dynamic measure of gain score. When the students of the experimental group were divided into three subgroups by their initial level of performance on the reading comprehension passages, no significant interaction effect was found for groups (High initial level of performance, Moderate initial level of performance, Low initial level of performance) by time (4). In other words, the static measure of initial level of performance does not appear to be a predictor of sensitivity to change, but the dynamic measure of modifiability does appear to be a predictor of modifiability in the specific domain.

It should be noted that these findings are consistent with the results of a previous study (Alfassi, 1986) in which static measures were found to be inadequate with respect to detecting significant differences in cognitive performance between groups, while the dynamic predictive measures (gain scores) were found to be significant predictors of cognitive performance across groups. Taken as a whole, these findings support the convictions of Vygotsky (1978), Feuerstein (1980), Budoff (1976), and Brown and Campione (1984) who emphasized the importance of analyzing how a child responds to instruction. This analysis provides diagnostic information that is inaccessible to users of traditional assessment procedures. Furthermore, these findings lend empirical support to the notion that it is

important to devise dynamic assessment measures that complement the information afforded by standard tests of ability and achievement.

Discussion related to Null Hypothesis Three

Even though null hypothesis three was not rejected (i.e., the repeated measures analyses showed no significant interaction on either measure of general cognitive modifiability), it is interesting to note that on the measure of cognitive modifiability in the general figural domain, the level of significance for group by time was $p > .785$. On the measure of modifiability in the general-verbal domain, the level of significance for group by time was $p > .276$. These findings taken in combination could result from the similarity between the tasks on the measure of modifiability in the general verbal domain and the tasks of the intervention, since both were presented in the verbal modality and had a high language loading.

Discussion Related to Null Hypothesis Four

Examination of the results of the statistical analyses related to this hypothesis indicated that there is a significant relationship between the measures of cognitive modifiability in the general domain. Even though the measures are different in their modality since one is verbal while the other is figural, they share the same cognitive operations needed in order to solve the different items of the tests. Past research (Alfassi, 1986) has reported that

a Pearson correlation analysis showed that there is a significant correlation between the two measures ($r = .50$, $p < .0001$) which suggests that although there is a difference in the content of both measures they examine the same aptitudes. The findings of this study further support this assumption.

This null hypothesis was only partially rejected since the statistical analyses of the data set indicated no significant correlation between rank level of modifiability on the specific domain of reading comprehension and either general measures of cognitive modifiability. Overall, these findings are supportive of the efficacy of administering dynamic assessment in a specific domain when attempting to determine individual differences that interact with intervention provided in the same domain. These findings also support Brown's notion that cognitive modifiability can be best assessed in the context of some principled domain (in press). It is not that Brown denies the existence of general processing skills rather she maintains that there are also important domain specific skills and procedures that need to be evaluated and that more general skills can vary across domains as a function of variations in the availability of those more specific capabilities. Thus situating assessment within a specific area should provide valuable diagnostic information about the individuals' learning potential and their readiness for change in that

domain. In other words modifiability can vary across domains (i.e., one can have a broader zone of proximal development and be more modifiable in one domain and as a result benefit more from intervention in that domain than in another in which one has a narrower zone of proximal development). These findings suggest that the sensitivity of dynamic measures is most pronounced when situated within the context of a specific domain.

Summary and Suggestions for Further Research

In sum, the results of the study show that reciprocal teaching is a viable instructional technique that can be implemented successfully within intact mainstream classes as part of the overall curriculum. In addition, the results provide empirical support that dynamic assessments of modifiability provide diagnostic information which cannot be afforded by standard tests of ability and achievement. Furthermore, the findings of this study support the efficacy of administering dynamic assessments in a specific domain when attempting to determine individual differences that interact with intervention provided in the same domain. Situating assessment within a specific domain appears to provide valuable diagnostic information with respect to a student's learning potential and his or her readiness for change and also serves to inform instruction.

The theoretical implications of the findings of this study result in support of developing assessments and

instructional methods within the domain of specific academic skills rather than in the domain of general independent skills. The operation of general processing skills appears to vary across domains as a function of variations in the availability of more specific capabilities. The findings of this study also lend support to the utilization of dynamic assessment procedures in defining cognitive modifiability (i.e., zone of proximal development) which appears to provide important diagnostic information about the learning potential of students that may be translated into suggestions for instruction. The results of the present study provide support for the development of an instructional model that integrates assessment and instruction.

The reciprocal teaching intervention appears to be a significant vehicle for change. Most of the studies supporting the efficacy of this instructional technique were done in the realm of reading comprehension. It appears to be of particular importance for us to investigate the component processes and skills of other content academic domains since this would enable us to utilize the reciprocal teaching technique in additional realms.

Research in the realm of dynamic assessment has been based on the assumption that learning and transfer are general processes that remain constant across a variety of tasks.. The findings from recent studies, including the

findings reported here, suggest that processes may vary with the task or content domain. Future research should be aimed at developing a means by which dynamic assessments could be utilized to identify the component processes involved in learning and transfer of particular skills. Additional studies exploring alternative teaching/learning interactions through dynamic assessments may enable teachers to adjust instruction to students' changing competencies across different academic domains.

It would be interesting to systematically replicate this study while enlarging the number of subjects and lengthening the duration of the study. It would be particularly interesting to see if a longer training session would in fact produce better and more durable changes within the low and moderate gainer groups. The number of subjects in such a study should be increased so that interaction comparisons would be possible. In order to increase the reliability of the instrumentation of the reading comprehension questions, it would be worthwhile to conduct a pilot study prior to the investigation itself. Such a study should include reading comprehension passages with twenty questions assigned to each passage. The passages and questions should be presented to adequate comprehenders. After which, the questions with the highest reliability would be selected for use in the investigation. This procedure would prevent excluding questions from the

statistical analysis of the results due to low reliability coefficients. As noted above, the investigation of the influences of individual differences on achievement and the instruments that were used to measure these constructs needs to be greatly expanded. An interesting avenue to pursue, would be to conduct a study utilizing the reciprocal teaching technique to determine if the fostering of social skills in addition to the fostering of reading comprehension skills has a significant influence on achievement.

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APPENDIX A

General Figural Domain

Group	Low Gainer n=15		Moderate Gainer n=18		High Gainer n=18	
	General Verbal Domain	Specific Domain	General Verbal Domain	Specific Domain	General Verbal Domain	Specific Domain
Low	n=8	n=6	n=2	n=3	n=4	n=6
Moderate	n=3	n=2	n=10	n=6	n=5	n=5
High	n=2	n=7	n=6	n=6	n=9	n=6

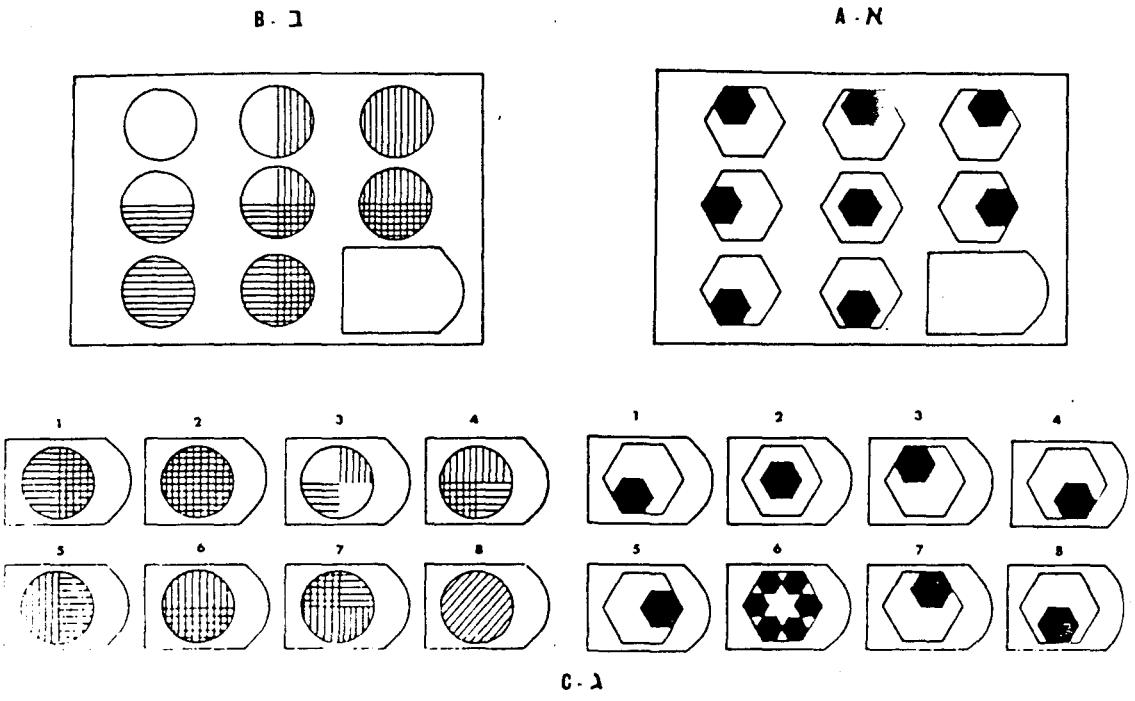
General Verbal Domain

	Low Gainer n=14		Moderate Gainer n=18		High Gainer n=17	
Group	General Figural Domain	Specific Domain	General Figural Domain	Specific Domain	General Figural Domain	Specific Domain
Low	n=8	n=6	n=3	n=2	n=2	n=6
Moderate	n=2	n=2	n=10	n=6	n=6	n=6
High	n=4	n=5	n=5	n=9	n=9	n=5

Specific Domain of Reading Comprehension

	Low Gainer n=14		Moderate Gainer n=14		High Gainer n=19	
Group	General Figural	General Verbal	General Figural	General Verbal	General Figural	General Verbal
Low	n=6	n=6	n=2	n=2	n=7	n=5
Moderate	n=3	n=2	n=6	n=6	n=6	n=9
High	n=6	n=6	n=5	n=6	n=6	n=5

APPENDIX B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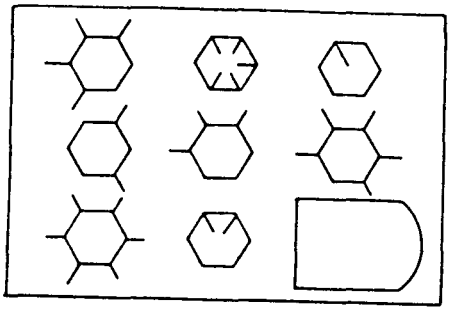

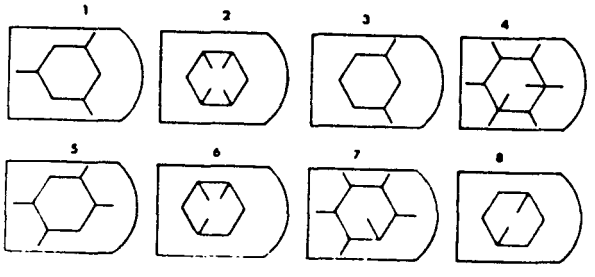

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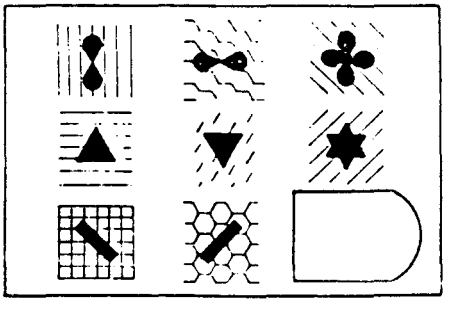
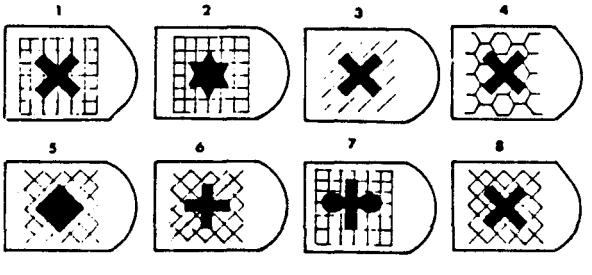




APPENDIX C

3

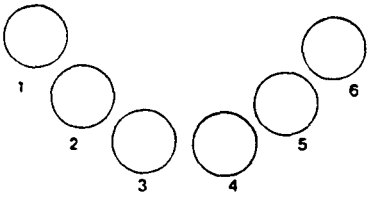
7. Colored beads are strung on a necklace. The six colors are Black, Gray, Orange, Pink, Red and White. Find the place of each bead on the necklace.

a) If the Orange, Pink and White are strung,
beads 1, 2 and 3 will be left.

b) If beads 2, 3, 4 and 5 are strung,
the Gray and the Pink beads will be left.

c) If beads 2 and 4 are strung,
the Black, Gray, Pink and White will be left.

The solution is:



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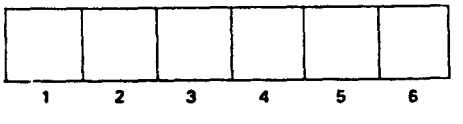
8. Place each of the animals in the appropriate cage.

a) In cages 1, 2, 4 and 5 are the Giraffe, the Lion, the Rabbit and the Zebra.

b) The Giraffe, the Monkey and the Zebra are in cages 4, 5 and 6.

c) The Wolf is next to the Rabbit but not next to the Giraffe.

The solution is:



APPENDIX D

Name _____

Questioning

Using Question Words

Write a question for each sentence below that begins with the question word given.

1. The falcon is a female hunting bird.

   What _____

2. A falcon prefers to hunt for its prey in open areas.

   Where _____

3. In the 1950's the falcon populations in North American and Central Europe dropped suddenly.

   When _____

4. The falcon hunts by swooping down on her prey and grabbing it with her sharp talons.

   How _____

Now, make up questions for sentences #5 through #8. This time, however, no question words are provided.

5. Although animals don't have the kind of language we have to communicate with one another, they do use signals to comminicate information to other animals.

   _____

   _____

6. Because snakes are totally deaf, it is the movement of the snake charmer that charms the snake, not the music the snake charmer plays.

   _____

   _____

7. Some ants give off a special alarm odor that warns nearby ants of danger.

   _____

   _____

8. The sounds made by bats, moths, and whales are too high for humans to hear.

_____

_____

Asking Different Kinds of Questions

Following paragraph #9 are five questions. We are going to try to decide how these questions are different. We'll see if they all are asking about important ideas and information in the paragraph. We'll also see whether the paragraph contains enough information to answer the questions.

9. Deaths from snakebite have been cut down in recent years by the use of antivenins, which are medicines that work against the snake poisons. There are now few deaths from snakebite in the United States and Canada.

a. What are antivenins?

b. Why do fewer people die from snakebite these days?

c. In what countries do few people die from snakebite?

d. Why do few people die from snakebite in those countries?

e. What kinds of snakes are poisonous?

Now that you know more about the different kinds of questions we can ask, we're going to practice identifying and creating some particular kinds of questions. The first kind we'll work on will be questions that ask about important ideas or main points since these are usually the best for checking understanding.

Read paragraph #10 and the three questions. Put an X beside the question that asks about the main point of the paragraph.

10. The smallest snake is just about the size of a worm. The largest snake has been known to reach thirty feet in length, which is almost as long as two station wagons put together. There are many varieties of snakes, and they come in different lengths.

a. How small is the smallest snake?

b. How long are two station wagons?

c. How long do different snakes get?

Now read paragraph #11 and the questions that follow it. Put an X beside the question that asks about the main point of the paragraph.

11. Contrary to what some people believe, snakes do not sting with their tongues. Their tongues are used to sharpen their sense of smell. The snake picks up tiny particles of matter in the air with his tongue and puts them in two tiny holes at the bottom of his nostrils so that he can smell better.

a. How do snakes use their tongues to improve their sense of smell?

b. How many holes does a snake have at the bottom of his nostrils?

c. What kinds of particles are in the air?

First, read paragraph #12. Then decide what the paragraph is mainly about. Next, write a question that you would ask to check understanding of the most important point or idea in the paragraph.

12. Very small snakes eat small insects or worms. But, large snakes can eat small deer, goats or even leopards. All snakes, no matter what size they are, eat living animals or animal eggs. In fact, some snakes even swallow other snakes.

_____

_____

_____

"Let's try one more like #12. The next one on your papers is #12a. First read the paragraph and then write a question to check understanding of the most important idea in the paragraph.

12a. Bees communicate with each other by performing special movements called dances. When a bee has found a good food source, it will return to the nest and perform a dance that will give the other bees important information.

_____

_____

_____

Now we're going to see if there are any important facts in the paragraph that support the main point. Look at the questions below the paragraph. Select one that asks about an important fact related to the main point. Put an X beside that question. If you think more than one question asks about an important fact, you may put an X beside two of the questions.

13. The smallest snake is just about the size of a worm. The largest snake has been known to reach thirty feet in length, which is almost as long as two station wagons put together. There are many varieties of snakes, and they come in different lengths.

main point : how long different snakes get

self-check question : How long do different snakes get?

a. How small is the smallest snake?

b. How long is the largest snake?

c. Are there different varieties of snakes?

Let's try another one. Read the paragraph about snakes' tongues and then select a question about an important fact in the paragraph.

14. Contrary to what some people believe, snakes do not sting with their tongues. Their tongues are used to sharpen their sense of smell. The snake picks up tiny particles of matter in the air with its tongue and puts them in two tiny holes at the bottom of its nostrils so that it can smell better.

main point : how snakes' tongues sharpen sense of smell

self-check question : How do snakes' tongues sharpen their sense of smell?

a. What do some people believe about snakes' tongues?

b. What does the snake place near its nostrils with its tongue?

Now you're ready to try creating a question on your own. Take another look at this paragraph. The main point and the self-check question are printed underneath it. In the space provided on your paper, write a question that asks about an important fact that supports the main point.

15. Very small snakes eat small insects or worms. But, large snakes can eat small deer, goats or even leopards. All snakes, no matter what size they are, eat living animals or animal eggs. In fact, some snakes even swallow other snakes.

main point : what food snakes eat

self-check question : What foods do snakes eat?

_____

_____

_____

Now look at #16 on your papers. It's another paragraph about snakes. We're going to practice identifying the kinds of questions we've been talking about today. Read paragraph # 16 now. When you have finished reading, read the questions that appear below it. Try to decide what kind of question each one is and whether or not you would ask it in order to check understanding of the paragraph. We'll discuss all the questions together.

16. Snakes are very flexible because their bodies are like rubber hoses with many bones. In fact, a snake's backbone can have as many as 300 vertebrae, almost ten times as many as a human's. Because of all these vertebrae, a snake can twist its body in almost any direction, and is much more flexible than the human body is.

a. Why are snakes able to move their bodies so flexibly?

b. How many vertebrae do snakes have?

c. How many vertebrae do humans have?

d. Are snakes as flexible as humans?

6

Now you're ready to try writing all the questions for a paragraph you have read-- the questions about the most important ideas and the questions about any facts or details that are important. Read paragraph #17 below. Then write at least two questions, one about the main point and one about an important fact that provides support for the main point.

17. A well-known tropical ant family, the Atta, get their food in an unusual way. The Atta live by eating fungus, a type of plant like mushrooms that can live without sunlight. The Atta keep a good supply of food available by growing crops of fungus right inside their nests.

(main point)

_____

_____

(important fact)

_____

_____

(another question)

_____

_____

Name _____

Questioning

Independent Practice

For the last part, I want you to practice identifying and creating questions on your own. Here are four paragraphs. For the first two, you will be selecting the best questions to ask in order to check understanding. For the last two, you will be writing your own questions to check understanding.

For # 18 and #19, put a 1 beside the question that you think would be the best question to ask someone in order to check understanding. Put a 2 beside the next best question. Put a 3 beside any question that you would definitely not ask to check understanding.

18. Camels have been helpful to people who live in deserts for thousands of years. They have carried people as well as their goods on their strangely shaped backs. They are able to cross deserts and mountains on trips that may take two months.

____a. How are camels helpful to people who live in the desert?

____b. How long can a trip last?

____c. Why do camels have strangely shaped backs?

____d. What sorts of things do camels carry?

19. Scientists have studied the camel carefully to determine how it can live where other animals would die. They have found that the camel's body is especially well designed for its life in the hot, dry, sandy parts of the world. The camel's feet, legs, nostril, and even eyelashes are all well designed for helping the camel survive in the desert.

____a. Where does the camel live?

____b. How does the camel survive in the desert?

____c. What are scientists?

____d. Do camels have strange backs?

For # 20 and # 21, write at least two questions that you would ask yourself or someone else in order to check understanding of the important ideas and information in the paragraph. Be sure to have one question that checks for understanding of the main point, and one question that checks understanding of an important fact that supports the main point. There is space provided for you to write a third question if you wish.

20. There have been many women in America's history who have done much good for mankind. One of these women was Alice Hamilton. Alice Hamilton was a doctor who was very concerned about the health of people who worked in factories. During her career, she helped to improve working conditions for many workers in American factories.

(main point)

_____

_____

(important fact)

_____

_____

(another question)

_____

_____

21. Some adult moths and butterflies feed only on nectar, and they must search for flowers and other plants that contain nectar. The females even lay their eggs near these flowers and plants so that later, the caterpillars will have the food they need nearby.

(main point)

_____

_____

(important fact)

_____

_____

(another question)

_____

_____

APPENDIX E

The Gila Monster

The Gila monster is not actually a monster, but neither is it an ordinary lizard. It is one of the largest lizards in North America, sometimes reaching two feet (about .6 meters) long, and it is the only poisonous lizard in the United States. It and a "relative" in Mexico are the only two varieties of poisonous lizards in the world.

The Gila monster is a slow-moving, clumsy animal. Its tail is so heavy that it is difficult for it to lift when it walks. But it manages somehow to waddle about carrying its thick body on those four stubby legs. Occasionally, it simply allows its tail to drag in the sand.

Because the Gila is not able to chase any prey, it is limited mainly to eating what it comes upon, such as eggs of snakes and of birds that nest on the ground. Sometimes it snatches a smaller lizard that comes close enough. It likes insects and is especially fond of black ants.

These ants usually travel in an extended line, one behind the other. A Gila monster will straddle the procession, and as the ants continue marching, they will pass directly under its body, for they will not alter their direction. The Gila monster simply stretches out its tongue and flicks one ant after another into its mouth.

Often during the hottest part of the summer, Gila monsters slink away to find a cool place. They doze and go without eating until the hottest weather is over.

Though Gila monsters are poisonous, they do not strike with fangs the way poisonous snakes do. A Gila monster has venom which pours from a gland in the creature's throat into the cuts its teeth make, a rather slow process. But its jaws are very strong, and once it grabs hold, it is very hard to pull it off.

Because this "monster" was feared by so many people who came to the desert, it was killed on sight. So many Gila monsters were killed in Arizona that they almost disappeared. Other people who believe that all species of wildlife have a right to exist on this earth protested the killings. A law protecting all Gila monsters was passed in Arizona. Heavy fines were imposed on those who disobeyed.

Now these beaded lizards are allowed to live in their natural habitat in the desert country; to find shelter from the intense heat in the summer and from the cold in the winter; and to drag their clumsy bodies about on the sand, finding such food as they are able to obtain in the desert. There may be monsters somewhere, but they are not the Gilas.

Name:

Questions to the Gila Monster

1. How would you describe the Gila monster?

2. What two characteristics distinguish the Gila monster from other lizards in North America?

3. What is the Gila's natural habitat?

4. Why would it be true to say that the black ant "marches straight" to it's death ?

5. Why does the Gila mainly eat eggs of snakes and birds that nest on the ground?

6. How does the Gila monster poison it's prey?

7. Why aren't Gila monsters killed today?

8. What basic principle do the people who protested the killing of the Gila believe in?

9. Why was the Gila considered to be a monster?

10. In what way is a Gila similar to a camel?

THE LEGEND OF THE POISON GLOVES

If Agatha Christie had been writing mysteries during the Middle Ages, one of her best might have been a tale about the poison gloves of Catherine de Medici. Catherine was a French queen, married to King Kenry of Navarre. At that time the monarchs had more than enough enemies; there were many plots against the king and queen and many ambitious persons behind those plots. A bit too often, however, an enemy of the Crown would meet a mysterious death; thus arose the legend of the poison gloves.

Gloves were one of the most important articles of clothing in medieval fashion. Kings and nobles had hundreds of pairs, handcrafted from the finest leathers and silks. Often they were embroidered with gold thread and studded with precious jewels or decorated with imported lace. One of the most respected gifts one could receive was a pair of gloves.

Gloves were only for men until the sixteenth century. Although glove-wearing dates back to the cave people, women were forbidden to wear gloves by ancient traditions. However, by the Middle Ages kings began allowing women to wear the famous fashion, and Catherine de Medici became well known for the beautiful gloves she wore. Her taste influenced the French Court as gloves became the height of fashion for French women. Queen Catherine's gloves, though, became famous for another reason—a sinister one.

Catherine was a powerful, a fearless, and, according to many, a ruthless queen. She came from a powerful family, the Medicis, a banking family who were highly influential in medieval history. The family included several members of royalty and many nobles. As queen, Catherine was in the middle of all the rivalries and plots that plagued the royalty of the Middle Ages.

Then, suddenly, enemies of the Crown, such as Jeanne of Navarre, were found dead in their beds. No signs of any struggles were found. It appeared that the victims had been poisoned, yet it was difficult to find out how the poison had been administered. Perhaps it was a coincidence, but many of the victims had received gifts of gloves from Queen Catherine.

Medieval detectives built a solid case blaming Queen Catherine de Medici. Her motives to eliminate the victims were obvious: they were endangering her power. Most likely, it was thought, she used a fashionable poison called "Venetian Juicelets." She could have soaked the gloves in the poison. The ill-fated wearer of the poison gloves would slowly absorb the deadly ingredient. After the death, there was no evidence. The case was closed.

The story of the deaths, however, does not end there. Historians now say that Catherine, although powerful, was not a murderer; poison gloves were not evidence dependable enough for murder charges. The deaths of Catherine's enemies, then, remain a mystery.

"Legend of the Poison Gloves"

1. Who is Agatha Christie?

2. What were some characteristics of Queen Catherine?

3. What was Queen Catherine De Medici main motive to eliminate her enemies?

4. How do Medieval detectives assume that Queen Catherine killed her victims?

5. What led these detectives to believe that Queen Catherine was the murderer?

6. What do historians today believe about these strange murders?

7. What would you give someone for a present during the Middle Ages to impress them?

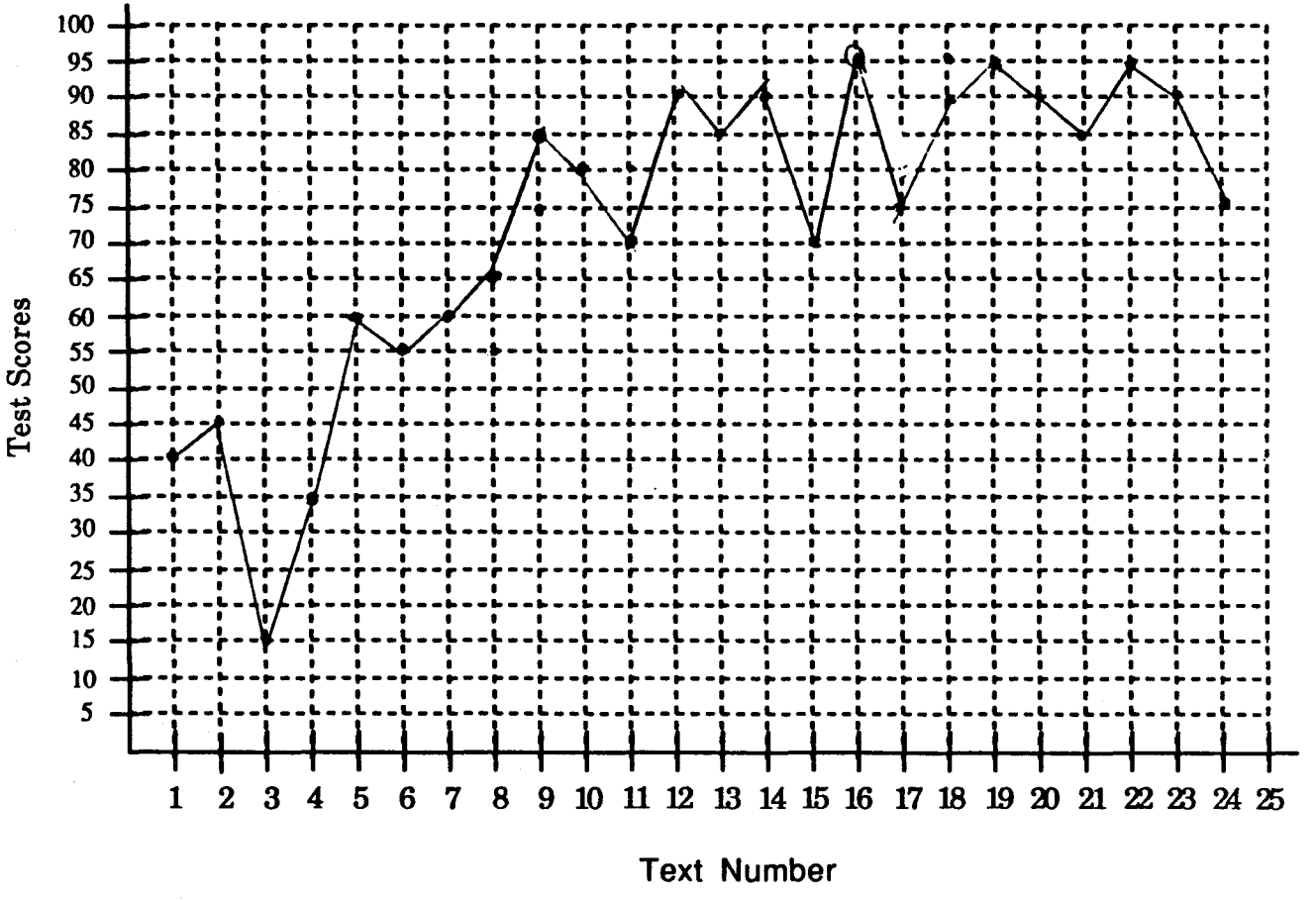
8. Why do the deaths of Catherine's enemies remain a mystery?

9. How are gloves worn differently today than in the past?

10. Why was there no evidence found on which to convict Queen Catherine?

APPENDIX F

Reciprocal Teaching Progress Report



Approval Sheet

The dissertation submitted by Miriam Alfassi has been read and approved by the following committee:

Dr. Ronald Morgan, Director
Associate Professor, Counseling & Educational Psychology

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Dr. Robert Harth
Professor, Special Education, National Louis University

The final copies have been examined by the director of the disseration and the signature which appears below verifies that fact that any necessary changes have been incorporated and that the dissertation is now given final approval by the Committee with reference to content and form.

The dissertation is therefore accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

9/6/98
Date


Director's Signature