RECIPROCAL TEACHING AND TRANSENVIRONMENTAL PROGRAMMING: A PROGRAM TO FACILITATE THE READING COMPREHENSION OF STUDENTS WITH LEARNING DISABILITIES

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TABLE OF CONTENTS

Abstract
Acknowledgements
List of Table
List of Figures

Page

CHAPTER I INTRODUCTION 1

Learning Disabilities
Definition
Characteristics of Children with Learning Disabilities
Metacognition
Cognitive and Metacognitive Strategy Training
Maintenance, Transfer and Generalization of Learned Strategies
Reciprocal Teaching
Transenvironmental Programming
Purposes of the Study

CHAPTER II REVIEW OF LITERATURE 16
The Nature of Learning Difficulties of Students with Learning Disabilities
Ability Deficits
Skills Deficits
Production Deficits
Affective Deficits
Instructional Deficits
Reciprocal Teaching
Overcoming Skills Deficits
Overcoming Production Deficits
Overcoming Affective Deficits
Overcoming Instructional Deficits
Research into the Effectiveness of Reciprocal Teaching
Research into the Efficiency of Reciprocal Teaching
Research into the Feasibility of Implementing Reciprocal Teaching in the Classroom.
Further Research on Reciprocal Teaching
Transenvironmental Programming
A Model of Generalization
Research into Transenvironmental Programming

CHAPTER III METHOD 46
Experimental Design
Subjects
Instructional Materials
Procedures
Reciprocal Teaching Condition (Condition 1)
Reading and Social Studies Transfer Conditions (Conditions 2 and 3)

CHAPTER IV RESULTS 54

Total Comprehension Scores for the Year 5 Students
Reciprocal Teaching Condition (Condition 1)
Reading Class Transfer Condition (Condition 2)
Social Studies Class Transfer Condition (Condition 3)
Total Comprehension Scores for the Year 6 Students
Reciprocal Teaching Condition (Condition 1)
Reading and Social Studies Class Transfer Condition (Conditions 2 and 3)
Scores for the Main Idea and Detail Questions for the Year 5 Students
Scores for the Main Idea and Detail Questions for the Year 6 Students
Summary

CHAPTER V DISCUSSION 72

Reciprocal Teaching
Transenvironmental Programming
Implications for Classroom Practice
Limitations of the Present Study and Suggestions for Future Research

REFERENCES 80

LIST OF APPENDICES 89

APPENDICES

ABSTRACT

This study examined the extent to which reciprocal teaching procedures combined with transenvironmental programming would facilitate comprehension of text and promote transfer of learning by a group of upper primary poor readers.

A multiple-baseline single subject research design with replications across three different instructional conditions was used. The three conditions were: (1) reciprocal teaching in small groups in the resource room; (2) transfer of learning to the reading class in the home room; and (3) transfer of learning to the social studies class in the home room. Each condition involved baseline, experimental and maintenance phases.

Analysis of the data revealed that reciprocal teaching was effective in promoting students' comprehension of text. In general, transenvironmental programming, during which students were instructed to employ the newly learned comprehension strategies in their reading and social studies classes, was also successful. However, it was found that successful transfer depended on a number of other factors including mastery of the strategies, cognitive ability of the subject, and cooperation of the regular class teacher.

The implications of these findings for classroom practice are discussed, along with the limitations of the study and suggestions for further research.

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LIST OF TABLE

		Page
3.1	Descriptive Statistics for the Subjects in this Study	49

LIST OF FIGURES

3.1	A schema of the experimental design	47
4.1	Total scores across phases in the 3 conditions for Group 1	55
4.2	Total scores across phases in the 3 conditions for Student 1	58
4.3	Total scores across phases in the 3 conditions for Student 2	59
4.4	Total scores across phases in the 3 conditions for Group 2	62
4.5	Main idea scores across phases in the 3 conditions for Group 1	66
4.6	Detail scores across phases in the 3 conditions for Group 1	67
4.7	Main idea scores across phases in the 3 conditions for Group 2	69
4.8	Detail scores across phases in the 3 conditions for Group 2	70

CHAPTER ONE

INTRODUCTION

A significant feature of recent educational research has been the development of instructional programs designed to overcome or lessen the effects of a learning disability. Implicit in much of this research is the notion that students with learning disabilities should actively participate in and take responsibility for their own learning to the extent that they can function as autonomously as their normally achieving peers.

This focus on self-regulated learning has resulted from the confluence of two lines of educational research; namely, research into the nature of the academic difficulties of children with learning disabilities, and research into the role of cognition and metacognition in the learning process. This research emphasis has provided better understanding of the nature of the deficits exhibited by students with learning disabilities and also provided implications for appropriate instruction. As a sizable proportion of persons with learning disabilities experience unusual difficulty in the acquisition of reading skills, and as reading is the most commonly studied academic subject in learning disability research, investigations in this area in particular, have offered new directions in instructional design.

In this chapter the concept of learning disabilities is discussed and the characteristics typically exhibited by children with learning disabilities are outlined. Then the term metacognition and the related concepts of cognitive strategy training, maintenance, generalization and environmental transfer are introduced, and the relevance of two techniques for promoting generalization is discussed. Finally there is a statement of the aims and purposes of this study.

Learning Disabilities

Broadly speaking, the term learning disabilities is applied to children of normal intelligence who display a significant discrepancy between expectations for academic performance and actual performance (Kirby & Williams, in press; Wong, 1985). Because their learning problems often occur in the performance of cognitive tasks such as reading and maths, many researchers have found it useful to examine the cognitive processes involved in such tasks and to translate any suggested cognitive process problems into suggestions for remedial activities designed to overcome them (Kirby & Williams, in press).

Definition

Although agreement on a precise definition for learning disabilities has proved to be problematic (Coplin & Morgan, 1988; Kirby & Williams, in press; Wong, 1986a), one that has achieved widespread acceptance has been proposed by the National Joint Council of Learning Disabilities in 1981. This definition states that:

> Learning disabilities is a generic term that refers to a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning or mathematical abilities. These disorders are intrinsic to the individual and presumed to be due to central nervous system dysfunction. Even though a learning disability may occur concomitantly with other handicapping conditions (e.g. sensory impairment, mental retardation, social and emotional disturbance) or environmental influences (e.g. cultural differences, insufficient/inappropriate instruction, psychological factors), it is not the direct result of those conditions or influences. (Hammil, Leigh, McNutt & Larsen, 1981, p.336)

Several key components are highlighted in this definition of learning disabilities, including the notion of underachievement, the concept of heterogeneity, and the presumed underlying cause of learning disability. In order to better understand the special characteristics of children with learning disabilities, each of these components will be described more fully, with particular reference to children who have a specific reading disability.

Characteristics of Children with Learning Disabilities

A key component of the learning disabilities definition is the notion of underachievement. Children with learning disabilities perform poorly in school subjects relative to estimated intellectual ability, and their problems in learning are not primarily due to sensory, motor, emotional, or environmental deprivation factors (Coplin & Morgan, 1988; Kirby & Williams, in press; Wong, 1985). Unlike the more general learning problems of children with intellectual disability, the underachievement of pupils with learning disabilities is located in more specific/limited areas or cluster of areas, e.g. the acquisition of reading and/or writing skills (Kirby & Williams, in press; Wong, 1985). Underachievement in reading is the most prevalent type of learning disability, and also the one most widely researched (Lewis, 1983; Stanovich, 1988). Such children are described as displaying a specific reading disability.

A second key component in the definition of learning disabilities is that of heterogeneity. Consistent research findings "have supported the view that learning disabilities reflect multiple syndromes of specific disorders" (McKinney, 1989, p.149). Children with learning disabilities display a complex pattern of interacting behavioral, affective and cognitive characteristics, which manifest themselves from a very early age, and which contribute to and/or are exacerbated by, their academic learning problems (Torgesen, 1989).

The behavioral and affective characteristics of children with learning disabilities most often described by educational researchers include the following maladaptive classroom behaviours: attention deficits; impulsivity and distractibility; dependency and withdrawal; gross motor inappropriate behaviour such as hyperactivity, aggression and hostility; and socioemotional problems such as low self-esteem, an attitude of learned helplessness and an external locus of control (Kirby & Williams, in press; McKinney, 1989; Schunk, 1989; Wong, 1985). The most widely researched cognitive characteristics include the following: perceptual problems stemming from the child's inability to recognise, discriminate and interpret sensation; disorders of receptive and/or expressive language; memory problems resulting in difficulty in encoding, storage and retrieval of information (Kirby & Williams, in press; Wong, 1985); phonological processing problems (Stanovich, 1986, 1988); and failure to deploy cognitive strategies effectively and efficiently (Palincsar & Brown, 1987; Torgesen, 1977; Wong, 1985).

As these characteristics tend to occur in clusters (Kirby & Williams, 1987; McKinney, 1989; Wong, 1985), studies into the most affective assessment and treatment of learning disability subtypes, based on common characteristics, has become common practice (Coplin & Morgan, 1988). This research aims to clarify the characteristics of those who will benefit from a certain intervention and those who will not.

A third key component of the definition of learning disabilities is that of the presumed cause of learning disability, i.e. central nervous system dysfunction. This aspect of the definition has proved to be somewhat controversial, with various researchers from the psycholinguistic, behavioral and developmental schools each arguing for somewhat different etiologies (Coplin & Morgan, 1988; Wong, 1985).

Those from the developmental school of thought cite a growing body of evidence which suggests that the poor performance of one subtype of students with learning disabilities seems to reflect their failure to produce and use task-specific strategies as an aid to their performance (Baker, 1982; Torgesen, 1977; Palincsar & Brown, 1987; Stone,

1989; Wong, 1985,1986b). These students have been conceptualized as passive, unmotivated learners who appear to be unaware of appropriate strategies to facilitate, regulate and monitor task performance (Torgesen, 1977; Wong, 1985); who fail to maintain and generalize learned strategies (Ellis, Lenz & Sabornie, 1987a; Palincsar & Brown, 1987); and who attribute failure to uncontrollable external causes and therefore give up trying (Cullen, 1985; Schunk, 1989). For example, students with a reading disability may fail to use self-questioning techniques to monitor comprehension of text (Wong, 1988), or when asked to search through a passage to find an answer to a question, may start at the beginning and read laboriously through the whole passage in order to locate the information (Anstey, 1988).

More specifically, research evidence into the learning problems of those students who are adequate decoders but poor comprehenders, suggests that they fail to (1) conceptualize reading as a search for meaning, (2) monitor their comprehension to ensure that they are deriving meaning, (3) engage in strategic behaviour to bring meaning to text and restore meaning when there has been a breakdown in comprehension, and (4) modify their choice of strategies to meet the varying demands of reading (Palincsar & Brown, 1987). This profile suggests that poor readers would benefit from instruction to increase their awareness of the purpose of reading, and to provide them with strategies to promote comprehension of text (Palincsar & Brown, 1987). Moreover, an impressive amount of evidence indicates that, given instruction in how, when, where, and why to use appropriate strategies, many students with learning disabilities can quickly learn to successfully use those strategies and improve their performance so that it becomes comparable with that of their normally achieving peers (Flavell, 1976; Palincsar & Brown, 1987; Stone, 1989; Torgesen, 1977; Wong, 1985). Hence programs which help these students develop the competencies and attitudes needed for self-directed learning are receiving increasing prominence in educational literature.

Such programs usually adopt a metacognitive approach (Cole & Chan, in press), hence the importance of the current interface between research into learning disabilities and research into metacognition. The concept of metacognition and metacognitive instruction will now be described in more detail.

Metacognition

Recent educational research has shown much interest in the suggestion that students should be aware of what they are doing as they learn. "The focus is not just on knowing, but on knowing about knowing" (Long, 1986, p.8). This emphasis on the **conscious** aspects of thinking and learning is usually referred to by the term **metacognition**.

The theoretical construct of metacognition was originated by Flavell (1976) to explain young children's failure to maintain learned mnemonic strategies as an aid to recall. He defined metacognition as "one's knowledge concerning one's own cognitive processes and products or anything related to them" (p. 232). The concept also has an active component that involves "the active monitoring and consequent regulation and orchestration of these processes in relation to the cognitive objects or data on which they bear" (p.232).

From this construct has arisen the notion that metacognition encompasses two major, interrelated components: knowledge about cognition and regulation of cognition (Baker, 1982; Baker & Brown, 1984). The first component involves one's awareness of the skills, strategies, and resources needed to perform a task effectively; and the second involves the ability to use self-regulatory mechanisms such as planning, monitoring, evaluating and modifying strategies, so as to ensure the successful completion of the task (Baker, 1982).

Consistent with the views of Luria (1976) and Vygotsky (1978), it has been argued by a number of researchers (e.g. Brown & DeLoache, 1978; Reeve & Brown, 1985; Palincsar 1986a; Turnure, 1986) that the emergence and development of these conscious self-regulatory activities has its roots in social interaction with others. Initially, in the developing child's world, others take responsibility for articulating the cognitive process. Gradually, over time, the responsibility is ceded to the child who is required to take responsibility for his or her own thinking behaviours. This kind of situation in which learners are gradually moved towards their potential level of development through social interaction with more expert members of the culture is often referred to as "scaffolded instruction", using the metaphor of a scaffold being a temporary and adjustable support system (Henderson, 1986; Palincsar, 1986a,1986b).

This conceptualization of the development of metacognitive knowledge and control has influenced the development of a number of instructional interventions described in the recent literature. The goal of these interventions is for children to gradually take control of their own learning, in that they not only learn a repertoire of task-appropriate strategies, but also develop the ability to maintain these strategies over time, and to transfer and generalize them to new learning situations. These notions of cognitive and metacognitive strategy training, and maintenance, transfer and generalization will now be discussed in more detail.

Cognitive and Metacognitive Strategy Training

Learning strategies have been defined by Deshler and Schumaker (1986) as "techniques, principles, or rules that enable a student to learn, to solve problems, and to complete tasks independently" (p.583). A learning strategy can be thought of as a set of self-instructional steps which a student uses to talk his or her way through a problem

(Ellis et al, 1987a). The ultimate goal of learning strategies instruction is to enable students not only to meet immediate requirements successfully, but also to transfer and generalize the skills learned to other situations and settings over time (Deshler & Schumaker, 1986).

A distinction has been made between cognitive and metacognitive strategies. Cognitive strategies are task-specific and are employed to facilitate the successful completion of particular tasks (e.g. self-questioning or underlining the main points); while metacognitive strategies are more general in scope and are used to monitor and regulate progress on cognitive tasks (e.g. selecting the most efficient strategy for the target task and constantly checking to see if the strategy is working, and if not, changing to another) (Cole & Chan, in press; Ellis et al, 1987a). Cognitive strategy training, therefore, involves instruction in task-specific cognitive strategies; while metacognitive strategy training focuses on instruction in techniques to monitor and regulate the use of these cognitive strategies (Cole & Chan, in press).

Maintenance, Transfer and Generalization of Learned Strategies

A great deal of the initial enthusiasm concerning strategy training as a powerful tool for improving the performance of students with learning disabilities has been tempered by the fact that many such training programs have failed to address issues of maintenance, transfer and generalization of strategies (Ellis et al, 1987a,1987b; Palincsar & Brown, 1987; Reeve & Brown, 1985; Stone, 1989; Wong, 1985).

Educators use the term *maintenance* to mean that learned strategies should become a permanent part of the child's cognitive repertoire whereby she or he can spontaneously produce and use those strategies in similar learning situations in the future (Palincsar & Brown, 1983, 1987).

The terms *transfer* and *generalization* refer respectively to the extent to which a student uses and adapts a skill outside the setting in which it was learned (Ellis et al, 1987a). *Transfer* is said to occur when the newly acquired strategy is used in the same form for a different subject (e.g. a self-questioning strategy learned in a reading lesson is applied to a social studies lesson), or in a new setting (e.g. a skill learned in the remedial resource room is transferred to the regular classroom); whereas *generalization* is demonstrated when the learned strategy is adapted or modified to meet the demands of a dissimilar task, e.g. children trained in self-questioning techniques are able to adapt the strategy to help them detect incongruities in text (Ellis et al, 1987a; Palincsar & Brown, 1983).

In this context, *environmental transfer* occurs when skills critical for regular classroom success are trained in the resource room and successfully transferred and generalized to the regular classroom environment (Anderson-Inman, 1987). Concomitantly responsibility for producing and using the strategy is also transferred, from the resource room teacher to the child (Anderson-Inman, 1987; Ellis et al, 1987a,1987b; Henderson, 1986; Stone, 1989).

In order to promote transfer and generalization of strategies, Brown and Palincsar (1982) recommend that cognitive training in the basic skills should be combined with metacognitive training procedures such as "informed" and "self-control" training. Informed training refers to intervention programs in which the trainees are explicitly told of the rationale and significance of the to-be-learned strategy, thus increasing the likelihood that they will continue the unprompted use of the strategy. Self-control training includes specific training of general executive skills such as planning, self-monitoring, self-evaluation and self-testing, so that greater transfer and generalization of the learned strategies can be expected (Cole & Chan, in press). According to Brown & Palincsar (1982) the "ideal" training package incorporates both "informed" and "self-control" training; while Ellis and associates (1987b) stress that such training for transfer and generalization should

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Two instructional programs which incorporate training in many of the elements of self-regulated learning described above, and which are designed to promote transfer and generalization of strategies, are *reciprocal teaching* and *trans-environmental programming*. The next section of the paper will describe the structure and implementation of these two programs.

Reciprocal Teaching

Reciprocal teaching is a metacognitive instructional procedure designed by Palincsar & Brown (1983,1984) to enhance students' comprehension of text. It has been characterised as "a dialogue between teachers and students for the purpose of jointly constructing the meaning of text" (Palincsar, 1986b, p.119). The dialogue is structured by the use of four strategies which represent the kind of strategic engagement experienced by successful readers (Palincsar, 1986b; Palincsar & Brown, 1987):

a. Question generating - formulating self-questions pertaining to the information given in the text.

b. Summarizing - identifying and paraphrasing the main ideas in the text.

c. Clarifying - discerning where there has been a breakdown in comprehension and taking the necessary action to restore the meaning (e.g. reading ahead, rereading, asking for assistance).

d. Predicting - hypothesizing about the structure and content of the next part of the text.

Each of these strategies has been selected as means of aiding students in constructing meaning from text as well as a means of monitoring their reading to ensure that they are in fact understanding what they read. However, the four strategies do not constitute reciprocal teaching within themselves (Palincsar, 1987). Rather, reciprocal teaching refers to the collaborative effort between teachers and students as they talk to one another about the meaning of text, taking turns leading the dialogue. The dialogue acts as a kind of scaffold - a temporary and adjustable support to instruction, which allows the teacher to adjust instruction to the students' needs and to gradually withdraw support as the student acquires and refines the strategies being learnt (Palincsar, 1986a, 1987; Palincsar & Brown, 1986).

In a reciprocal teaching dialogue the teacher initially models and explains how to use the four strategies, together with information about their importance, and the context in which they are useful. After the initial days of instruction, students are asked to lead the dialogue while the teacher provides feedback and coaching as necessary to enable them to do this successfully. Responsibility for leading the dialogue is gradually transferred to the students as they become better informed and more competent at applying the strategies learned (Palincsar, 1986b; 1987).

In a typical reciprocal teaching lesson instruction occurs in the following manner. First, as the lesson begins, the group reviews the strategies they are learning, their importance, and the context in which those strategies are useful. Next, they are presented

with the title of the text they will be reading and encouraged to use background knowledge to make predictions about what they will read in the text, and to indicate what they would like to learn regarding this topic. A "teacher" is then appointed for the first segment of the text (usually a paragraph). After reading the segment (silently or orally, depending on the decoding skills of the students), the "teacher" (student or adult) leads in oral discussion using each of the four strategies to jointly construct the meaning of the text, i.e. she or he asks questions about the text, provides a summary and calls on members of the group to elaborate on it, leads in a discussion of any clarifications that have been or still need to be made by group members, and asks group members for their predictions regarding upcoming text. Finally a new "teacher" is appointed and everyone reads the next segment in preparation for the next part of the dialogue (Palincsar, 1986b; Palincsar & Brown, 1986).

Palincsar (1987), Palincsar & Brown (1988) and Palincsar, Ransom & Derber (1988-9) have provided a number of suggestions and recommendations for improving the effectiveness of a reciprocal teaching intervention:

1. Reciprocal teaching works best during group reading time when students are working in groups of six to eight.

2. When first introduced, the instruction should run for twenty consecutive school days, and then be followed up on a weekly basis to ensure maintenance throughout the school year. 3. Initially the teacher should model the use of the strategies in very explicit ways. For example, when modelling the summarizing strategy, she can explain that she first asks herself what the topic was and then asks what was the most important thing she has learned about that topic.

3. The dialogue needs to be interactive and spontaneous in nature, e.g. some segments may require a lot of clarification and question generating before leading into a summary, others may require very little clarification, or the provision of the summary may lead to further questioning.

4. Each child should be expected to contribute to the discussion at the level he or she can, while the teacher provides support (scaffolding) to raise this level (for example, providing prompts or altering the demands on the pupil).

5. The teacher should make conscious efforts every day to release control of the dialogue to the students.

6. There should be frequent measures of changes in each student's ability to read and answer comprehension questions, with the percentage correct being graphed and shared with the children. If scores improve, the children can see the payoff for their efforts. If there is no improvement, the teacher can meet with the child to determine the reason.

Transenvironmental Programming

It has frequently been observed that skills learned in the remedial resource room often fail to transfer automatically to the regular classroom (Anderson-Inman, 1986; Ellis et al, 1986a, 1987b; Idol, West & Lloyd, 1989). One of the reasons for this is that instruction in the resource room is often very different in content and format to that of the regular classroom (often because of failure of resource teachers and regular teacher to collaborate and cooperate). Because of the nature of their disability, these differences seem to inhibit transfer from one classroom setting to another for children with learning problems (Anderson-Inman, 1986). One approach to promoting the transfer of skills across classroom settings has been called transenvironmental programming (Anderson-Inman, 1986). Transenvironmental programming has been described as a process composed of four components, each having a specific goal (Anderson-Inman, 1986):

1. Environmental Assessment. The purpose of this component is to ascertain the specific skills and behaviours required for classroom success, so that this knowledge can be used to plan the content of resource room instruction and to prioritize curricular interventions.

2. Intervention and Preparation. In this component the goal is to provide the pupil with instructional support on the skill identified during the assessment phase as being critical to classroom success.

3. Promoting Transfer Across Settings. The goal of the third component is to ensure that the child uses the newly acquired skill in the regular classroom. To promote transfer the child is provided with specific, metacognitive instruction as to the usefulness of the strategy being taught, and how, when and where it can be used in the classroom setting. According to Ellis et al (1987a), this instruction should take place before, during and after the intervention.

4. Evaluation in the Target Environment. The purpose of the final component is to acquire data in the regular class on the extent to which the resource room instruction has been effective. The data can be used to identify when and if the instruction in the resource room needs to be adjusted.

The premise on which this program is based is that transfer training will be most effective when (a) students see the relevance of the newly acquired strategy to the classroom situation, and (b) conditions are arranged so that the student takes an active role in promoting the transfer of skills across settings (Anderson-Inman, 1986).

An essential feature of this approach is that of active collaboration and consultation between the resource teacher, the regular teacher, and the student (Anderson-Inman, 1986; Idol et al, 1989). Research indicates that this approach also has powerful effects in promoting transfer and generalization of strategy training (Ellis et al, 1987b).

Purposes of the Study

As indicated in the foregoing discussion, research has supported the usefulness of metacognitive training for facilitating the intellectual performance of children with learning problems. However, during the early 1980's, initial enthusiasm for metacognitive instructional approaches was tempered somewhat by the fact that transfer and generalization of skills was not always consistently demonstrated (Reeve & Brown, 1985; Palincsar & Brown, 1987). As a result the more recent research focuses on metacognitive interventions designed to promote both the acquisition and the control of strategies, including informed and self-control strategy training (Brown & Palincsar, 1982), attributional retraining (Borkowski, Weyhing & Turner, 1986), reciprocal teaching (Palincsar & Brown, 1987) and transenvironmental programming (Anderson-Inman, 1986).

The purpose of this study was to contribute to this research by investigating the usefulness of incorporating several of these elements into a program to enhance the reading comprehension skills of students with learning disabilities. More specifically, the study aimed to evaluate the extent to which a combination of reciprocal teaching and transenvironmental programming would facilitate comprehension of text and promote transfer of training for a group of Years 5 and 6 students who had been identified by their class teachers as having learning disabilities.

The particular research questions which this study addressed were:

1. Do reciprocal teaching procedures improve reading competence in students with learning disabilities?
2. Does transenvironmental programming with specific instructions to transfer and generalize promote transfer and generalization of strategies across settings and academic subjects?

CHAPTER TWO

REVIEW OF LITERATURE

This chapter reviews relevant educational literature in order to establish a theoretical and empirical base for the experimental study reported in this thesis. First, it examines research evidence concerning the nature of the learning difficulties of students with learning disabilities with a view to developing a rationale for the use of a reciprocal teaching intervention with such students. Next it surveys evidence concerning the efficacy of reciprocal teaching. Finally, it explores findings which support the suggestion that transfer and generalization of strategies learned in reciprocal teaching interventions may be enhanced through a procedure of transenvironmental programming.

The Nature of Learning Difficulties of Students with Learning Disabilities

There has been much debate in the literature as to whether the learning failures of students with learning disabilities are due to underlying ability deficits (Torgesen, 1977; Wong, 1985), skills deficits (Coplin & Morgan, 1989; Wong, 1985), production deficits (Flavell, 1976; Palincsar & Brown, 1987; Wong, 1985), affective deficits (Cullen, 1985; Kirby & Williams, in press; Robinson, 1986; Schunk, 1989), instructional deficits (Turnure, 1986), or to some interaction of some or all of these (Coplin & Morgan, 1988; Turnure, 1986; Wong, 1985).

Ability Deficits

The "ability deficits" theory was promulgated by the psycholinguistic school of thought (Kirk, McCarthy & Kirk, 1968; Kirk & Kirk, 1971), and has played a significant role in special education (Kirby & Williams, in press; Palincsar & Brown, 1987; Wong, 1985). The underlying abilities hypothesis suggests that students fail to achieve academically because the presumed psychological/underlying processes necessary for particular skill development are deficient, e.g. the child may have auditory perception or visual discrimination problems which impede the acquisition of reading skills. This hypothesis led to instructional programs directed at either strengthening these underlying deficient abilities or circumventing them and teaching to intact abilities (Palincsar & Brown, 1987; Wong, 1985). For example, a child with an ability deficit in auditory processing but intact visual processing abilities may be given exercises in auditory processing in an attempt to strengthen this ability, and/or be taught to read using a sight, rather than phonic, method of instruction.

According to Palincsar & Brown (1987), Kirby and Williams (in press) and Wong (1985), this ability deficits orientation has not been consistently supported by empirical research. Among the problems have been: (1) lack of a demonstrated relationship between the ability deficits of children with learning disabilities and their academic problems; (2) lack of transfer effects between ability training and improvement in reading; and (3) a failure to take into account the complexity of the total learning situation, including factors such as the nature of the materials to be learnt, and the cognitive, motivational and attitudinal characteristics of the learner (Wong, 1985).

Skills Deficits

In contrast, the behaviorists perceive children with learning disabilities as "skills-deficient" (Coplin & Morgan, 1988; Wong, 1985). Hence, they suggest educators should focus on teaching the academic skills and strategies a child needs to learn, and not concentrate on the child's ability deficits (Wong, 1985). Central to this perspective is the assumption that the cause of learning failures is not necessarily internal to the child, and hence remediation is best addressed by modification of environmental and teaching conditions (Coplin & Morgan, 1988; Kirby & Williams, in press).

This orientation, therefore, involves performing an analysis of the skills needed to accomplish a task, together with diagnostic testing to determine the skills not yet acquired by the child; sequencing these skills into a logical hierarchy; teaching according to principles of modelling and corrective feedback; and reinforcement of behaviour that is considered desirable and the discouragement of undesirable behaviour (Coplin & Morgan, 1988; Kirby & Williams, in press; Wong, 1985).

Although there is research evidence that skills instruction, with its emphasis on individualised diagnostic prescriptive teaching and the drill and overlearning of highly specific basic skills, may result in improved academic performance by certain children with learning disabilities (Coplin & Morgan, 1988; Torgesen, 1982), this approach has been criticised on the grounds that it is insufficient in and of itself. This is because:
(1) it ignores the causes of problems and tends to treat all children as though they have simple problems, when indeed the problems might be quite complex (Campione, 1989; Coplin & Morgan, 1988; Kirby & Williams, in press); (2) there is a tendency to teach isolated lower level subskills with little attention to the flexible use of these skills in appropriate contexts or to practicing the higher level skills (Campione, 1989); (3) as it is the teacher who typically assumes responsibility for designing and organizing the instructional sequence, student dependency behaviours and external locus of control tend

to be subtly reinforced leading to a decreased use of their own metacognitive skills; (Ellis, 1986; Ellis, Deshler & Schumaker, 1989); and (4) the practice of using extrinsic motivators (point systems, tokens-economy, praise, prizes, etc) also increases the external focus, thus further mitigating against metacognition and independence of action, especially as these extrinsic motivators are usually not forthcoming in the natural environment (Ellis, 1986).

For the reasons stated above, research findings have consistently shown that, while behaviour management programs may improve student performance during the time of the intervention, they consistently fail to address problems of maintenance and generalization in non-treatment situations (Ellis, 1986; Ellis et al, 1989; Kirby & Williams, in press). In summarising this research Ellis (1986) suggests that the main reason for the lack of maintenance and generalization is that many of the teaching practices common to skill-mastery programs "subdue, rather than encourage student use of metacognition" (Ellis, 1986, p.69), i.e. they repress rather than facilitate the development of the self-regulatory skills necessary for spontaneous use of strategies to facilitate task completion (Ellis et al, 1989; Wong, 1985).

Production Deficits

Complementary to the behavioral theory of skills deficiencies for explaining differences between children with learning disabilities and their normally achieving peers, is the "production deficiency" hypothesis proposed by the proponents of the information processing theories of cognitive functioning (Wong, 1985). Flavell (1976) coined the term "production deficient" to describe children who did not spontaneously use an appropriate strategy to memorise items for a recall test, but who responded to instruction to use a memory strategy and showed improved recall. Because extensive instruction was not required to elicit the strategy, Flavell concluded that the children had the requisite skills and abilities but for some reason failed to produce the strategy. In short, according to this

orientation, children's learning problems result from their lack of awareness and control of appropriate strategies for learning, i.e. from their lack of metacognitive skills (Wong, 1985).

According to this perspective, therefore, remedial instruction should be designed to increase both cognitive and metacognitive functions in students with learning disabilities, i.e. self-monitoring skills should be built into individualized instruction programs of basic skills training (Coplin & Morgan, 1988; Palincsar & Brown, 1987; Wong, 1985, 1986). Central to this orientation is the view that individuals should actively participate in and take responsibility for their own learning to the extent that they can independently generalize learned strategies to other settings and contexts (Reeve & Brown, 1985; Wong, 1985).

More specifically, metacognitive instructional programs include features common to traditional cognitive strategy training such as careful analysis of the task at hand, identification of the strategies needed to promote successful task completion, and explicit teaching of those strategies. However, they also include metacognitive features such as instruction in the significance and usefulness of those strategies; explicit training of general executive skills such as planning, checking and monitoring; the provision of feedback regarding the success with which the strategies are being acquired; and instructions regarding the generalized use of those strategies (Cole & Chan, in press; Palincsar & Brown, 1987). The rationale behind this approach is that when students are aware of the benefits and appropriate use of the cognitive strategies being learned, and know how to use an executive control system for regulating their employment of those strategies, maintenance and generalization of learned strategies is far more likely to occur (Brown & Palincsar, 1982; Cole & Chan, in press; Wang & Peverly, 1986,1987).

Recent years have seen the development of a plethora of metacognitive programs designed to provide explicit instruction in specific cognitive strategies which most students with learning difficulties fail to employ spontaneously (e.g. Bauman & Ballard, 1987; Chan

& Cole, 1986; Deshler & Schumaker, 1986; Harris & Graham, 1988; Leon & Pepe, 1983; Meichenbaum, 1977; Paris, Saarnio & Cross, 1986; Schunk, 1986; Seidenberg, 1988). Such programs usually emphasise self-instructions or self-questions as cues to monitoring performance; and involve initial teacher modelling and explanation using think-aloud procedures, followed by student verbalisations of the instructions or questions to guide their own thinking. There is a gradual fading of overt to covert speech to allow for gradual internalisations of these verbalisations (Cole & Chan, in press; Stone, 1989).

Research suggests that interventions based on these metacognitive principles have been successful in improving student learning in many academic skills areas (Cole & Chan, in press; Palincsar & Brown, 1987; Reeve & Brown, 1985), and particularly in the text comprehension and reading domains (Baker & Brown, 1984; Lewis, 1983; Palincsar et al, 1988-9; Reeve & Brown, 1985). However, the goal of spontaneous generalization of learned strategies to new situations when no longer being prompted to do so, has remained an elusive one (Chan & Cole, 1986; Ellis et al, 1987a,1987b; Palincsar & Brown, 1987), prompting further research into instructional procedures that will promote strategy generalization (e.g. Anderson-Inman, 1986; Deshler & Schumaker, 1986; Ellis et al, 1989; Ellis et al, 1987a,1987b; Gelzheiser, Shepherd & Wozniak, 1986; Paris & Oka, 1986).

Affective Deficits

One reason why the metacognitive approach described above may fail to induce maintenance and generalization of strategies is that many children with learning disabilities have what may be termed "affective deficiency" problems, such as a negative self-concept or external attributions of success, which contribute to their learning failures (Cullen, 1985; Reeve & Brown, 1985; Schunk, 1989). Even when taught how, when, where and why to use effective strategies, these children may fail to activate them because of an attitude of "learned helplessness", whereby, after a repeated number of failure experiences,

"they feel they have no control over the outcome of events, and come to believe that no amount of effort (internal or external) will bring about an appreciable change" (Kirby & Williams, in press, p. 250). Many researchers, therefore, (e.g. Borkowski et al, 1986; Cullen, 1985; Kirby & Williams, in press; Robinson, 1986; Schunk, 1989) have emphasised the importance of building into intervention programs components to help ameliorate the affective and motivational problems of students with learning disabilities, thus seeking to develop the "whole" child by integrating cognitive and affective concerns.

Research summarised by Schunk (1989) indicates that student perceptions of self-efficacy are largely determined through social interactions with peers and trustworthy adults (e.g. teachers). According to this research students' beliefs about their own capabilities can be enhanced (with resulting improvement in motivation and learning) through a number of social and instructional variables, including the following:
(1) achievement of early task successes through working in content materials which do not place too many demands on their word level information processing capabilities;
(2) observing similar peers (e.g. other poor readers) improving their skills, rather than observing failure or observing peers who cope easily; (3) receiving strategy training and strategy value information i.e. conditional knowledge concerning when and why to apply strategies, so that they have a greater sense of control over their own learning;
(4) verbalising aloud the component steps of a strategy while applying it to a task, with gradual fading of the verbalisation as advocated in self-instructional training programs (Meichenbaum, 1977); (5) setting specific, realistic short-term performance goals through a process of teacher-student discussion; (6) performance and attributional feedback from the teacher which is sensitively based on both effort and ability variables; and (7) being given rewards which are tied to students' actual accomplishments.

Instructional Deficits

As a final perspective as to why certain children fail to maintain and generalize learned strategies, Turnure (1986) has argued that the problem may well be an "instructional deficit", in that many teachers fail to provide an instructional environment conducive to the development of self-regulatory activities. This perspective calls for what Reeve & Brown (1985) describe as a refinement and modification of the concept of metacognition. Basing their arguments on the social learning theories of Vygotsky (1978) and Luria (1976), Reeve and Brown (1985) refute the suggestion that metacognitive processes can be effective only if an individual consciously controls them (Flavell, 1979), and suggest rather that the emergence and development of self-regulatory activities has its roots in social interactions with others, and only gradually comes under the conscious control of the child. Thus the focus of intervention should not be on task and performance factors, but on the importance of the social situation and, in particular, the personal involvement and impact of the teacher on the development of cognitive and metacognitive skills (Applebee & Langer, 1983; Cole & Chan, in press; Moore, 1988; Palincsar, 1986a; Stone, 1989; Turnure, 1986).

Central to this refined concept of metacognition, is the notion of "scaffolded instruction", i.e. a process whereby the teacher or expert adult provides the support or "scaffolding" necessary for the novice to carry through unfamiliar tasks, even though at first the learner may not fully understand the activity and would most certainly not be able to perform it independently. Over time the level of support is adjusted and gradually withdrawn as the child demonstrates increased competence with the task. In the course of this process, the cognitive and metacognitive structure provided by the expert adult is assumed to be gradually internalized by the novice who eventually learns to carry through similar tasks without external support (Applebee & Langer, 1983; Cole & Chan, in press; Henderson, 1986; Palincsar, 1986a,1986b; Stone, 1989).

This approach is said to be in contrast to earlier Piagetian developmental-type theoretical approaches which tend to minimize or eliminate the personal involvement of the teacher; and behaviourist approaches of the Skinnerian persuasion which tend to emphasise the role of the teacher to the extent that the child becomes a dependent, passive learner (Ellis, 1986; Ellis, et al, 1989; Palincsar, 1986a; Turnure, 1986). The social learning orientation seeks to bridge the gap between these two dichotomies by gradually transferring the responsibility for learning from the teacher to the child, i.e. from conscious other-regulation (parents and teachers) to conscious self-regulation (Cullen, 1985; Cole & Chan, in press; Reeve & Brown, 1985). Thus emphasis is placed on the crucial role of the teacher in structuring an interactive classroom learning environment in which this transition can take place (Duffy & Roehler, 1986,1987; Palincsar, 1986a; Palincsar & Brown, 1987,in press; Stone, 1989; Turnure, 1986).

Critical to the success of scaffolded instruction, according to Palincsar (1986a), is the role of dialogue, as it is the means whereby support is provided and adjusted. In instructional programs based on this model, therefore, teachers do not merely demonstrate and explain out loud the mental acts involved in the to-be-learned-strategies (a process which is important but which in and of itself minimises the active role of the learner in constructing meaning) (Stone, 1989); they also engage the students in collaborative communication and conversation to help develop a shared understanding of the mental processes associated with those strategies (Duffy & Roehler, 1986,1987; Henderson, 1986; Palincsar, 1986a; Stone, 1989; Turnure, 1986). In this context student responses and verbalisation become "windows to the mind" (Duffy & Roehler, 1987; Palincsar, 1987), whereby teachers can diagnose the sources of comprehension problems and spontaneously generate additional explanations and elaborations as needed (Duffy & Roehler, 1987; Palincsar 1986a;1987), such that, over time, the students "modify and refine their understandings, eventually building conceptions similar to what the teacher has in mind" (Duffy & Roehler, 1986, p.25).

In this model, generalization does not become exclusively an "adding-on" (Stone, 1989) feature through additional instructions as to how, when and where to generalize the learned strategies; but it is directly taught and practiced as the child moves along the continuum from other-regulation to self-regulation (Turnure, 1985), and is assumed to be an integral part of the internalization process as scaffolded support is gradually withdrawn (Applebee & Langer, 1983; Palincsar, 1986a; Reeve & Brown, 1985; Stone, 1989).

It is important to note, however, consistent findings by a number of researchers (e.g. Brown, Campione & Barclay, 1979; Cross & Paris, 1988; Kirby and Moore, 1987; Wong, 1986b) that the emergence of self-regulatory skills appears to follow an orderly developmental pattern, so that there is a "general trend for metacognition and strategic reading to become more congruent from 8 to 10 years of age" (Cross & Paris, 1988, p.131). Hence metacognitive intervention to teach transfer and generalization of strategies will be more effective for older children, while younger children may require a more explicit, intensive and externally based approach (Cole & Chan, in press; Wong, 1986b). For this reason teachers need to be sensitive to the learners' age and cognitive ability when deciding on the level of scaffolded instruction to provide (Reeve & Brown, 1985).

Reciprocal Teaching

Although there has been relatively little research comparing the efficacy of an approach embodying Vygotskian principles of scaffolded instruction and transfer of responsibility with the more traditional direct instructional techniques, the evidence that is available is very encouraging (Stone, 1989). The results of three such investigations are discussed below, one of which was conducted for the purpose of improving written composition skills and the other for increasing comprehension of text.

An extensive series of research studies by Scardamalia and Bereiter into ways of improving written composition skills has demonstrated the value of adopting an approach

based on scaffolded instruction and interactive communication techniques (See Bereiter & Scardamalia, 1982; Scardamalia & Bereiter, 1985a,1985b,1986; Scardamalia, Bereiter & Steinbach, 1984). In an attempt to help grade six students "think like experts", Scardamalia and her associates experimented with a number of techniques based on two-way interactions between the instructor and the child, including the following: (1) modelling of thinking aloud procedures by both teacher and students while attempting to write so as to externalise the cognitive processes involved, followed by discussion of the thinking procedures exhibited; (2) procedural facilitation or the provision of simplified routines and external aids to help students get a start on more complex composing processes, e.g. the provision of evaluative and diagnostic cue cards to stimulate self-questioning during the composition stage; and (3) the use of direct strategy instruction to help students resolve conflicting ideas (Scardamalia & Bereiter, 1985a; Scardamalia et al, 1984).

A comparison of the data of the experimental and the control students produced some encouraging results, indicating that the techniques used facilitated both an increased ability to reflect on ideas, and the construction of better-structured compositions (Scardamalia et al, 1984). Further research, however, indicated that the ability to transfer and generalize to non-experimental conditions was developmentally related, with Year 12 students showing greater internalization of the facilitative procedures than Year 6 students. Nevertheless, there was considerable evidence that the younger students could be greatly assisted in developing the processes that lead to reflection (Scardamalia & Bereiter, 1985a).

A criticism of this research would appear to be that the interventions were carried out by the experimenters, albeit in a natural classroom setting, and there was no reporting of any attempt to train regular classroom teachers in the utilisation of the techniques - an approach which was an important feature of the next study to be described.

Duffy and his associates (Duffy, Roehler, Sivan, Rackliffe, Book, Meloth, Vavrus, Wesselman, Purnam & Bassiri, 1987) conducted a year long study designed to evaluate the effects of training teachers of third grade low-achieving students to directly explain the mental acts associated with strategic reading, as compared to a control group of teachers who followed their usual instructional routines regarding basal textbook skill instruction. The results indicated that the treatment teachers were more explicit than the control teachers when explaining the mental processing associated with using reading skills as strategies. Furthermore, the low-achieving students of the treatment teachers (a) were more aware of lesson content and of the need to be strategic when reading, and (b) scored better on nontraditional, standardised, and maintenance measures of reading achievement. In elaborating on the results of this experiment, Duffy and Roehler (1986,1987) emphasised that effective teachers help students become strategic readers by (i) making substantive statements explaining the mental acts associated with the task, (ii) asking for answers to assess how students have restructured her explanation, and on the basis of these responses, (iii) providing still more information. By way of contrast, less effective teachers neither gather evidence about students' reasoning nor respond with assistance about how to do such reasoning. Moreover, another important finding of this study was that teachers' instructional talk can be modified in a fairly short period of time, resulting in increased student understanding of the instructional activity (Duffy et al, 1987). However, according to Palincsar (1986a), the focus of these interventions has been on teacher's statements rather than student-teacher interaction.

The "most directly relevant and promising research on new approaches to strategy training", according to Stone (1989, p.39), has been the reciprocal teaching studies conducted by Annemarie Palincsar & Ann Brown (Palincsar & Brown, 1983,1984). In developing the reciprocal teaching model, these researchers worked from the underlying assumption that "expert-led social interactions have a prominent role to play in learning and can provide a major impetus in cognitive growth" (Palincsar & Brown, 1988, p.56).

Because research indicates, firstly that such dialogue assumes little prominence in typical classroom practice, and secondly that many teachers express concern over the management of meaningful dialogue, Palincsar and Brown (in press) set out to develop "an instructional procedure by which teachers could use learning dialogues" (p.10).

The resulting instructional procedure, reciprocal teaching (described in the previous chapter) is therefore, essentially dialogic in nature, and incorporates the principles of effective metacognitive instruction outlined in the first section of this chapter, namely: specific strategy instruction in deficient cognitive skills (overcoming skills deficits); explicit instruction in the appropriate use and regulation of these cognitive strategies with the aim of making the child responsible for his or her own learning (overcoming production deficits); the remediation of affective problems and faulty attributions so that the child will have the motivation and will to apply the cognitive and metacognitive strategies being taught (overcoming affective deficits); and the provision of a socially interactive learning environment in which all of this can occur (overcoming instructional deficits). Each of these aspects will now be described in more detail below.

Overcoming Skills Deficits

The teaching of specific strategies for enhancing comprehension of text is an essential feature of reciprocal teaching (Palincsar & Brown, 1983,1988). The four strategies which structure the reciprocal teaching dialogue, i.e. questioning, summarizing, clarifying and predicting, were selected by Palincsar and Brown on the basis of several features (Palincsar, 1986a,1986b; Palincsar & Brown, 1988;in press).

First, these four strategies represent the kind of skills which successful readers routinely employ (Bereiter & Bird, 1985), but poor readers fail to use (Garner, 1987; (Palincsar & Brown, 1988,in press). Second, there is strong empirical support (cited by Palincsar, 1986b) that these particular skills are effective in promoting comprehension of

text. Third, although they are specific task appropriate strategies, they are flexible enough for use across an array of reading situations (Palincsar, 1986b). Fourth, when students are engaged in the use of these strategies, they are forced to both focus on the materials at hand and monitor their own understanding of the text (Palincsar, 1986a; Palincsar & Brown, 1988). For example, Palincsar & Brown (1988) found that when first beginning reciprocal teaching, students often ask questions that cannot be answered using information presented in the text, mainly because they are unable to identify what information has been presented in the text. However, by requiring the students to focus on textual information, the teacher and student become aware of, and can take steps to correct, any breakdown in comprehension. Finally, these particular strategies lend themselves well to scaffolding a discussion (Palincsar & Brown, in press), as will be discussed in more detail later.

However, it should be noted that it has been stressed by the authors of the reciprocal teaching intervention, that the acquisition of the strategies is not the ultimate goal of instruction. They are only important as "they provide the vehicle for teaching students to read for meaning and to monitor their reading to ensure that they are understanding" (Palincsar & Brown, 1986, p.276).

Overcoming Production Deficits

As mentioned previously, research indicates that metacognitive training programs for promoting strategic functioning by poor learners should include (1) guided practice in specific task appropriate strategies, as well as (2) information about the purpose and significance of the activity (informed training), and (3) the provision of explicit instruction concerning the orchestration, overseeing and monitoring of these strategies (self-control training) (Brown & Palincsar, 1982). These features are incorporated into reciprocal teaching in the following ways:

(1) The students receive explicit instruction, extensive modelling, and repeated practice in the use of the four strategies. Palincsar and Brown (1986) advise that it is best if the teacher spends one day introducing each strategy, after which time the group dialogue begins. For the initial days of reciprocal teaching, the adult teacher leads the dialogue, modelling how she employs the four strategies while reading. During this stage the students are encouraged to respond to the teacher's questions, comment on her summaries, and add their own predictions and clarifications. As the days of instruction proceed, more responsibility for initiating and sustaining the dialogue is transferred to the students, while the teacher's role becomes focused on evaluation, encouragement, and the provision of further modelling and instruction as her judgement indicates.

(2) When instruction first begins, the teacher explains what strategies the pupils will be learning (questioning, summarizing, clarifying, predicting), why they are learning those particular activities (to help them understand what they read), in what situations such strategies would be useful (any task or school subject that involves reading for information), and how they will go about learning the strategies (i.e. by taking turns as the teacher). This explanation is reviewed regularly.

(3) The pupils are constantly reminded that they should engage in these activities <u>while</u> reading, and, indeed, they should read for the purpose of performing these activities for themselves. Moreover, they should not proceed until they <u>can</u> summarize, clarify, and answer questions on each segment of text (Palincsar & Brown, 1983).

Overcoming Affective Deficits

Consistent with the suggestions of other researchers (e.g. Borkowski et al, 1986; Cullen, 1985; Paris & Oka, 1986; Reeve & Brown, 1985; Schunk, 1989) that motivation is fostered when students are taught strategies to help them succeed where previously they

were experiencing failure, Palincsar and Brown repeatedly reported that children find reciprocal teaching highly motivating (Palincsar, 1986a,1986b; Palincsar & Brown, 1988, in press). In fact, many of the classroom teachers, who initially expressed concern that the behaviour problems of their students would preclude the use of such an intervention, were pleasantly surprised to discover how highly motivated the children were (Palincsar & Brown, 1983,1988).

At the conclusion of the original studies by Palincsar and Brown (1983) with Year Seven students, post training questionnaires showed that the students responded positively to the procedure, and particularly enjoyed the opportunity to assume the role of the teacher. Palincsar (1986b,1987) suggests also that sharing the results of their progress with the students, both by daily graphing the results, and by occasionally playing back tape recordings of earlier sessions so that they can evaluate their improvement in the use of the strategies, is also highly motivating to the students.

Overcoming Instructional Deficits

Fundamental to reciprocal teaching procedures is the provision of a socially interactive learning environment based on Vygotsky's (1978) notion of scaffolded instruction and gradual transfer of responsibility for learning from the teacher to the student (Palincsar 1986a). In this context the role of dialogue in helping students become more successful readers is seen as being particularly appropriate for a number of reasons (Palincsar, 1985,1986a; Palincsar & Brown, in press; Palincsar et al, 1988-9):

1. It is a language format with which children are familiar.
2. It gives the teacher the chance to model the processes of successful comprehension.
3. It provides a useful vehicle for alternating control of the activity between the teacher and the students in a systematic and purposeful manner.

4. As pupils assume control of the dialogue, they practice the strategies within a familiar and meaningful context, a factor which is particularly significant for helping poor learners transfer and generalize learned strategies.

5. It provides the opportunity for students to evaluate their facility with the skills and to evaluate the effect employing these skills has on comprehension, i.e. students can determine for themselves that strategies can and do make a difference to comprehension.

6. It fosters collaborative problem solving among peers.

7. It furnishes the teacher with rich opportunities to diagnose student strengths and weaknesses and to supply follow up instruction as needed, or simply to provide praise and encouragement.

8. As students become more competent at using the strategies, it allows the teacher to increases his or her demands until the student's behaviour increasingly resembles that of the teacher.

Consistent with previous research which suggests that scaffolded instruction "embodies the best of teaching practices" (Palincsar, 1986a, p.95), studies by Palincsar and Brown indicate that the scaffolding and gradual transfer of responsibility for learning inherent in the reciprocal teaching dialogue provide a powerful means of helping students acquire, maintain and generalize the four targeted strategies, with a resultant dramatic increase in comprehension skills (Palincsar, 1985,1986a; Palincsar & Brown, 1986,1988,in press). For example, analysis by Palincsar and Brown (cited in Palincsar, 1986a) of the student-teacher verbal interactions of eight Grade One teachers during a twenty-day reciprocal teaching intervention indicated that students in the classes of those teachers who were most successful in using dialogue to promote scaffolded instruction: (a) were functioning far more independently of their teachers on the final days of instruction, and (b) when given transfer measures of their ability to apply the four instructional strategies, their gain scores exceeded those of the comparison group by about 100%.

The features which emerged as distinguishing more effective from less effective dialogue included: (a) the extent to which there was teacher support of the students' contribution to the dialogue at the idea level as opposed to the word level; (b) the extent to which there was deft use of student ideas and linking of those ideas to new knowledge; (c) the extent to which there was focus and direction to the dialogue; (d) the extent to which the point of instruction was made explicit to the student and seemed explicit to the teacher; and (e) the way in which evaluative statements by the teacher were made that changed the complexion of a student response from negative to constructive (Palincsar, 1986a).

Further research by Palincsar and Brown into the efficacy of reciprocal teaching instructional techniques can be clustered into three types of studies: effectiveness, efficiency and feasibility (Palincsar et al, 1988-9). This research will now be discussed in some detail.

Research into the Effectiveness of Reciprocal Teaching

The initial series of studies by Palincsar and Brown were designed to compare the effectiveness of the basic instructional package with more traditional approaches to comprehension to rule out explanations of the improvement in terms of practice, time-on-task, or teacher attention (Palincsar et al, 1988-9).

The bulk of the research in these original studies was conducted with Seventh Grade students who were attending developmental reading classes, and who were adequate decoders but poor comprehenders of grade level material. Thus the students in these investigations were typically decoding seventh grade material at an oral reading rate of at least 80 words per minute correct with two or fewer errors (i.e. instructional level material); but on standardised measures of comprehension they were performing at least 2 years below grade level (Palincsar & Brown, 1983,1986).

The experimental design for these studies typically covered at least four phases, namely baseline, reciprocal teaching, maintenance and long-term follow-up, with the reciprocal teaching phase lasting for 20 consecutive school days. The reciprocal teaching dialogues were tape recorded for later analysis. Each day of the study the students were presented with a 400-450 word assessment passage which they were required to read silently and then answer 10 comprehension questions from recall. During baseline, maintenance and follow-up this was the only activity to occur. On intervention days the assessment passage was preceded by about 30 minutes of reciprocal teaching intervention based on instructional materials which were completely independent of the assessment passages. It was the responses to these assessment passages that were reported as data throughout.

The results of these interventions, as reported by Palincsar (1985,1986), Palincsar and Brown (1983,1984,1986), and Palincsar, Brown & Martin (1987) show consistent findings of:

(1) Clear evidence from the taped transcripts that students became increasingly sophisticated in their ability to employ the strategies independently of the teacher. For example, over time the students asked more main idea questions and provided more main idea summaries.

(2) Quantitative improvements on comprehension measures which were large and reliable. All but one of the experimental students achieved criterion level which had been defined as 70% accuracy on the comprehension measures for 4 out of 5 consecutive days. This was in contrast to the control students who completed an equivalent number of assessment passages but showed no improvement.

(3) Effects which were durable. Maintenance probes showed no drop in performance after 8 weeks, and only minimum decline after 6 months.

(4) Transfer to tasks that were similar to but distinct from the instructional task. The experimental children showed reliable transfer to the tasks of writing summaries of text, generating written questions about text, and detecting incongruities in text.

(5) Where measured, effects that generalized to the classroom setting. These generalization probes occurred during the social studies and science classes with no hint being given that they were in any way related to the experimental procedure. Although these probes resulted in variable performance, they did show clear evidence of improvement, averaging a 36 percentile rank increase, thus bringing them up to at least the average level of their age mates.

(6) Where measured, sizable improvements in standardised comprehension scores for the majority of the experimental subjects (mean gain of 15 months), but not for the control students.

(7) Evidence that the intervention was no less successful in natural group settings conducted by teachers than it was in the laboratory when conducted by the experimenter. This was true for both classroom teachers and remedial teachers, and with naturally occurring groups of from 4 to 18 students.

(8) Superior performance for reciprocal teaching students over students taught by more traditional methods. For example, while a locating information intervention was found to be superior to no intervention at all, the effects were not as impressive nor as enduring as the effects of reciprocal teaching.

(9) Encouraging results from the use of trained peer tutors in small group reciprocal teaching situations.

Research into the Efficiency of Reciprocal Teaching

Having satisfied themselves that "the reciprocal teaching of the four strategies was a robust intervention" which "had utility not only in the pristine confines of a laboratory

setting, but also on the battlegrounds in a classroom setting" (Palincsar, 1985, p.4), Palincsar and Brown next initiated a series of studies to determine whether the result was worth the effort, or whether the rather labour intensive reciprocal teaching procedure could be streamlined in some way (Palincsar, 1986a; Palincsar & Brown, in press; Palincsar et al, 1988-9).

In one such study the investigators evaluated the relative effects of the two most frequently used strategies (i.e. reciprocal summarizing alone and reciprocal questioning alone) with the effect of the total package of strategies on reading comprehension (Palincsar, 1985). The results showed that while the students did show gains, over time, in response to instruction in the isolated strategies; the students who were instructed in the simultaneous use of all four strategies responded more quickly to instruction and showed greater gains (Palincsar, 1985).

In another study (Palincsar, 1985) the traditional reciprocal teaching procedure was found to be significantly superior to the following conditions:

(1) Reciprocal teaching/practice: four days of reciprocal teaching, followed by eight days of independent practice in which the students wrote their summaries, questions, points to be clarified and predictions and the teacher gave minimal feedback by starring the best of the students' responses.

(2) Demonstration: daily teacher modelling of the four strategies during which student participation was restricted to answering the questions posed by the teacher.

(3) Skill instruction: workbook exercises of the four strategies in which, although there was plenty of opportunity for carefully structured practice and for student-teacher interaction, the practice was not individually guided and there was no opportunity to integrate and practice these strategies in the context of reading.

The results showed that the reciprocal teaching intervention was the most effective of these four procedures, followed, but not closely, by the reciprocal teaching with practice and the worksheet activity. Demonstration was the least effective of the instructional

conditions. Hence these experiments satisfied the investigators that they were "unable to identify a more economical means by which the same comprehension gains could be achieved as in the labour intensive reciprocal teaching procedure" (Palincsar 1985, p.8).

Research into the Feasibility of Implementing Reciprocal Teaching in the Classroom

With empirical evidence supporting both the effectiveness and the efficiency of reciprocal teaching, Palincsar and Brown (Palincsar et al, 1988-9) then initiated a series of studies to measure how reciprocal teaching could best be incorporated into the repertoires of classroom teachers. Permission was obtained to determine the feasibility of introducing reciprocal teaching to the entire Springfield, Illinois, school district.

Of critical importance to these feasibility studies has been the preparation of the teachers. Over the years, with suggestions from participating teachers, Palincsar and Brown (in press) have refined a collaborative staff development process which includes the following features: reflection and discussion of current teaching practices with regard to improving students' comprehension of text; introduction to the theory behind reciprocal teaching; and initiation into the use of reciprocal teaching procedures through the use of videos, role-plays, demonstration lessons, and practice lessons where each teacher and the investigator jointly conducted a reciprocal teaching lesson, followed by a debriefing of the teacher. Provided with this preparation, the classroom teachers have shown considerable success in implementing reciprocal teaching, as demonstrated by weekly procedural reliability checks (Palincsar et al, 1988-9).

As a result of discussion with teachers, the method of introducing reciprocal teaching to the students has also been refined. Whereas previously, instruction started straight in with the dialogue, the 20 days of reciprocal teaching are now preceded by five days of teacher-led instruction to introduce the students to each of the four strategies in

isolation and to provide the teacher with diagnostic information concerning how much support each individual in the group may need (Palincsar & Brown, in press; Palincsar et al, 1988-9).

In one of the earliest of these studies, the entire Springfield District middle school reading staff (six teachers) each taught one reciprocal teaching (experimental) group and one basic skills instruction (control) group. The group ranged in size from 7 to 17 students. Despite the size of the groups, 72 percent of the 71 students in the reciprocal teaching groups achieved statistically significant gains on the comprehension measures, compared to 20 percent of the 76 students in the control groups (Palincsar et al, 1988-9).

From these small beginnings, the project has expanded to the extent that in 1987-88 approximately 150 teachers in 23 buildings were involved with reciprocal teaching instruction. Correspondingly, the student populations participating in these instructional programs have increased from the original seventh grade poor decoders, to include groups as diverse as at-risk first grade students (to whom the teachers read the text aloud) (Palincsar, 1986a; Palincsar & Brown, in press); fifth and sixth grade normally achieving students; gifted third graders and learning disabled college students (Brown & Palincsar, 1985), all with promising results.

Interest in classroom based reciprocal teaching has been promoted and sustained by a number of initiatives on the part of the Springfield school district. These initiatives include inservice education, the establishment of peer support groups, the development of a new reading achievement instrument designed to measure the four strategies of reciprocal teaching, and support in the form of incentives such as release time for inservice sessions and official recognition of the work of developing and testing new ideas (Palincsar et al, 1988-9).

Finally, Palincsar and Brown suggest that perhaps the greatest value in this ongoing classroom based research is that it fosters active collaboration between teachers, administrators, students and researchers, so that each "can gain an understanding and

appreciation of what teaching and learning is all about" as they take their "respective turns at 'being the teacher'" (Palincsar et al, 1988-9, p.40).

Further Research on Reciprocal Teaching

Although the bulk of the research on reciprocal teaching has been carried out by its originators, Annemarie Palincsar and Ann Brown, several investigations by other researchers (e.g. Andrews, 1988; Gilroy & Moore, 1988; Grant, Elias & Broerse, 1989) have provided supporting evidence of the powerful effects of this intervention.

The study by Gilroy and Moore (1988) was a replication of that by Palincsar and Brown (1984) in a New Zealand setting. Three different class groups of low comprehenders, Standard 4, Form 1 and Form 2, (equivalent to NSW Years 5,6 and 7), were exposed to 21 days of reciprocal teaching followed by daily comprehension assessments on a different text at the same difficulty level. The no treatment comparison groups were average and above average comprehending class peers. Results of the daily comprehension tests showed that by the end of the intervention all of the experimental groups were more accurate than the average comparison groups, and scores of two of the experimental groups matched those of the above average controls. Follow-up probes eight weeks later showed that all groups had maintained their comprehension gains. Furthermore, pre- and post-intervention scores on the Progressive Achievement Test in Reading Comprehension (Reid & Elley, 1969) showed notable gains in Level score and Equivalent Reading Age for all students except one, thus supporting the notion that strategies learned during this program can generalize to a non-equivalent testing situation.

An interesting application of the reciprocal teaching paradigm to teaching listening skills to Year Seven students was reported by Grant and her associates (1989). In this study the comprehension passages were prerecorded for use as listening comprehension stimuli, and the traditional reciprocal teaching dialogue proceeded after listening to one

segment at a time from the tape. Once again results revealed that students in the intervention group made significant gains in comprehension when compared with the performance of a nonintervention control group.

An innovative application of reciprocal teaching procedures was made by Andrews (1988) in an intervention designed to enhance deaf children's acquisition of prereading skills. Reciprocal teaching instructional procedures were used but with prereading skills rather than comprehension skills. The four prereading skills selected for this training were finger spelling, book reading, story telling and word recognition. Instructional materials consisted of 20 experimenter-made simple story books containing printed words in a picture context with a graphic illustration of the American Sign Language (ASL) equivalent for each new word, along with drill cards of each new printed word and its manual sign illustration. The instructional procedure consisted of an interactive sign language dialogue in groups of five to six students, during which the teacher explicitly modelled the four skills and the children imitated the teacher's example by performing the same skills at whatever level was appropriate for them. The teacher and peers prompted and shaped each child's participation through corrective feedback.

The intervention, which lasted for 30 minutes per week over 9 months, resulted in significantly greater gains in letter, word and story knowledge for the experimental group as compared to a control group, which received traditional individualised reading instruction for children with hearing disabilities. Moreover, it was found that the training was beneficial for children at all levels of prereading ability and that the benefits extended to the home environment where the children unintentionally became sign language teachers for their hearing relatives as they practiced reading and retelling the stories.

Transenvironmental Programming

It has been noted that in the initial Palincsar and Brown (1983) studies, although generalization probes were made in the social studies and science classes which showed considerable promise of generalization of the strategies, no attempt was made to prompt or remind the students to use these strategies during these probes. However, it has been suggested by several recent researchers (e.g. Anderson-Inman, 1986; Ellis et al, 1987a,1987b; Idol et al, 1988), that transfer and generalization will be maximised for students with learning disabilities when it is specifically programmed into the intervention.

A Model of Generalization

In a comprehensive review of research, Ellis and his colleagues (1987a,1987b) cite numerous studies to support their model of generalization which emphasises elements of remedial teacher-, regular teacher-, peer-, and student-mediated techniques for facilitating generalization during all phases of instruction. This model addresses four levels of generalization when teaching new strategies: (i) antecedent generalization which occurs prior to strategy instruction with the purpose of motivating students to learn and use the new strategy; (i) concurrent generalization which occurs during strategy instruction with emphasis on acquiring the new skill well enough so that it can become a generalized procedure; (iii) subsequent generalization which occurs after the strategy has been mastered when focus is directly on generalization of the newly learned strategy; and (iv) independent generalization which refers to those procedures employed by the teacher to facilitate the self-regulatory skills of the pupil so as to attain independent generalization and adaptation of the new strategy.

In brief, the research cited by these investigators suggests that generalization instruction should include the following features:

(1) Students should be explicitly taught to generalize their use of strategies.

(2) Teachers should clearly establish the expectation of strategy generalization.

(3) Strategies should be practiced in a variety of situations and materials and reinforcement should be structured and purposeful.

(4) Regular teachers and peers should be recruited to cue the student to apply the strategies.

(5) The teacher should adapt and demonstrate a metacognitive perspective, including the use of self-monitoring and self-coping statements.

(6) Specific lessons/subjects should be targeted for application of the strategies.

(7) Throughout the intervention students should be given feedback regarding the results of their efforts to generalize strategies. This feedback may come from the remedial teacher, the classroom teacher and/or fellow students.

(8) The ultimate goal of instruction should be to develop student mediated generalization, through training the student in the use of techniques such as self-recording, self-monitoring, self-evaluation, and self-goal setting.

In conclusion Ellis and his associates argue that in the early stages the teacher may need to take most of the responsibility for designing and delivering task-specific strategies so as to provide opportunities for students to develop strategic thinking patterns. However, once these opportunities are provided in a setting of antecedent, concurrent, subsequent, and independent levels of strategy generalization, many students with learning disabilities "appear to be able to act as the primary control agent for strategic learning" (Ellis et al, 1987b, pp.20,21).

Research into Transenvironmental Programming

The transenvironmental programming intervention developed by Anderson-Inman (1986) (described in chapter one) is a relatively simple procedure which incorporates the essence of the model of generalization (Ellis et al, 1987a,1987b) referred to above. Anderson-Inman (1986) discusses three studies which demonstrate the efficacy of transenvironmental programming in facilitating transfer of learned strategies from the resource room to the regular classroom.

The first study explored the effects of resource room- based preteaching sessions on spelling accuracy in the regular class. In this intervention a 12-year old girl was provided with a brief daily preteaching session in the resource room during which the resource teacher previewed the morphographs to be taught in the regular classroom later that day and then gave the student practice in spelling them and combining them into words. As a result of this intervention the student was able to improve her mean level of written spelling accuracy from 54.6% (baseline condition) to 83.1% during the first phase of the intervention. By the third phase of the intervention, the student's accuracy surpassed the mean of her classmates and retained this position for the remainder of the study. An important feature of this study was that it was the child who decided which academic subject she wanted assistance with (spelling rather than maths), as this seemed to build her sense of responsibility for her own learning.

A second study conducted by Anderson-Inman (1986) investigated the assumption that students diagnosed as learning disabled and receiving resource room instruction in specific reading comprehension skills, would be able to apply those skills when reading content-area textbooks. After five junior high school students had successfully learned a strategy for answering comprehension questions in commercially available instructional materials, their accuracy in answering similar questions about passages in content-area textbooks was measured over several weeks. The results showed that three of the students

had considerable difficulty transferring the strategy from generic materials to content-area text books while the other two had moderate variable success, with no student reaching criterion level of 80% mean performance accuracy. It was not until the next phase of the experiment, when the students were given direct and systematic resource room-based instruction in applying the strategy to various passages in their actual textbooks, that successful transfer was achieved, i.e. the student attained performance levels ranging from 80% to 100% accuracy on the transfer tests. Moreover, the students were able to maintain their high levels of accuracy as the transfer training was faded and eliminated. A weakness of this study, as reported by Anderson-Inman (1986) is that it was entirely a resource room-based intervention no data were available on whether there was successful transfer of the strategy to the use of texts in the regular classroom. Anderson-Inman (1986) indicated that subsequent efforts to promote such transfer from the resource room to the regular classroom highlighted the need for close collaboration and cooperation between the student, the resource teacher and the regular class teacher if such interventions were to be successful. No data were given for these later efforts.

The third study investigated the use of a self-monitoring checklist for promoting the transfer of targeted "neat paper" skills from the resource room to written work produced in the regular classroom. Whereas few of the students had previously transferred any of the targeted skills to the classroom, after introduction of the checklist neatness in the transfer setting improved immediately and significantly, stabilising at 80% to 100% occurrence.

From these studies it can be argued that the generalization scores for Palincsar and Brown's experimental students would have been less variable if greater emphasis had been placed on systematic and explicit procedures to promote transfer and generalization. In fact Palincsar (1985) suggests that she and her colleague were planning further studies with the specific purpose of examining the role of metacognitive instruction in the transfer of strategies to classroom activities. Part of the purpose of the study reported in this thesis was to examine precisely this notion, by combining Anderson-Inman's (1986)

transenvironmental programming with its emphasis on transfer of learned strategies, with Palincsar and Brown's reciprocal teaching intervention.

CHAPTER THREE

METHOD

In this chapter the experimental method used in the present study is described. The first section provides an outline of the experimental design. This is followed by a description of the subjects and their characteristics. Finally the materials used, the methods employed in their construction and the procedures followed in conducting the study are reported.

Experimental Design

A multiple-baseline single subject research design with replications across three different instructional conditions was used. The three conditions were: (1) reciprocal teaching in small groups in the resource room; (2) transfer of learning to the reading class in the home classrooms; and (3) transfer of learning to the social studies class in the home classrooms. In each condition there were several phases which will be described below. (See Figure 3.1 for an illustration of the experimental design).

The sequence of phases for the reciprocal teaching condition (Condition 1) was as follows: (i) baseline which consisted of 4 sessions involving 3 days in one week and 1 day the following week; (ii) reciprocal teaching intervention which consisted of 13 sessions spread over 5 weeks; (iii) maintenance which lasted for 3 sessions during Week 7 of the program; (iv) three more weeks of reciprocal teaching intervention consisting of six sessions for Group 1 (Year 5 students) and five sessions for Group 2 (Year 6 students); and (v) a final maintenance phase which was conducted four weeks after the last reciprocal teaching training session and consisted of four sessions for Group 1 and three for Group 2. During the baseline and maintenance phases the children read silently an assessment

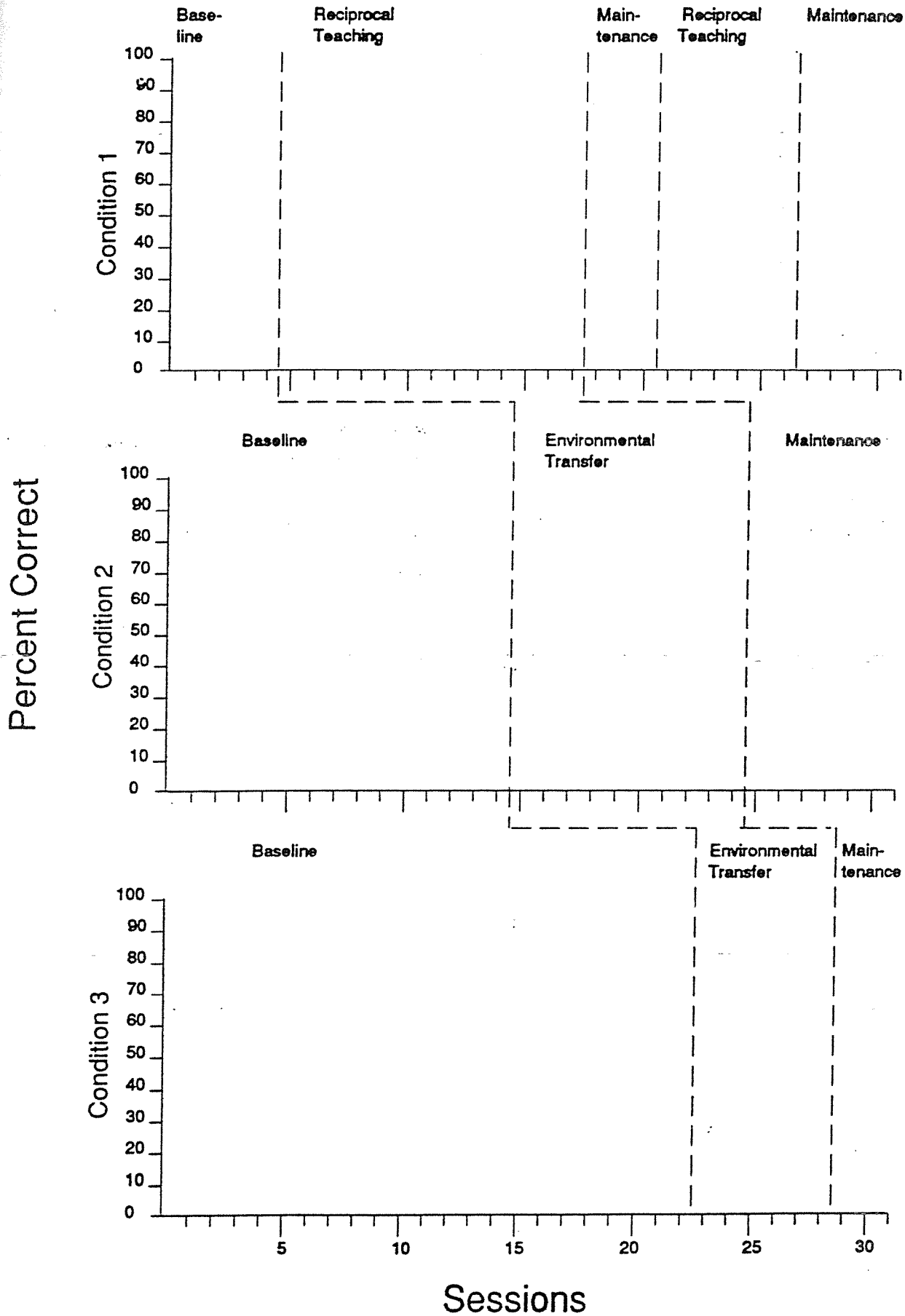


Fig. 3.1 A schema of the experimental design

passage on their own and then answered comprehension questions from recall. During the reciprocal teaching phases reciprocal teaching procedures were used to enhance comprehension of the passage before children answered the comprehension questions.

The phases for the reading class transfer condition (Condition 2) were: (i) baseline, consisting of 3 probes spread over 5 weeks, during which all children (not only the subjects receiving reciprocal teaching in the resource room) were administered an assessment passage similar to those used in Condition 1, with no hint that this activity was part of the experimental study; (ii) environmental transfer, consisting of one probe per week for the next 4 weeks (Weeks 6-9 of the study), during which the experimental children were prompted to use the strategies they had been learning in the resource room; and (iii) maintenance, which involved three more weekly probes with the last probe corresponding with the final maintenance phase in Week 12 of Condition 1. During this phase the hints and prompts to use the strategies were discontinued.

The sequence for Condition 3 was similar to that of Condition 2 except that the probes were conducted in the home room social studies class. Two baseline probes were conducted in Weeks 1 and 5 of the program. A third baseline probe was planned for Week 8 but did not eventuate. There were three environmental transfer probes in Weeks 9,10 and 11, and one final maintenance probe in Week 12 of the program.

Subjects

The subjects of this study were a group of two Year 5 and five Year 6 students who had been identified by their class teachers as having learning disabilities, and who were receiving remedial reading instruction from the resource teacher on a withdrawal basis. Of the five students from Year 6, three were boys from one home class and two were girls from another home class, while the two students from Year 5 were boys. A third boy from the Year 5 class left the school part way through the intervention and so was eliminated

from the study. The chronological ages of the two students in Year 5 were 10 years 10 months and 11 years 2 months (mean 11 years 0 months), and those of the Year 6 students ranged from 11 years 1 month to 12 years 8 months with a mean of 12 years 0 months. Prior to the commencement of the study the subjects were given a series of standardised comprehension and decoding tests, the details of which are shown in Table 3.1.

TABLE 3.1
Descriptive Statistics of the Subjects in this Study

Subject	CA	St Lucia RA	PAT Comp. PR	PAT Comp. Stan.	Burns/Roe IRI WR % Correct
Year Five (Group 1)					
1	11yr 2m	7yr 5m	4	1	93
2	10yr 10m	7yr 8m	26	4	92
Year Six (Group 2)					
3	12yr 8m	8yr 0m	28	4	98
4	11yr 8m	10yr 1m	23	4	99
5	12yr 1m	8yr 5m	5	2	96
6	12yr 4m	10yr 8m	33	4	98
7	11yr 1m	8yr 4m	33	4	96

Preliminary testing on the Progressive Achievement Tests in Reading Comprehension (Reid & Elley, 1986) indicated comprehension deficits for all subjects, with percentile rankings ranging from 4 to 33 and stanine scores from 1 to 4.

Testing with the St Lucia Graded Word Reading Test (Andrews, 1973) indicated that the word recognition reading ages of the Year 6 students ranged from 8 to 10 years, and that they were a little lower for the Year 5 students. Further testing with the Burns\Roe Informal Reading Inventory, Grade 3 passage (Richek, List & Lerner, 1983), suggested that Grade 3 reading material would be appropriate for this group. The students achieved 92% to 99% word recognition accuracy, implying that their instructional level was at Grade 3. (For this inventory instructional level is set

at 95% or above on word recognition accuracy in oral reading and frustration level at 90% or below). For this reason it was decided to target reading materials at the Grade 3 readability level, and to provide whatever word recognition assistance was necessary for the Year 5 boys.

Instructional Materials

Instructional materials consisted of a total of 58 short (250-300 word) expository passages written at the Grade 3 readability level as determined by the Rix readability formula (Anderson, 1983). The passages for the reciprocal teaching intervention (Condition 1) and for the home room reading class transfer measures (Condition 2) were adapted from various reading kits and library books and contained descriptive information put into story form. They were selected because of their interest value for upper primary school students. Thirty such passages were prepared for Condition 1 and ten for Condition 2. In consultation with the classroom teachers the passages for the social studies transfer measures (Condition 3) were adapted from reference materials currently used in the social studies classes. Because each class was working on different social studies units, a total of eighteen passages was required for this condition - six for each classroom.

Each passage was accompanied by a short answer comprehension test in which half of the questions were about main idea propositions in the passage and half were about supporting details. Initially a total of 10 questions was constructed for each passage, but because of time constraints it was decided after five session of reciprocal teaching to reduce the total to 8 questions, 4 of which were main idea and 4 detail questions. Copies of the 58 passages and their associated short answer questions can be found in Appendices 3.1, 3.2 and 3.3.

Procedures

Procedures for each of the three conditions will be reported in this section.

Reciprocal Teaching Condition (Condition 1).

The sessions in the reciprocal teaching condition took place in a small resource room off the library where distractions would be at a minimum. The sessions were conducted in two groups (the two Year 5 poor readers in one group and the five Year 6 poor readers in the other) in half-hour sessions three days per week, (sometimes only 2 days because of holidays, excursions etc) for eleven consecutive weeks in Term 2, and for one week in Term 3, resulting in a total of thirty sessions.

During each of the four baseline sessions the students were given a passage and asked to read it silently and carefully. They were told that they would be required to answer comprehension questions from memory after reading the passage, and that they could ask for assistance with any words they could not read or understand. When all students indicated that they had finished reading the passage, the text was removed and the children wrote down short answers to the questions asked orally by the experimenter. Each child's score on the test was graphed daily and shown to him or her at the beginning of the following session.

During the reciprocal teaching phases, reciprocal teaching procedures as described by Palincsar (1986b,1987) and Palincsar and Brown (1983,1986) were used to enhance comprehension of the text before the students answered the questions.

The initial days of reciprocal teaching were largely teacher directed as the experimenter introduced the students to the four strategies, and then took the lead in modelling how these strategies are employed. The experimenter and students also discussed ways in which use of the strategies could promote a better understanding of the reading passages, and how they could be applied in other reading situations, e.g. questioning oneself when rehearsing for a test, summarizing the main points in a classroom text or clarifying information when reading a set of instructions. A chart outlining the four strategies was displayed in the resource room, and information concerning the usefulness and application of the strategies was reviewed constantly throughout the intervention, with the students being encouraged to use the strategies whenever they read silently.

The children were told at the outset that after a few days of becoming familiar with the procedure they would take turns at being the teacher, and were keen to do so after about the third

day. As in most reciprocal teaching studies, at first it was necessary for the experimenter to provide a great deal of support to enable the students to lead the dialogue successfully, but over time they became much more proficient at doing so and the support was gradually withdrawn. To help students focus on the main ideas in the text, they were encouraged to underline main points and ideas as they read each segment silently and then to use the underlined points in helping them frame questions and main idea summaries. Several of the sessions were tape recorded during the study for later analysis of improvements in the dialogue.

It was planned that each session should take about 30 minutes. For the Year 6 sessions, which were conducted during the half hour before recess, it was necessary to keep strictly to time. However, the Year 5 students, who met during the half hour after recess, often extended their session to 40 or 45 minutes (with the cooperation of the class teacher). This proved to be very helpful as these students were the poorer readers, and it allowed the experimenter extra time for preteaching difficult words and the students more time for clarifying words and ideas, and articulating questions and summaries.

The maintenance phases were identical to the baseline phase with the students reading the passage silently and answering the comprehension questions without the benefit of the reciprocal teaching dialogue.

Daily graphing of each child's score continued throughout the reciprocal teaching and maintenance phases and the children were delighted to see the immediate and sustained improvement once reciprocal teaching procedures were initiated.

Transfer to the Reading and Social Studies Classes - (Conditions 2 and 3).

The subjects, along with their classmates, were given similar comprehension tasks in their reading and social studies classes as a measure of their transfer of the learned strategies from the resource room to the regular classroom. The assessment procedure was similar to that used in the baseline and maintenance phases of the reciprocal teaching condition, i.e. the students read the passage silently, with the understanding that they could ask for help with any word they could not read or understand. When all the students had finished reading the passages were removed and

the children wrote down short answers to the questions asked orally by the class teacher. The class teacher then collected the answer sheets for marking by the experimenter. Only the scores of the experimental subjects were recorded, although occasional checks of the performance of the other class members revealed that they found the passages easy and scored consistently in the range of 70% to 100% correct.

During the baseline phase no hint was given by the experimenter or the class teachers that these comprehension exercises were in any way related to what they were learning in the resource room. However, during the reciprocal teaching session just prior to the week when environmental transfer intervention was due to begin, the experimenter explained to the subjects that for the rest of the term their teachers would be giving the whole class a weekly reading comprehension test (Condition 2) or social studies test (Condition 3) based on passages similar to the ones they were using in their reciprocal teaching sessions. She then instructed the subjects to use the questioning, summarising, clarifying and predicting strategies whenever they were given one of these comprehension exercises in class. For the duration of the environmental transfer phase, whenever the experimenter met with the subjects in a reciprocal teaching session, she reminded them to transfer the strategies to their reading or social studies classes and discussed their progress with them. During the environmental transfer phase the home class teachers also reminded the experimental subjects, just prior to reading the passages, to use the strategies they had been learning in the resource room.

During the maintenance phase all such instructions and prompts to employ the strategies were discontinued to determine whether students were transferring the strategies independently.

CHAPTER FOUR

RESULTS

Results of the data analyses are reported in this chapter.

The three dependent measures analysed were the percentage correct on the total number of questions, percentage correct on the main idea questions, and percentage correct on the detail questions. For each dependent measure the percentage correct scores were graphed as a function of sessions for the various phases in the three different conditions, i.e. the reciprocal teaching condition, the reading class transfer condition and the social studies class transfer condition. As the Year 5 and Year 6 subjects were taught in different instructional groups the data for the two groups were analysed separately.

Separate graphs were prepared for group results and for individual results. As the graphs for the individual subjects show a similar trend to the graphs for the group means, for ease of presentation and understanding only the group means will be reported in this chapter, and important points of comparison and contrast between the results for the Year 5 and Year 6 groups will be noted. The graphs for the individual subjects will be referred to where necessary to explain some of the trends in the data for the group means.

Total Comprehension Scores for the Year 5 Students

There were two students in this group. Their individual results on the total comprehension questions across the three conditions are presented in Figure 4.2 and Figure 4.3, respectively. Figure 4.1 provides the average results for this group.

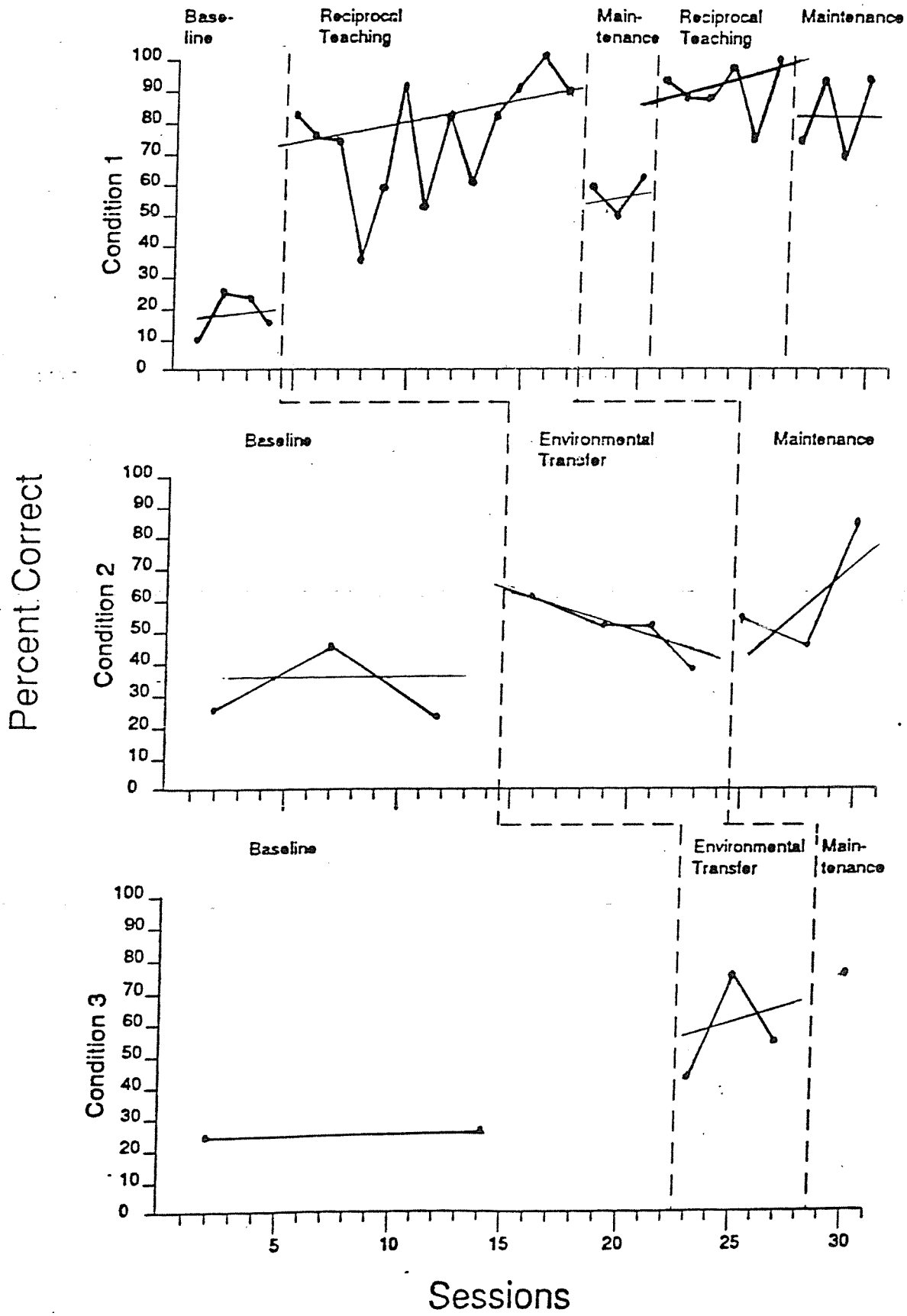


Fig. 4.1 Total scores across phases in the 3 conditions for Group 1

Reciprocal Teaching Condition (Condition 1)

During baseline in the reciprocal teaching condition (Condition 1) the Year 5 students on average scored 18% correct on the comprehension questions, with mean accuracy scores per session ranging from 10% through to 25%. A stable baseline is demonstrated (see Fig. 4.1).

The very first reciprocal teaching training session resulted in immediate dramatic improvement with a mean score of 82.5% accuracy for that session. Thereafter the students demonstrated somewhat variable performance for the next 8 sessions, but with an accelerating level of improvement, stabilising at a mean of 89% correct during the last 4 training sessions. The overall mean for this phase was 75% accuracy.

With the reciprocal teaching withdrawn, the first maintenance phase evidenced a regression in the level of performance to a mean accuracy of 57.5%, which was, nevertheless, still considerably better than the baseline performance. However, as soon as reciprocal teaching was re-introduced, performance returned to the previous level, with a mean accuracy of 91%. This high level of performance was maintained in the final post-training (maintenance) sessions, with only a slight decrement to a mean accuracy of 83%, which was approximately 25% higher than mean performance in the first maintenance phase.

Overall, the Year 5 students improved their performance on the comprehension questions from a baseline mean level of 18% correct to a final maintenance mean level of 83% correct as a result of reciprocal teaching. The effect of training was impressive.

Reading Class Transfer Condition (Condition 2)

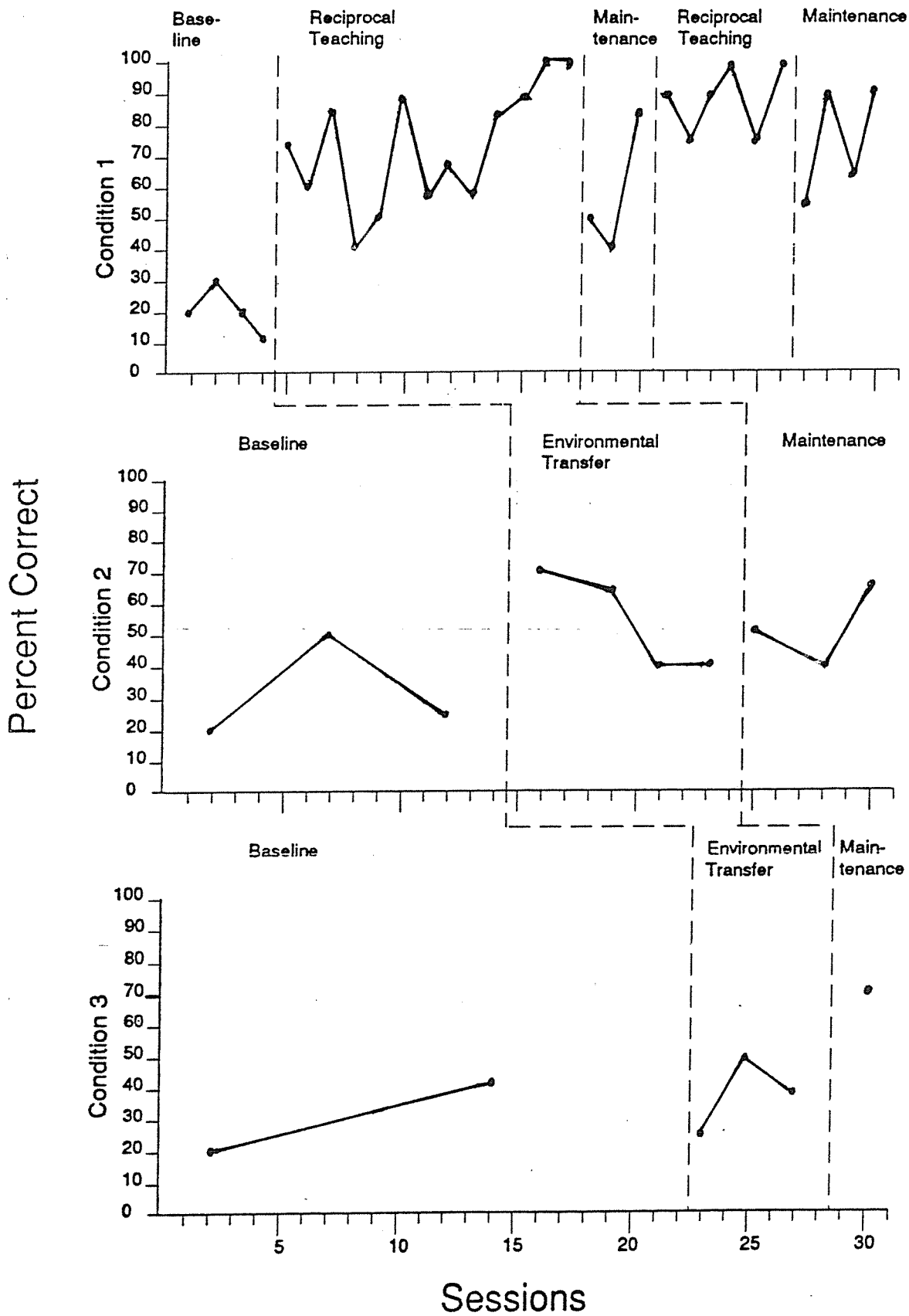
Results of the comprehension probes measuring transfer of learning to the reading class in the home classroom (Condition 2) revealed a similar trend to the results for the reciprocal teaching condition (Condition 1), but the improvement was not so spectacular. Baseline performance remained stable at a mean of 30% accuracy indicating that comprehension was relatively low in the reading class setting when the subjects were not explicitly directed to use the strategies. Performance in the environmental transfer phase, during which both the experimenter and the

class teachers instructed the students to use the strategies they had learned, showed an immediate improvement to 60% mean accuracy on the first probe. However there was a disappointing decelerating trend to only 38% in the final probe of the environmental transfer phase, and an overall mean of 51% accuracy for this phase. During the maintenance phase performance showed an accelerating trend, with a mean accuracy score of 60.5%, and an average score on the final probe of 81.5%.

Thus, as a consequence of instructing students to transfer the strategies learned in the reciprocal teaching context, the two Year 5 students improved their performance on the comprehension questions in the reading class in the home room from a baseline mean level of 30% to a maintenance mean level of 60.5%. These results show considerable evidence of transfer of learning from the withdrawal situation to the regular classroom.

Inspection of the individual results reveals that Student 2 (see Fig. 4.3), improved from 28% mean accuracy during baseline to 71% mean accuracy during maintenance and gained a perfect score of 100% in the final sessions of both the reciprocal teaching condition and the reading class transfer conditions. These results indicate that Student 2 was much more successful at transferring the strategies than Student 1, whose corresponding scores for baseline and maintenance were 32% and 50% (see Fig. 4.2).

Comparison of the trends in the reciprocal teaching condition with those in the reading class transfer condition reveal a number of interesting features. First, there was no improvement during baseline in the reading class transfer condition (Condition 2) despite the fact that when the second and third probes were undertaken the students had already had the benefit of a number of sessions of reciprocal teaching training in the small group withdrawal situation of Condition 1 (Fig. 4.1), thus suggesting that unprompted transfer of training was not taking place. It should be noted, in this regard, that performance in the reciprocal teaching condition had not yet stabilised when these transfer probes were undertaken, thus making the likelihood that unprompted transfer would occur rather problematic.



F.g 4.2 Total scores across phases in the 3 conditions for Student 1

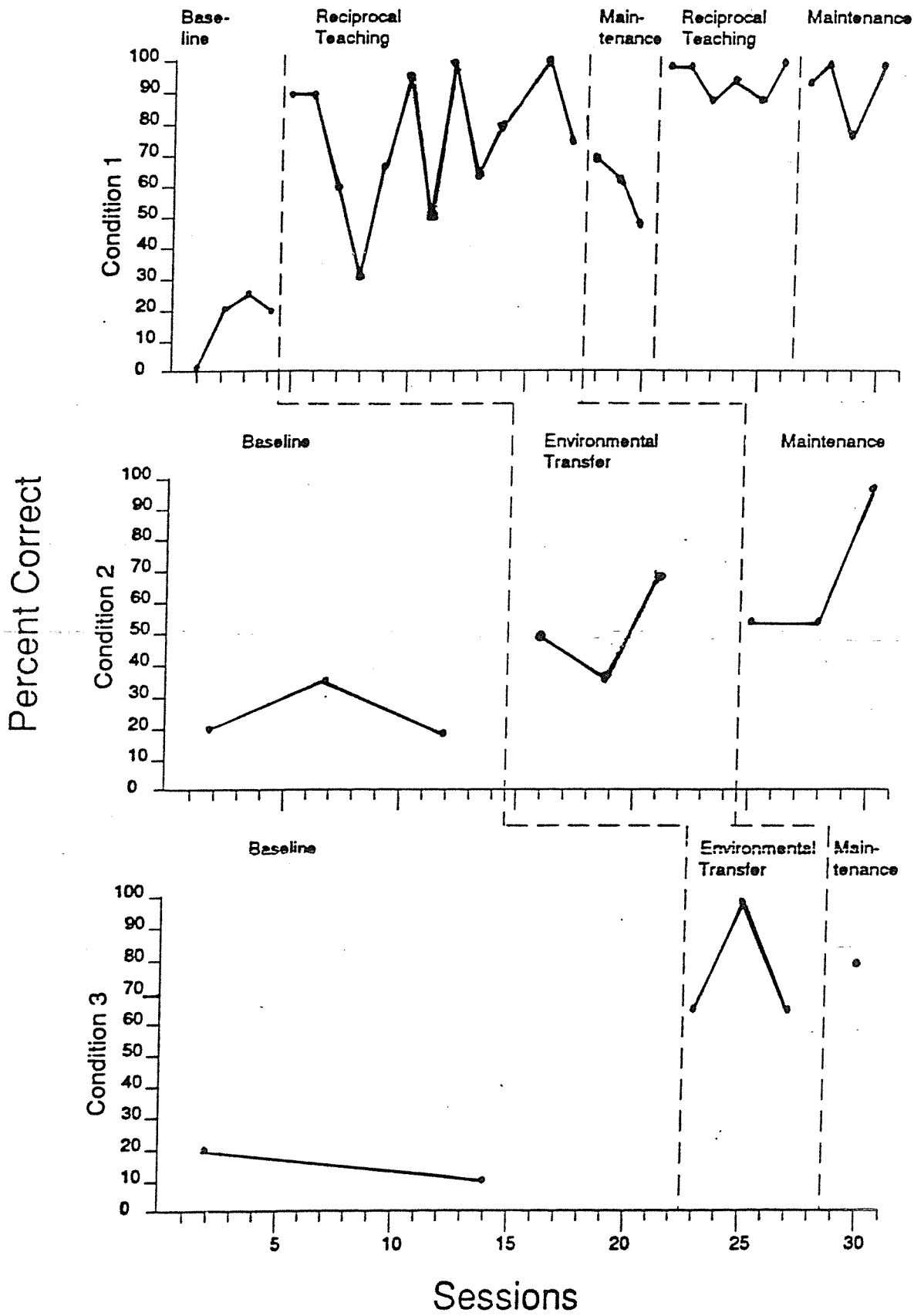


Fig. 4.3 Total scores across phases in the 3 conditions for Student 2

Second, the trends in the first half, but not the second half, of the environmental transfer phase of the reading class transfer condition appear to parallel those of the reciprocal teaching condition during this same time period. The improved accuracy scores for the initial probe were observed during the time of stabilising performance in the latter part of the first reciprocal teaching training phase; while the slight drop in performance for the second probe reflected the regression in performance during the first maintenance phase of the reciprocal teaching condition, which occurred during this same week. However, the graph does not show a rising level for the final two probes in the environmental transfer phase to parallel the immediate return to high levels of performance which occurred with the commencement of the second reciprocal teaching phase of Condition 1 during the same time period, but rather, a downward trend. Nevertheless, for this particular phase the two students seemed to show a different trend, with Student 1 regressing (Fig. 4.2) and Student 2 improving (Fig. 4.3), thus indicating that Student 2 responded much more effectively than Student 1 to instructions to employing the strategies in another setting.

Social Studies Class Transfer Condition (Condition 3)

It was planned originally that there should be three probes to measure transfer of learning to the home room social studies class during the baseline phase of the social studies class transfer condition (Condition 3), with the third probe to occur concurrently with the environmental transfer phase in Condition 2 and during the time of reintroduction of reciprocal teaching in Condition 1. However, because of other commitments when the third probe was due (excursions etc), the teachers requested that no social studies probes be undertaken that week.

As indicated in Fig. 4.1 the students showed no evidence of unprompted transfer of strategies to the social studies class during the baseline of Condition 3, where performance remained at a stable mean of 24% accuracy. However, in contrast to the reading class transfer condition (Condition 2), the data show steadily improving performance during the environmental transfer training phase with a mean of 50.5% accuracy. This accelerating trend continued in the maintenance phase with a mean score of 75%, thus showing an average overall improvement from

baseline to maintenance of 51%, which is considerably more than the 30.5% average overall improvement in Condition 2.

However, inspection of the individual graphs shows that the improved performance in the environmental transfer phase in Condition 3, when compared to the baseline phase, was almost entirely due to the efforts of Student 2 (Fig. 4.3), whose mean performance in this phase was 75% accuracy, compared to 15% in baseline. The mean performance of Student 1 (Fig. 4.2) of 38% accuracy during the environmental transfer phase shows little improvement over his score of 33% mean accuracy during baseline. Thus for Student 1, instructions to use the strategies during the environmental transfer intervention in Condition 3 appear to have had minimal effect. Performance for Student 1, however, did show accelerating trends during the maintenance phase of Condition 3 with a score of 69% accuracy.

These results provide evidence that environmental transfer in Condition 3 was a successful intervention in enabling Student 2 to transfer learned strategies from the small group setting to the social studies class in the regular classroom, and suggest that, had the program continued longer, Student 1 may have benefited also. It would appear that the reason why environmental transfer was more successful in Condition 3 than in Condition 2, was that the environmental transfer phase in Condition 3 corresponded with the stage when employment of the strategies had stabilised in the reciprocal teaching training condition. This finding provides support for the proposition that mastery of strategies stabilised in a resource room reciprocal teaching situation, combined with prompts and instructions to transfer strategies to the home room in a transenvironmental programming mode, facilitates comprehension of text and transfer of learning for students with disabilities.

Total Comprehension Scores for the Year 6 Students

The data for the total comprehension scores for the five Year 6 students across the three conditions are depicted in Fig. 4.4. The individual graphs for these students are presented in Appendix 4.1.

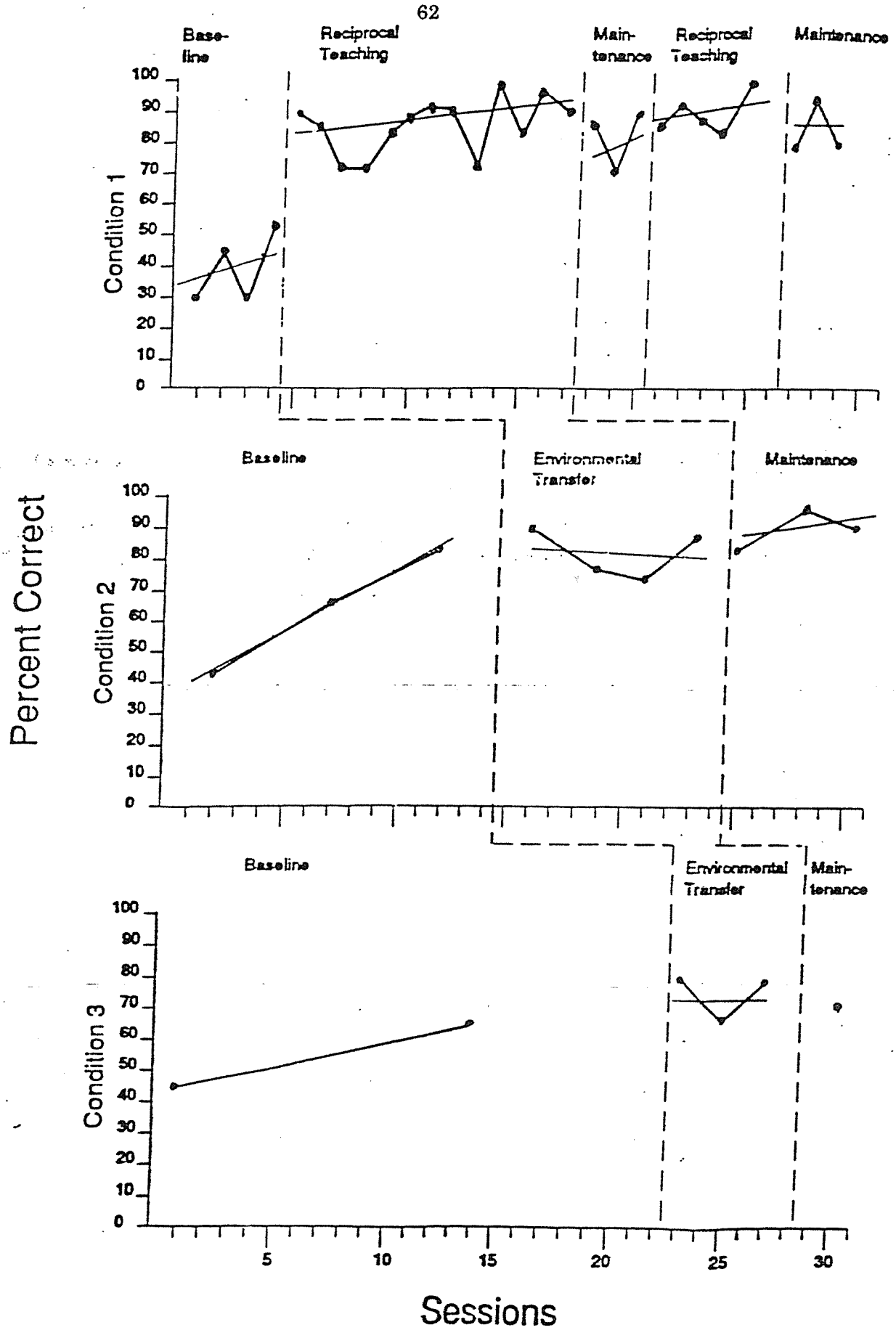


Fig. 4.4 Total scores across phases in the 3 conditions for Group 2

Reciprocal Teaching Condition (Condition 1)

During baseline for the reciprocal teaching condition the Year 6 students averaged 39% correct on the comprehension questions, with mean accuracy per session ranging from 30% to 45%. While this score was a little higher than the corresponding average for the Year Five students (18%), the same stable baseline was demonstrated.

As with the Year 5 students, the very first reciprocal teaching session resulted in immediate dramatic improvement to a mean of 87% accuracy for that session. However, in contrast to the Year 5 group, mean accuracy scores for the Year 6 students stabilised very quickly, with only minor fluctuations, to give an overall average for the phase of 83% correct. Perhaps because the average scores of the Year 6 students stabilised so quickly during reciprocal teaching, decrement in performance for the first maintenance phase to a mean of 80% accuracy, was very minimal when compared to that of the Year 5 subjects during the same phase (57.5% mean accuracy). The second reciprocal teaching and maintenance phases were almost a repeat of the first with mean accuracy scores of 85% and 79%, respectively.

Thus as a result of reciprocal teaching the subjects in Year 6 improved their performance on the comprehension questions from a baseline mean level of 39% to a final maintenance level of 79%, an average improvement of 40%. While these results do not appear quite as dramatic as those of the Year 5 students, this is partially explained by the higher baseline entry level of the Year 6 students.

It is important to note that once the Year 6 students were introduced to reciprocal teaching, their comprehension scores improved dramatically to a mean of 83% correct for the first reciprocal teaching phase and stabilised at a mean of approximately 80% accuracy or better for the rest of the phases in the reciprocal teaching condition. This was in contrast to the Year 5 students, who required more training sessions for their performance to improve and stabilise in the first reciprocal teaching phase, and whose maintenance of the strategies only stabilised after the second reciprocal teaching phase. It seems evident that the greater maturity level of the Year 6 students, combined with the fact that the Grade 3 readability level materials presented far fewer decoding problems for them than for the Year 5 students, led to their much more rapid mastery of the strategies.

Inspection of the individual graphs (Appendix 4.1) for the reciprocal teaching condition reveals that, with only minor exceptions, the results for all the students in Year 6 followed the group mean fairly closely. Students 3,5 and 7, who showed the greatest deficits in word recognition and comprehension skills during pretesting, took longer to master the comprehension strategies and showed greater variability of performance across session and phases. Student 4, whose initial word recognition and comprehension scores were among the best in the group, evidenced the least amount of overall improvement of any member of the group, obtaining the highest average score during baseline (54%) and the lowest average score in the final maintenance phase (67%). One reason for his relative lack of improvement may have been that he was on medication for hyperactivity which seemed to affect his concentration. Student 7, with an average overall improvement of 64% from baseline (24% mean accuracy) to the final maintenance phase (88% mean accuracy), made the greatest gains of any student in the group.

Reading and Social Studies Class Transfer Conditions (Conditions 2 and 3)

As the graph for the Year 6 students (Fig. 4.4) shows very similar patterns for Conditions 2 and 3, the results for these two conditions will be reported together.

An important feature of the Year 6 results was their steadily improving performance during the baseline phases of both transfer conditions. Average baseline scores in the reading class transfer condition improved by 40% from 41% in the first probe to 81% on the last probe, with a mean accuracy score for the phase of 62%; while average baseline scores in the social studies class transfer condition showed a
19% gain from 44% to 63%, with 53.5% mean accuracy for the phase. These results indicate that once reciprocal teaching was introduced in Condition 1, the Year 6 students were able to spontaneously transfer the strategies from the small group setting to the home room conditions before being prompted to do so in the environmental transfer phase.

During the environmental transfer phases, when students were directed to use the strategies, performance stabilised at levels of 80% mean accuracy for the reading class transfer condition, and improved slightly and stabilised at 74% mean accuracy for the social studies class

transfer condition. These scores were maintained in the final phase at an even higher level (88% mean accuracy) in the reading transfer condition and a slightly lower level (70%) in the social studies transfer condition.

As a result of combining mastery of the strategies in a reciprocal teaching situation with instructions to transfer those strategies to the home room, the Year 6 students improved their average performance on the comprehension tests in the reading class from an average of 42% correct on the first baseline probe to 88% in the final maintenance phase. The corresponding scores for the social studies class transfer condition were 44% for the first maintenance probe and 70% for the final maintenance phase. These results indicate that this was an effective intervention for facilitating transfer of strategies from the resource room to the home room.

Inspection of the individual graphs (Appendix 4.1) reveals that Student 3 and Student 5, i.e. two of the students who showed the greatest deficits in their word recognition and comprehension skills during pre-testing, had the greatest trouble in transferring strategies, especially in the social studies classes. On the other hand Student 7, who also showed considerable initial word recognition and comprehension deficits, achieved perfect scores for every probe in the maintenance phase of the reading class transfer condition and a relatively high score of 70% in the maintenance phase of the social studies transfer condition, thus demonstrating the effectiveness of the program in facilitating her acquisition and transfer of strategies.

Scores for the Main Idea and Detail Questions for the Year 5 Students

Figures 4.5 and 4.6 depict the data for the main idea and detail questions, respectively, for the Year 5 students. In general, the pattern of results for both main idea and detail questions was very similar to that of the total comprehension questions (Fig. 4.1), with two notable exceptions which will be reported below.

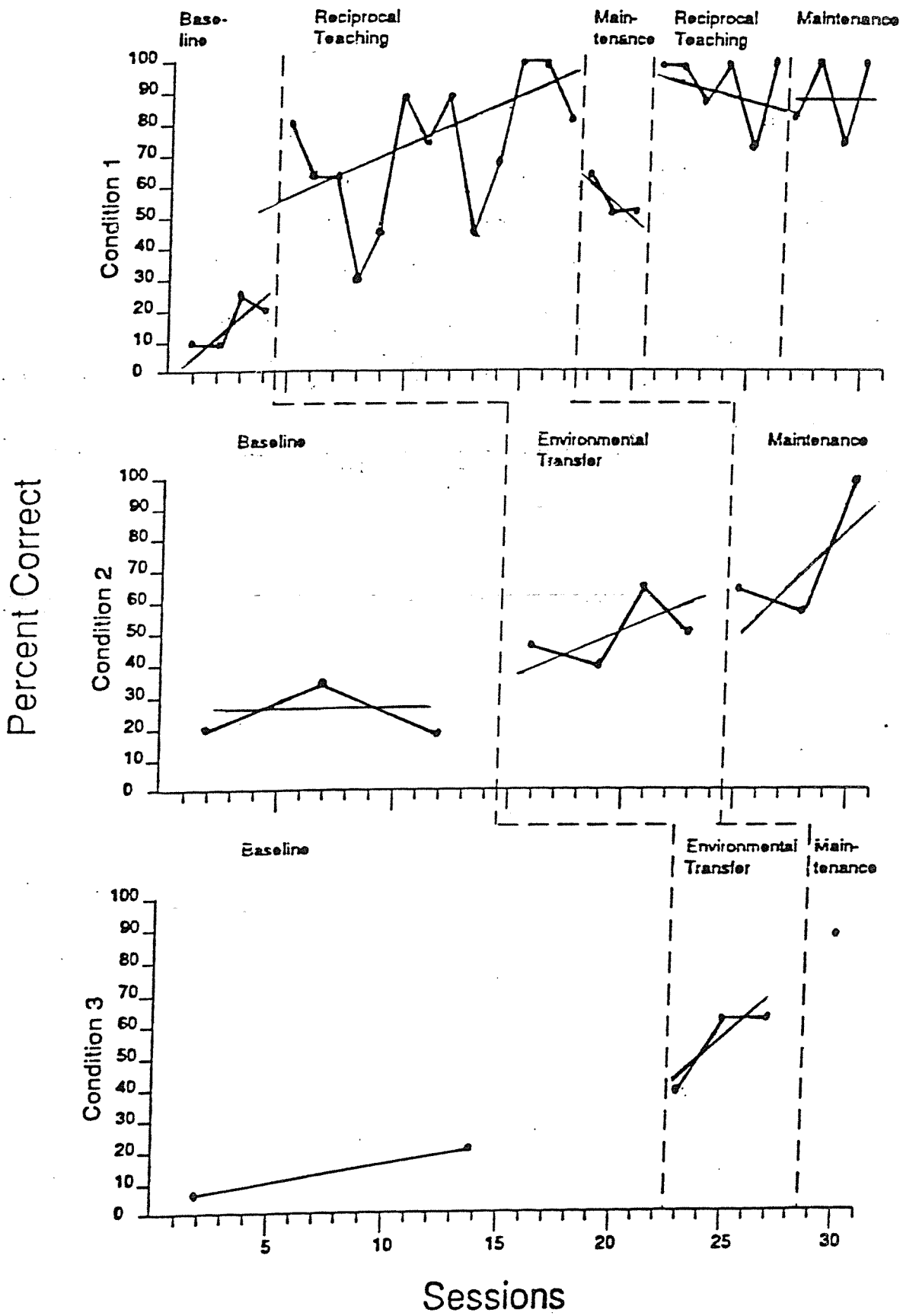


Fig. 4.5 Main idea scores across phases in the 3 conditions for Group 1

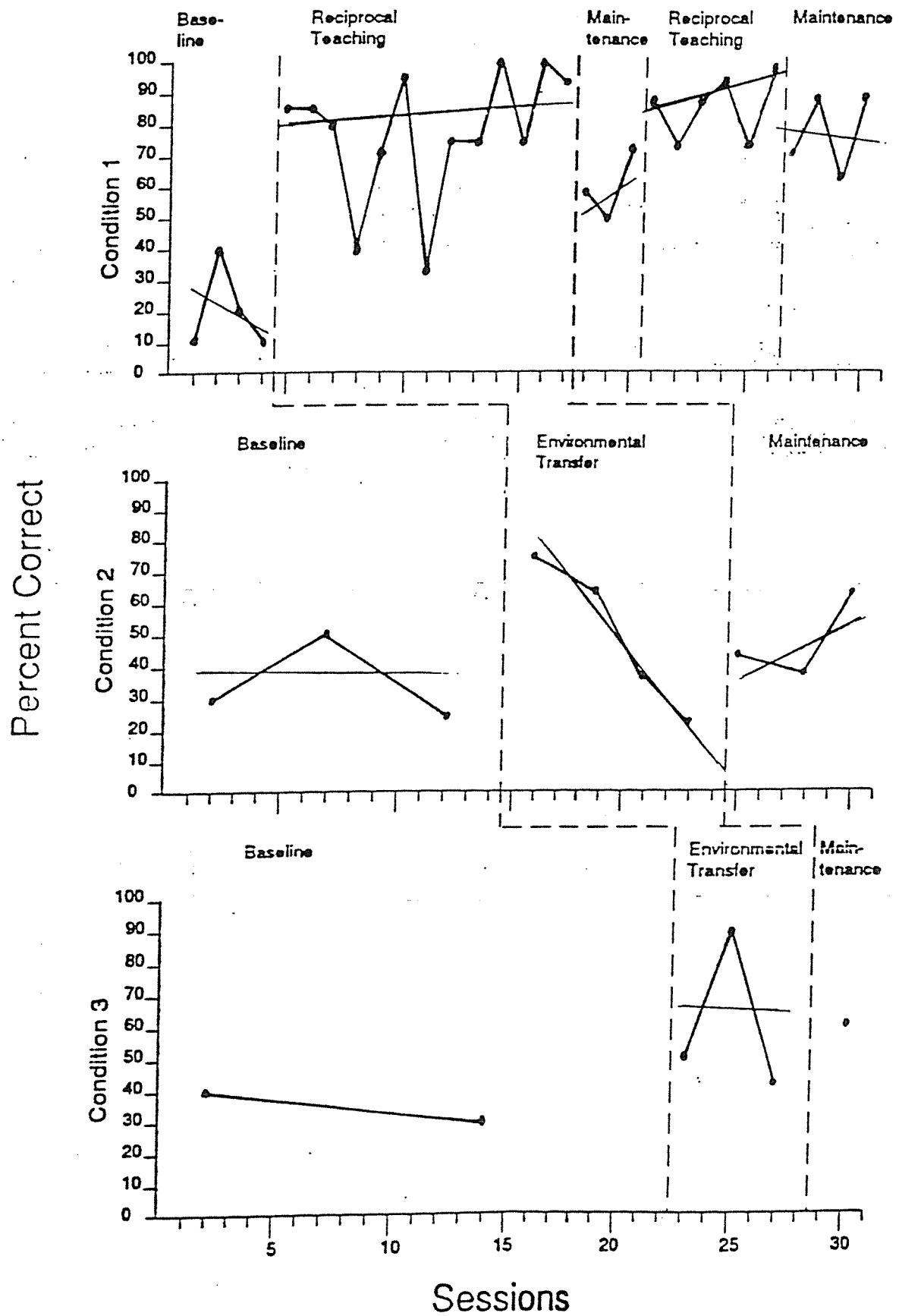


Fig. 4.6 Detail scores across phases in the 3 conditions for Group 1

First, the scores for the main idea questions during the environmental transfer phase for the main idea questions in the reading class transfer condition (Fig. 4.5) show an accelerating slope, in contrast to the decelerating slopes in the same phase for the total score and detail question graphs (Figs. 4.1 and 4.6, respectively).

Second, inspection of the graphs reveals a reversal from the beginning to the end of the study of the relative number of main idea and detail questions answered correctly. During baseline in both Conditions 2 and 3, the students tended to achieve higher scores in the detail questions, but during the environmental transfer and maintenance phases they achieved higher scores in the main idea questions.

These results suggest that the reciprocal teaching dialogue, with its emphasis on main idea questions and summaries, was more facilitative of comprehension of main ideas than details.

Scores for the Main Idea and Detail Questions for the Year 6 Students

The data for the main idea and detail questions for the Year 6 students are shown in Figures 4.7 and 4.8, respectively. The pattern of results for both the main idea and detail questions is also very similar to that of the total score questions for this group (Fig. 4.4).

Inspection of the two graphs reveals no noticeable change across phases for the main idea and detail questions data, as is the case for the Year 5 students, but rather a steady improvement in the totals for both kinds of questions. This suggests that the Year 6 students, being more mature than the Year 5 group, were better able to focus from the beginning on both main ideas and relevant details.

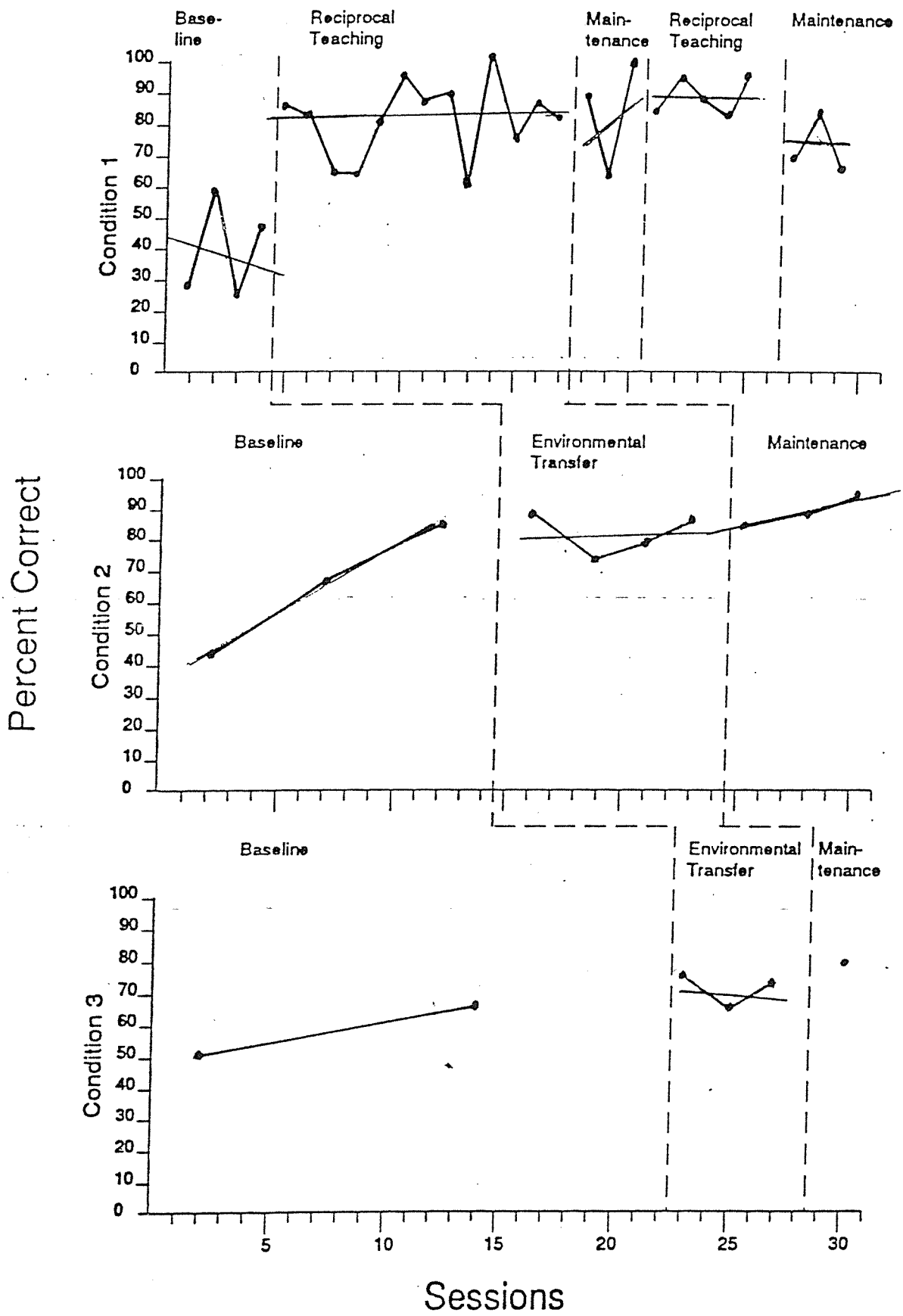


Fig. 4.7 Main idea scores across phases in the 3 conditions for Group 2

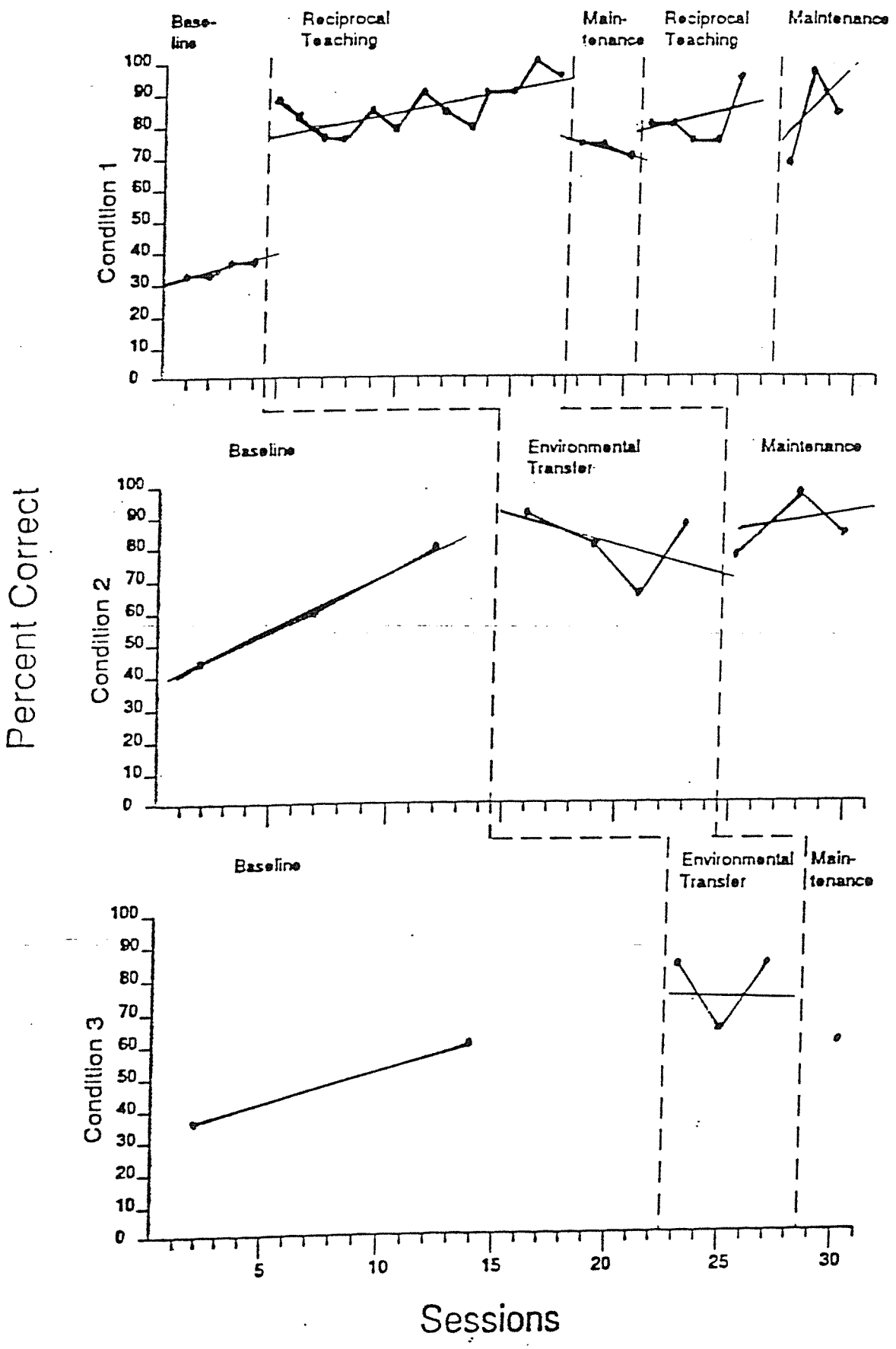


Fig. 4.8 Detail scores across phases in the 3 conditions for Group 2

Summary

To summarize, analysis of the data revealed a number of key findings regarding the efficacy of combining reciprocal teaching with transenvironmental programming procedures.

(1) The comprehension scores of each subject rose dramatically as a result of the reciprocal teaching training, and the effects were durable over a four week interval.

(2) The two Year 5 students, who were also the poorer readers, required more reciprocal teaching training sessions than the Year 6 students for their performance in Condition 1 to improve and stabilise, and it was only after the second reciprocal teaching phase that their maintenance of the strategies stabilised.

(3) In general, the performance of the older students in Year 6 improved after only a few reciprocal teaching training sessions and high comprehension scores were maintained throughout the rest of the phases of the reciprocal teaching condition.

(4) The students in Year 5, in common with most students with learning disabilities, were unable to spontaneously transfer the learned strategies from the resource room to the home room conditions. By way of contrast, the Year 6 students showed some evidence of unprompted transfer of the strategies.

(5) Instructions to use the strategies in the reading and social studies classes during the environmental transfer phases of Conditions 2 and 3, resulted in great improvement for one of the Year 5 students and moderate improvement for the other. Because the Year 6 students were already spontaneously transferring the strategies, instructions to use the strategies in the environmental transfer phases served to stabilise their performance.

(6) Mastery of the strategies in the reciprocal teaching condition appeared to be an important factor in facilitating transfer of the strategies to the classroom context.

(7) The Year 5 students made relatively greater improvement on the main idea questions than with the detail questions, thus indicating that reciprocal teaching techniques are effective in helping students understand the main ideas of a passage. For the Year 6 students there was a steady improvement with both kinds of questions suggesting that these students were better able to focus from the beginning on both main ideas and relevant details.

CHAPTER FIVE

DISCUSSION

This chapter discusses the results of the present study. The findings concerning the efficacy of reciprocal teaching for enhancing comprehension of text by students with learning disabilities are discussed in relation to the research reviewed in Chapter Two. The findings on the facilitative effects of transenvironmental programming for promoting transfer of strategies learned in a resource room context to a regular classroom setting are also examined. Implications for teaching comprehension strategies to students with learning disabilities are also analysed. Finally the limitations of the study and suggestions for further research are considered.

Reciprocal Teaching

This study demonstrates the effectiveness of reciprocal teaching procedures for enhancing reading competence in students with learning disabilities. This conclusion is evident from the great improvement in the percentage of comprehension questions answered correctly by all subjects in the study as a result of involvement in the reciprocal teaching procedures. It could be argued that this improvement came about as a result of interaction with the text during the reciprocal teaching dialogue, but the same high scores were achieved during the maintenance phase, when there was no interactive discussion of the text before students answered the questions, indicating that they were using the strategies independently. Moreover, the effects were durable in that they were maintained over a 4-week period after the reciprocal teaching dialogue had been discontinued. The improved performance during the maintenance phase was a clear indication of the effects of training.

A number of reasons can be advanced for the success of the reciprocal teaching intervention in this study. First, there are indications that the reciprocal teaching dialogue helped the subjects overcome comprehension *skills deficits*. For example, there were indications that improvements, over time, in the use of the strategies during reciprocal teaching (e.g. the ability to ask teacher-like

questions or make succinct summaries), corresponded with the improvement in comprehension scores. At first the students had difficulty, not only in framing questions, but also in asking questions that could be answered from information in the text rather than being purely speculative or tangential to the text. It seemed that their increasing ability to ask appropriate questions and lead the dialogue in a teacher-like way, helped students focus on and understand the content of the passages, something they had not done very effectively before. This is consistent with the findings of Palincsar (1986a) and Palincsar & Brown (in press) into the efficacy of reciprocal teaching dialogue for promoting sophisticated use of the strategies.

Second, there are indications that the program assisted the students in overcoming *production deficiencies* in the use of the strategies (Flavell, 1976). Once introduced to information concerning how, when and where to use the strategies, the subjects appeared to be able to make immediate use of this information so to achieve dramatically improved comprehension scores. The fact that the Year 5 boys took longer for their spontaneous use of the strategies to improve and stabilise is consistent with research cited earlier which suggests that age and cognitive ability are important factors in the development of self-regulatory skills (Brown, Campione & Barclay, 1979; Cross & Paris, 1988; Kirby & Moore, 1987; Reeve & Brown, 1985; Wong, 1986b).

Third, it appears that *affective deficits* were overcome in at least three ways:

(a) It can be argued that the use of content materials which presented relatively few decoding problems, as recommended by Schunk (1989), was an important factor in enabling the students to attain immediate success, thus motivating them in the continued use and mastery of the strategies. The fact that the materials were relatively easier for the Year 6 students, enabling their performance to stabilise more quickly, suggests that the next step in the program could have been to raise the difficulty level of the materials being used by the Year 6 students so as to move them towards comprehension of grade level materials.

(b) The opportunity for students to graph their daily results, and hence see the payoff for their efforts, also proved to be very motivating for them.

(c) A third motivating factor, as suggested by Schunk (1989), may well have been that of observing similar peers, i.e. other poor readers, improving their skills, rather than observing failure or observing peers who cope easily. However, this factor may also have mitigated against rapid

improvement by the Year 5 group. After the third Year 5 student left the school this group was reduced to two members, both of whom had fairly severe reading deficits. Inspection of the results of the third Year 5 student up until the time that he left just after the first maintenance phase, showed that he was making faster progress in mastering the strategies than either of the other two Year 5 boys. If he had remained it is possible that he would have served as a more successful peer model for the other two students.

Fourth, *instructional deficits* were overcome in that the reciprocal teaching dialogue provided an ideal venue for helping students in both groups learn to monitor their own comprehension and take steps to correct any breakdown in meaning. For example, during the dialogue and discussion it was discovered that one of the reasons why the two Year 5 boys initially did so poorly in the daily comprehension tests, was that they often read only part of a sentence, leaving out the part with qualifying words like "didn't" or "but", which gave the sentence the opposite meaning to what they thought. Apparently, up until this time it had never occurred to them to read the rest of the sentence to clear up any confusion in meaning which might result. After this was pointed out to them, they took great delight in telling each other to "Read the rest of the sentence", whenever this kind of breakdown in meaning occurred. Moreover, after a time the strategy appeared to become internalised as the problem no longer occurred, and, of course, their comprehension scores improved considerably.

The finding that the program facilitated the understanding of main ideas for both the Year 5 and Year 6 groups suggests that the interactive nature of the reciprocal teaching dialogue may be useful in helping children focus on main idea propositions, an important prerequisite for later study skills. The fact that the Year 5 students did not improve so much in their answering of detail questions may well be due to their younger age. Given time and further instruction it could well be that their understanding and recall of supporting details would also be facilitated, as it was for the Year 6 students.

Transenvironmental Programming

In general, this study supported the usefulness of transenvironmental programming, in which students are given explicit instruction to employ the strategies they have learned in the resource room when they are given similar reading tasks in the regular classroom.

A number of expected and unexpected results occurred during the transfer conditions. As expected, the Year 5 students, in common with most students with learning disabilities, showed no evidence of unprompted transfer of the strategies. It could also be predicted that the Year 5 students would be more successful at transferring strategies to the social studies condition than the reading condition, because of the cumulative effects of previous instructions to use the strategies in the reading class during Condition 2. An unexpected finding was that one of the Year 5 students had considerable difficulty using the strategies in the home classroom in either condition, even after being instructed to do so, until right at the very end of the program. Another unexpected finding was that the Year 6 students showed evidence of unprompted transfer of the strategies to the reading and social studies class settings as soon as they had been introduced to reciprocal teaching in the withdrawal situation. Also unexpected was the fact that the Year 6 students were more successful at transferring strategies to the reading class than to the social studies class.

Taken together these outcomes suggest that successful transfer of strategies may depend on a number of factors besides explicitly instructing students to use the strategies in other settings. First, as argued by Ellis and his colleagues (1987b), it seems evident that mastery of the comprehension strategies in the resource room context was a prerequisite for successful transfer of the strategies to the home classroom. As the Year 6 students mastered the strategies very quickly, this may partially explain their unprompted transfer of strategies from the resource room to the classroom setting. On the other hand, performance of the Year 5 boys in the reciprocal teaching setting did not stabilise till towards the end of the study, which may be a reason for their more gradual improvement in transferring the strategies to the home classroom.

Second, the fact that those students in both Years 5 and 6 who had the most difficulty in transferring the strategies, were those with the greatest comprehension and word recognition deficits at the commencement of the study, suggests that students' initial reading levels may have

been a factor influencing transfer. This is consistent with research quoted earlier (e.g. Brown, Campione & Barclay, 1979; Cross & Paris, 1988; Wong, 1986b) that younger children require a more explicit, intensive, externally based approach if interventions to teach transfer and generalization of strategies are to be successful. It can be speculated that, had instructions to transfer strategies to the home classroom setting been continued for a longer period of time after mastery of the strategies in the withdrawal situation, then this intervention may have been more successful for those students with lower initial reading ability levels. Also, as suggested by Ellis and his colleagues (1987b), they may have been assisted by the provision of checklists to cue their use of the strategies, or by having their peers provide additional prompts to use the strategies.

A third factor which may have influenced the degree of transfer to the classroom settings is the extent to which the home classroom teachers made allowances for the students to use their newly acquired strategies. For example, part way through the environmental transfer phase for the reading class transfer condition, the Year 5 boys complained that their teacher was not allowing them the time they needed to self-question, summarize, clarify and predict while they were reading silently. Consultation with the teacher helped to rectify this situation, but this may be one reason why transfer of the strategies, especially for the student whose decoding skills were the weakest, was minimal at first. These findings support the arguments of researchers such as Anderson-Inman (1986), Ellis and his colleagues (1987a,1987b) and Idol and her associates (1988), that there needs to be very close cooperation and collaboration between the resource teacher and the regular class teacher if successful transfer of strategies across settings is to be achieved.

A fourth factor, which may explain why the Year 6 students were more successful at using the strategies in the reading class than in the social studies class transfer condition, may have to do with the students' familiarity and background knowledge of the content of the instructional materials. Although every effort was made to rewrite the materials at the Grade 3 readability level, some of the social studies units, especially the one on Energy for the Year 6 girls, contained many unfamiliar words and concepts which probably affected comprehension even though the students were using the strategies. This finding suggests that the students would have benefited from Anderson-Inman's (1986) recommendation to preteach difficult concepts in the resource room before being asked to transfer the strategies to the home room.

As a final point of interest, anecdotal evidence concerning the efficacy of this program for promoting transfer of strategies was obtained during informal discussions with the students on the last day of instruction. At this time a number of students revealed that they were spontaneously beginning to transfer and generalize the strategies to other school subjects without ever being prompted to do so. For example, the Year 5 boys (Student 1) whose rate of improvement had been the slowest during the transfer conditions, indicated that he had used the clarifying strategy the day before to help him understand what to do in a maths problem - something he would not have bothered to do previously. This suggests that if booster sessions were planned for the rest of the year, as suggested by Palincsar (1987), then the facilitative effects of transfer of learning would be strengthened.

Implications for Classroom Practice

The results of this study support previous research into the facilitative effects of reciprocal teaching on reading comprehension, and of transenvironmental programming on transfer of learning across settings; and, moreover, indicate that a combination of the two instructional programs provides a very effective means of improving the comprehension skills of poor readers.

The results also suggest a number of important implications for classroom practice if this combination of reciprocal teaching and transenvironmental programming is to be most effective.

(1) There should be thorough mastery of the reciprocal teaching strategies in the training situation before attempts are made to prompt transfer of the strategies to other learning situations.

(2) Instructional materials should be written at a reading level which presents few decoding problems for the targeted students, i.e. their instructional reading level, so that working memory space can be used for higher level comprehension processes. This may mean rewriting text at a suitable level, which can be a time consuming process. However, if a number of teachers work together a bank of such materials can be built up.

(3) Instructions to employ the strategies in other contexts need to be continued over a period of time (possibly longer than was planned for in this intervention), so as to allow performance in the

transfer situation to stabilise. Also, the program needs to be flexible enough to allow for individual differences in mastery and transfer of the strategies, e.g. the prompts to transfer the strategies may need to be continued longer for some students than for others.

(4) There needs to be close cooperation and collaboration between the resource teacher, the regular classroom teacher and the student, to ensure that all understand and are working towards the same goals.

(5) Transfer of the strategies to unfamiliar content material may be facilitated by preteaching difficult concepts in the resource room.

(6) An alternative to resource room based instruction would be for the class teacher to use reciprocal teaching techniques in natural reading groups. As the other students in the class thus became familiar with the strategies they could act as peer-tutors in prompting the targeted students in the transfer and generalization of the strategies.

Limitations of the Present Study and Suggestions for Future Research

Interpretation of the data in the present study was limited by a number of factors inherent in the chosen methodological approach and the contingencies of school organisation and management. Further areas requiring investigation will be discussed in relation to the limitations of the present study.

A major limitation was the lack of a third probe in the baseline phase of the social studies class transfer condition, due to other commitments by the class teachers at the time when this probe was due. For this reason it was not possible to investigate whether instructions to use the strategies in the reading class transfer condition would lead to unprompted use of the strategies in the social studies class transfer condition. Further research could examine the extent to which students spontaneously transfer strategies to other school subjects when they are instructed to use newly acquired strategies in one particular subject.

Another limitation of this study was inherent in the fact that instructional levels had to be modified to meet the decoding needs of the students. While this was an essential feature of the

program as explained earlier, the ultimate goal of remedial instruction for students with learning disabilities should be to enable them to function as far as possible at grade level. This suggests that a comprehensive remedial reading program should aim at improving both comprehension and word recognition skills. The implication for future research is that, if the social instructional approach used in this study is effective in improving comprehension skills, the same kind of training could be used to teach word recognition skills.

A third limitation of this intervention lay in the fact that it required withdrawal of students from the regular classroom, a procedure which can create communication problems at times. An important consideration for future research would be the development and trialing of a reciprocal teaching/environmental transfer package which could be effectively used by regular teachers in their own classrooms, perhaps with the assistance of a support teacher. A classroom based intervention of this nature would have the double advantage of minimising communication breakdowns between the support teacher, the regular teacher and the students; and maximising the impact of the intervention by allowing for coordinated efforts by the class teacher, the support teacher and the peer group in assisting and prompting the targeted students to acquire and transfer the reciprocal teaching comprehension strategies.

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LIST OF APPENDICES

3.1 Instructional Materials for the Reciprocal Teaching Condition

3.2 Instructional Materials for the Reading Class Transfer Condition

3.3 Instructional Materials for the Social Studies Class Transfer Condition

Classroom 1 (Year 5)

Classroom 2 (Year 6)

Classroom 3 (Year 6)

4.1 Graphs for the Individual Students

APPENDIX 3.1

Instructional Materials
for the Reciprocal Teaching Condition

MAKING FACES

Do you like to take photos? It is fun to see how they come out. Sometimes we laugh at how queer we look in them. However, we are lucky to have our photos.

There were no cameras until 150 years ago. Instead, rich people paid artists to paint for them. Perhaps a little girl would be the one to be painted. She would dress up in her best clothes. She would sit still for a long time. When the picture was done, it would be hung on the wall. These pictures of people were called portraits and they were very expensive.

In China people did not have to sit for their portraits. No one would ever have his portrait painted. He thought that, if he did, bad luck would come. This was sad, for the Chinese wanted to have pictures. So they found a way to make a picture and not bring bad luck.

After a Chinese person died, his family called in an artist. He came with some strange things. He had lots of drawings of the parts of the human face. There were all sorts of eyes, ears, mouths, cheeks, and noses. The family looked through these "spare parts". They then chose the eyes, ears, mouth, cheeks and nose that were most like the dead person's. They showed the artist what they wanted.

The artist went away. Soon he sent back the portrait he had made. Often it was very good. So the family had the portrait without the bad luck.

The police force has artists who make up faces. Often people can remember what a law-breaker looks like. When they go to the police, an artist shows them a book. It has pictures of parts of the face. It is called an Identi-Kit.
"Did he have these eyes? Did his hair look like this? Were his cheeks fat. Did he have this nose?" he says.

Soon he has all the clues he needs. He makes a picture of the wanted man.

It is sent out to all police. Soon the guilty one is seen and caught. Having his portrait made has certainly brought him bad luck.

MAKING FACES

1. (D) How old are the oldest photographs?

2. (M) How do we know what people looked like before cameras were invented?

3. (M) What is the difference between a photo and a portrait?

4. (D) Why were portraits mostly of rich people?

5. (M) Why did the Chinese not want their portraits painted?

6. (M) Why did Chinese people get a portrait made after the family member had died?

7. (D) What were the "spare parts" used by a Chinese artist when making a portrait?

8. (D) What is the name of the system used by a police to obtain a likeness of a law-breaker?

9. (D) Where did this idea for getting a likeness of a person originate?

10. (M) In what way does this help police in their work?

ANIMAL SENSE

Silently we knelt in the scrub. We were looking at a group of 20 or 30 rabbits. It we could catch one, we could take it to school for news. All at once, every rabbit stopped eating and lifted its head. It seemed as if they had been given some kind of signal. Then, before we had a chance to move, they raced off into the bush.

What had warned them? We were puzzled about this. We would ask dad when he came home for tea.

Dad could not tell us all the answers. But he was able to tell us many unusual things about this warning of danger that animals seem to feel. It is called an extra sense. One day we may find out about this. People who study them think that animals can talk to each other. Dad told us some strange stories about this extra sense.

Once, a keeper at a zoo told of unrest among the animals. At midnight, the hyena began to howl loudly. All at once other animals joined in. They kept up this dismal chorus for half an hour. All of a sudden there was a hush as they all stopped at once. They lay about in their cages. They did not move or make a sound. All at once an awful earthquake hit the city. More than 1,000 people lost their lives. Many of these people might still be alive if only man had been able to know what the animals were saying.

During World War II, the Germans attacked Russia. They came to a big town. A fierce battle was fought. Some of the people who were still alive later, told of hordes of rats and mice that left the city before the battle began.

In 1883, most of the island of Krakatoa in the Indian Ocean was blown up by a volcano. Once again the animals seemed to know that disaster was coming. Fish, birds and animals are said to have left the island before the great tragedy. On this day, 36,000 people died.

Dogs, cats, horses and pet birds have often been known to save their owners from danger. Dogs sometimes take care of young children. They watch them on the roads and around the house.

Do animals really have this extra sense? We were quite sure those rabbits had sensed that there was danger close by. Maybe, one day, we will find the answers to all these questions. That will be when we learn understand the way animals talk.

ANIMAL SENSE

1. (M) What does this story tell us that animals seem to have that we do not have?

2. (D) What did the children want to do with the rabbits?

3. (M) What was dad able to tell the children about?

4. (M) What do people who study animals think that they can do?

5. (D) What did the animals at a zoo do just before a big earthquake?

6. (D) Which animals left the town before the Russians and Germans started fighting?

7. (M) What might have saved the lives of many of the people in this story?

8. (D) When does the writer think we will find the answers to questions about animals?

CROSSING THE ATLANTIC

Today anyone can cross the Atlantic Ocean - as long as she or he has the money and a few days to spare. At this moment there are many great planes, which belong to many different airlines, flying across the waters of the Atlantic. In them, flying in comfort, are many hundreds of people.

It is hard to believe that the very first flight across the Atlantic took place just 70 years ago in 1919, when Alcock and Brown made the very first crossing in their small plane. At times they were flying only three metres above the waves. From then on aircraft design has got better and better. Today great jumbo jets can carry as many as 490 people across the Atlantic in just a few hours.

Of course people have been crossing the Atlantic by ship since the time of Columbus in 1492. Many think that the Vikings made the trip in their ships even before that. Large passenger liners now make the trip in great comfort in under four days. Yet it was only in 1827 that the first ship with no sails, sailed across the Atlantic under power. It was a small wooden paddle steamer.

There have been many risky crossings made by people sailing alone in small wind or power-driven craft. But so far as is known, only once was a boat rowed across the Atlantic. On June 6th, 1887, George Haroo and Frank Samuelson set out from New York in a boat 5.5 metres long and 1.5 metres wide. They had five pairs of oars but no masts or sails. They took 45 days to make the trip. They had covered 4,950 km by muscle power only. Even this is not the only record, for a still tinier boat using sail has made the crossing. Andrews took 84 days to sail across the Atlantic in his canvas-covered folding boat which was just 4.4 metres long.

Would you rather make a risky trip like that, or travel in a modern ship or plane?

CROSSING THE ATLANTIC

1. (M) Who can cross the Atlantic today?

2. (M) When did the first aeroplane flight across the Atlantic take place?

3. (D) How many passengers can a jumbo jet carry?

4. (D) Who are believed to be the first to cross the Atlantic by ship even before the time of Christopher Columbus?

5. (D) What kind of power was used by the first ship to cross the Atlantic without sails.

6. (M) What has been risky about some of the Atlantic crossings described in this story?

7. (M) What kind of crossing has been made only once?

8. (D) How big was the tinniest boat ever to sail across the Atlantic?

TOYS AS OLD AS THE PYRAMIDS

Having toys to play with is not a new idea. It is a very old one - at least 4,500 years old. When men first opened the pyramids, they found toys in the graves of the children. In the days of the kings of Egypt, toys were buried with rich children because people thought they would need them in the next life. These toys are believed to be the oldest found in the whole world.

One of the toys that was found was a checker board. It was the kind on which we play chess or draughts, but it was much more valuable than our black-and-white boards. The squares on it were made of shells and rich blue jewels.

In one smally grave a wooden horse was found. It looked as if its owners had loved and used it a lot, and it had two back wheels missing. A child of today would still like to play with it. However, it is far too valuable for that. It is now kept in the British Museum.

The rattles that babies play with now have quite a story too. The first one we know of goes back as far as 1,300 B.C. This was also found in Egypt.

A doll was found in the grave of a small girl. The doll had arms that moved. Its eyes were made up with dark eye-shadow. Its hair was even done in the fashion of the time. The men who found the doll were surprised to find other things in the grave. They saw tiny carved animals, made with care and skill. There were small pieces of furniture as well, and even tiny pots and pans.

Some toys show us that the Egyptians could be unkind people. One such toy was a slave being hurt by a dog. It was probably the first workable toy in the world. It is a pity it wa not a more pleasant one!

Yes, toys of past ages are interesting to learn about. They bring us closer to the children of long ago.

TOYS AS OLD AS THE PYRAMIDS

1. (M) How old is the idea of having toys to play with?

2. (M) In which country were the oldest toys in the world found?

3. (D) Why were toys put in the children's graves?

4. (D) What were the squares of the checker board made of?

5. (D) Why can no one play with the wooden horse now?

6. (M) What was found in the grave of a small girl?

7. (M) Which toy showed that the Egyptians could be unkind people?

8. (D) What word in the story means an Egyptian tomb?

9. (D) Name two other things found in the grave with the doll?

10. (M) What do the toys found in the pyramids tell us about?

THE GIBBON THAT WASHED HER HANDS

The phone rang at the doctor's office in the zoo and the doctor answered the call. "I've just come back from a long trip to Asia," said the man who was calling. "And I've brought back a young gibbon, but there seems to be something wrong with her." The doctor told the man to bring the gibbon to the zoo. This he did. He put the ape in a small box and carried her over.

The doctor could see straight away that the gibbon was sick. This is because she was so weak that she could not hold up her head, and she was so thin that she seemed to be all bones.

The doctor asked the man some questions to find out why the gibbon was sick. He asked him what he had fed the gibbon. From the answer he found out why the little ape was unwell. The man had not fed her fresh fruit, and gibbons need fresh fruit to stay healthy.

The doctor got some fresh chopped up oranges and bananas to feed to the gibbon. First he tried to feed the banana to the gibbon but she would not eat it. The doctor then tried to feed her some orange but she could not eat; she was too weak.

Then the doctor tried a different way to get the gibbon to eat. He mashed up some banana and smeared this onto the gibbon's hands. The little ape moved her fingers. They felt sticky. She raised her hands to her mouth and licked them to wash them clean. Of course when she licked her hands she swallowed the mashed fruit. The doctor got the gibbon to eat the whole banana by smearing it onto her hands in this way.

In a few weeks the little ape was completely well - thanks to the doctor who had made her wash her hands.

THE GIBBON THAT WASHED HER HANDS

1. (D) Where was the doctor's office?

2. (D) What kind of animal is a gibbon?

3. (D) What country was the gibbon in this story brought back from?

4. (M) Why was the gibbon sick?

5. (M) How could the doctor tell that the gibbon was sick?

6. (D) How did the doctor find out why the gibbon was sick?

7. (D) Why could the gibbon not eat the chopped up fruit?

8. (M) How did the doctor finally get the gibbon to eat the fruit?

9. (M) What happened to the gibbon in a few week's time?

10. (M) How did washing her hands help the gibbon?

BILL MILKS COBRAS

Bill Jones has a farm. But Bill doesn't have cows, pigs, or chickens on his farm. He has snakes, five hundred of them, and they are all cobras. A cobra is a very poisonous snake and a bite of this snake will kill a man in a few hours.

Bill keeps cobras because he gets money for the poison from his cobras. He is like a farmer who gets money for the milk from his cows. The poison from the snakes is made into a medicine which helps people get well if they are bitten by a cobra.

Before Bill can milk the cobras he has to catch them. To do this he uses a stick with a hook on the end. When Bill opens the door of a cobra's cage, the cobra lifts its head and hisses. Bill catches the cobra around the neck with the hook, reaches in fast and grabs the snake behind the head. The he lifts the cobra out of the cage.

Now Bill has to milk the cobra. To do this he uses a cup with a rubber sheet over the top. Bill puts the cobra's head near the top of the cup. The cobra strikes fast and sinks its two pointed teeth into the rubber. One or two drops of yellow poison fell down the sides of the cup.

Bill has been bitten ten times in the last three years but he has not been hurt by these bites. This is because for two years Bill took small amounts of cobra poison into his body before he was first bitten which helped him to bet used to the cobra bites.

BILL MILKS COBRAS

1. (M) What will a bite from a cobra do to a man?

2. (M) Why does Bill have a cobra farm?

3. (M) The snake poison from Bill's farm is used to help which people?

4. (D) What does Bill use to catch the cobra with?

5. (D) When does the snake lift its head and hiss?

6. (D) What does Bill catch the cobra poison in?

7. (M) How often has Bill been bitten by a cobra?

8. (D) For how long did Bill take small amounts of cobra poison into his body?

9. (M) Why did he take the poison into his body?

10. (D) What part of the cobra's body does the poison come from?

USED STAMPS...A LOT FOR A LITTLE COST

Stamp collecting is a popular hobby. Many people enjoy looking at stamps and learning about them.

There are many ways to get stamps for your collection. You can buy new stamps at the post office. You can buy older unused stamps at a stamp store or from a stamp dealer. But unused stamps cost a lot of money.

Many people collect used stamps. There are ways to get used stamps at little or no cost. One way is to buy packets of used stamps. These packets are very cheap and they have a lot of stamps in them. Another way to get used stamps is to save envelopes that come in the mail. Some people get their used stamps by writing to pen friends in far away places.

You will need to know how to get these used stamps ready for display. First you need to tear off the corner of the envelope with the stamp. Take care not to tear the stamp! Now you need to remove the stamp from the envelope corner. Put some cool water (hot water will fade some stamps) into a bowl. Drop a few of the envelope corners with stamps into the water. Let them soak until the stamps slip off easily. Place the stamps face down on a piece of paper or towel to dry. Then place them between the pages of a book so they will lie flat. When the stamps are dry and flat, you can put them in a stamp album.

Collecting used stamps is a good, cheap way to enjoy a great hobby.

USED STAMPS...A LOT FOR A LITTLE COST

1. (M) How do you know from the story that lots of people collect stamps?

2. (D) Where can you get older unused stamps?

3. (M) What is the problem with collecting unused stamps?

4. (M) Why do many people collect used stamps?

5. (D) What is one way to get used stamps?

6. (M) What do you need to know about the used stamps on envelopes?

7. (D) Why must cool water be used when soaking the stamps?

8. (D) How do you know when the stamps have been soaking for long enough?

9. (D) How can you make sure that the stamps dry out flat?

10. (M) Does the author think it is better to collect used or unused stamps? Why?

HIC!

"Hic! hic! hic! Oh-oh! Not the hiccups again. Do you know what makes hiccups happen?"

When you have the hiccups you aren't sick, they just happen. One of the muscles that helps you breathe just starts jerking for no reason at all and then you hic. Even though you aren't sick when you have the hiccups you usually want to get rid of them.

Sometimes hiccups might be funny. If you get hiccups when you are in class they can make your friends giggle, or your friends might pretend they have hiccups too. What a lot of hics. But what if it doesn't stop? It's not funny any more because you start to feel bad and even your tummy can hurt.

People have lots of different ideas on how to stop hiccups. Some say hold your breath. Others may tell you to breathe into a paper bag for a few minutes, or to drink a glass of water while you hold your breath. Try drinking water from the far side of a glass (what a mess!). My Gran says get someone to give you a scare. All these cures work sometimes, so if you get hiccups try them, one might help you.

Doctors usually tell people just to wait until their hiccups go away because most hiccups only last a short time. There are a few medicines that can help sometimes.

A man by the name of Jack O'Leary had to wait a long time for his hiccups to go away. In fact he hiccuped about 160 million hics, making a world record. He hiccuped from 1948 to 1956, a total of 8 years. I wonder what stopped his hiccups?

HIC!

1. (M) What does the story say makes hiccups happen?

2. (D) One of which muscles starts jerking when you hic?

3. (D) What can you do with a paper bag to try and stop your hiccups?

4. (D) What do some people think you should do while you drink a glass of water to cure hiccups?

5. (D) What does gran in the story think will stop hiccups?

6. (D) How often do these cures work?

7. (M) How long do hiccups usually last?

8. (M) What does the story suggest that you should do to try and cure your hiccups?

9. (M) What does a doctor usually tell you to do to cure your hiccups?

10. (M) How did Jack O'Leary set a world record?

FUNNY MONEY

Over time people have used different things for money. Usually money is something that is not easy to find. Also everyone must agree to take the money for the things they want to sell.

One of the first things ever used for money were large, round, flat stones. They were used many, many years ago. These stones were not easy to find. The bigger the stone the more it was worth. Some stones were so big people needed slaves to carry them when they went shopping! Other stones were even bigger. They were left in front of rich men's houses so everyone could see how rich they were.

Shells strung on string like necklaces were used for money at one time. The more strings of shells you had the richer you were. Shell money was easier to take shopping too.

Salt was used as money once. The salt was shaped into bricks, all the same size and amount. Often the king had his picture shaped on the salt brick. This meant that the king would accept salt as money, so other people would too. Salt bricks were easy to find but if it rained they could melt.

Later on people began using copper, silver and gold metal for money. It was made into many different shapes and it was stamped like the salt money. Metal money lasted a long time because it wasn't easily damaged by water or heat or time. There wasn't a lot of metal so everyone wanted it.

Today we use metal money and paper money. Paper money is easier to carry because it isn't so heavy as metal. Also it doesn't take up as much space. Numbers are printed on the paper money to show how much it is worth.

FUNNY MONEY

1. (M) For money to be useful, what must people agree on?

2. (M) What was one of the first things ever used for money?

3. (M) How was shell money carried around?

4. (D) What did salt money look like?

5. (D) What did the picture of the king stamped on the salt money mean?

6. (D) Why wasn't salt always a good form of money?

7. (M) Name three metals that have been used for money?

8. (D) What was one reason that metals made good money?

9. (D) What is one advantage that paper money has over metal money?

10. (M) Why do you think money is usually made from something that is hard to find?

PEPPY

Mr Andrews looked after the animals at the Zoo near Perth. One day he went to see the big grey monkeys. They have long silky fur, and wise bearded faces. They are called langur monkeys. He looked in the cage. He saw a little ball of fur on the ground. He picked it up. It was a baby monkey.

Mr Andrews knew that a mother monkey often does not know how to look after her first baby. He took the baby home to his daughter, Jo. He knew she would look after it, for she had nursed zoo babies before.

Jo found an old coat. This was to be the baby's mother. A little monkey clings to his mother's tummy. Jo thought that the fur would make the little one feel at home.

Jo's mother had warmed up some milk. She put it in a bottle for the baby to suck. However, it was not a big bottle. It came from a doll's set. The monkey's mouth was for too small for any other kind. Soon Jo was kept busy feeding the baby. He had a drink every hour. Later he ate fruit and vegetables as well.

The little monkey became a pet with all the family. He had a quaint little face and short black fur which would go grey later. He had a long tail. He held it high, but he did not swing by it. Soon he was able to jump and climb everywhere. He was so quick and so full of life that Jo called him Peppy.

All too soon, Peppy grew up. It was time for him to be returned to the Zoo. Jo was sad, but she knew that Peppy would be happy with the other monkeys.

PEPPY

1. (M) Why was the baby monkey on the ground?

2. (M) What did Jo use as the baby's mother?

3. (D) Why did Jo feed him with a doll's bottle?

4. (D) What did he eat later on?

5. (D) What colour is a baby langur monkey's fur?

6. (D) What does a baby langur monkey not do with his tail?

7. (M) Why did Jo call the monkey Peppy?

8. (M) Why did Jo send Peppy back to the zoo?

SCHOOLBOYS HELP SCIENCE

What was life like long ago? We are finding out more and more about this, sometimes by accident. Boys and girls have been able to help in this study. They have often found fossils in their spare time.

Most fossils are parts of animals or plants that have been kept safe for a very long time. Fossils are studied by scientists who can often tell how old the fossils are. They can also find out what things looked like long ago.

In 1963, a schoolboy in Tasmania found a fossil of a tortoise. The boy's name was Simon Stephens. He was walking along the beach and he saw some queer lines in the side of a rock. He took the rock home, hit it with a hammer and the rock fell in half. Inside he saw the fossil of a tortoise. Later, a scientist told him that this was the oldest fossil tortoise ever found in Australia.

In Western Australia too, a schoolboy found an important fossil. Victor Roberts saw an odd shape when he was playing in the sand dunes near Scott River. It was an egg.

This fossil was not an ordinary egg. It was about 30 cm long and 20 cm wide and its shell was very thick. Scientists said that they had never seen such a big egg. They still do not know what creature laid it, or when.

So next time you go for a walk, keep your eyes open. Who knows? You may find an important fossil.

SCHOOLBOYS HELP SCIENCE

1. (M) Most fossils are parts of what?

2. (M) What are fossils able to tell us?

3. (M) What fossil was found by a schoolboy in Tasmania?

4. (D) What was special about this fossil?

5. (D) How many centimetres long was the fossil egg found by Victor Roberts?

6. (D) What kind of shell did it have?

7. (D) What do scientists not know about this shell fossil?

8. (M) Who can find important fossils?

FISH FOOD

Do you like swimming? Have you ever wished you were a fish so you could swim all day? Read on and you may change your mind.

All animals in the water are food for some other animals. They have many odd ways of getting their food.

The codfish has strong, grabbing teeth like a cat. He snaps them around an unlucky fish. It is useless for the victim to struggle. He will not escape.

The sword fish has strong teeth too, and he has a sharp sword on the end of his nose. He uses this to spear his dinner. He can attack a fish as large as a shark. Often he meets a school of small fish. He slashes about with his sword. Soon he has stunned enough small fish to make a fine meal.

The oyster does not chase his food. He sits still in one place and waits for his food to come to him. He has many fine hairs which he uses like tiny oars. They pump water through his open shell. Many small animals and pieces of weed stick to the slimy juice on his body. He eats them later.

The oyster has a very hard shell, but this does not always keep him from harm. The five-pointed star-fish is able to open an oyster. Each "point" is a strong arm. He uses them to take a good grip on the oyster's shell. Then he pulls and pulls until it opens.

No matter what a fish eats, he can be sure of one thing. He will nearly always end up as a meal himself. So you see, it is not such fun to be a fish!

FISH FOOD

1. (M) What is this story mainly about?

2. (M) What fish has strong grabbing teeth like a cat?

3. (D) What does a swordfish use his sword for?

4. (D) How big an animal can a swordfish attack?

5. (D) What does an oyster use the fine hairs of his body for?

6. (D) Which fish can pull an oyster shell open?

7. (M) What can every animal in the water be sure of?

8. (M) Why does the author think it would not be fun to be a fish?

NAMES

When you were a new born baby your father and mother chose your first name. Many people call this a Christian name. This is because many Christians give their child his or her name at a christening. You may have been called after your father or mother, or one of your grandparents. Now it is your very own name.

A surname is a last name. Each member of your family has the same surname. It has been your family name for 100's of years. Now it is your name.

Long ago there were no surnames. A man was known by the name of the trade at which he worked. He might be called "John the cook", or "James the fisher". Many surnames tell us how people earned their living in the past. The Bakers made bread. The Smiths worked with iron or other metals. The Potters made clay pots.

Some names came in the first place from nicknames. A man might have very long legs, so his friends called him Longshanks. Another boy might behave well, so he would earn the name of Goodchild. Maybe the first Mr Armstrong had very strong arms.

Other people took their names from the house or place in which they lived. So we get surnames like Whitehouse or Hill.

The most common way of making a surname was for a boy to add "son" to the name of his father. Wilson was the son of "Will". Robson was the son of "Rob". And so on.

We have all gained our surnames from ancestors who lived long ago.

NAMES

1. (D) Why are first names often called Christian names?

2. (M) Which part of their name did people not have long ago?

3. (D) Name 2 surnames that tell how people what kind of work people did in the past?

4. (D) How would a person get a surname like Greenfield?

5. (M) What was the most common way of making a surname for a boy?

6. (M) What is another name for your family name?

7. (D) Give an example of a surname that came from a nickname.

8. (M) What is this story mainly about?

GRACE BUSSELL

In December, 1876, a ship set out from the port of Fremantle, near Perth. The next day the ship ran into a wild storm. Great waves began to throw it about. At last it ran onto hidden rocks, not far from the beach. The high waves began to smash the ship to pieces. It seemed that there was no hope for the people on board.

A man named Mr Bussell had a farm on that part of the coast. One of his daughters was riding near the beach when the ship hit the rocks. A stockman named Sam Isaacs was with her.

When they saw the ship they rode straight down to the beach. The people on the ship had put a small boat into the water. A number of women and children had climbed into it. They tried to row to the shore. However, the big waves soon turned the little boat over. Grace saw the children thrown into the wild sea.

This brave girl then rode her horse straight into the surf. Out she went, past the second line of waves. She reached the people in the water. Grace then picked up some of the children. She held them on the saddle in front of her. Those in the water clung on to the saddle straps. Grace then turned the horse and pulled them to the beach.

Then she and Sam Isaacs rode out again through the waves. This time they went right to the ship. They pulled back as many people as they could. Again and again they rode through the rough surf. At last everyone on the ship was safe.

However, the job was not yet finished. The people were wet and cold, and some were injured. Grace rode to the farm house to get more help. She was so tired she could hardly speak. Quickly Grace's father drove his horse and wagon to the beach. He carried the people back to the house. They were given warm food and clothes. Grace's mother and sisters looked after them. They were very thankful to Grace. They would have died if she had not been there.

GRACE BUSSELL

1. (D) Why did it seem that there would be no hope for the people on board the ship?

2. (M) What was Grace doing when she first saw the ship?

3. (D) What was the name of the stockman with Grace?

4. (D) What happened to the little boat with the women and children on board?

5. (M) How did Grace get the people back to shore?

6. (M) What did Grace do when she had finished bringing all the people ashore?

7. (D) What did Grace's mother and sisters give the people?

8. (M) Why do you think we remember Grace Bussell today?

DAM BUILDER IN A FUR COAT

A plane roars over the woods. At last it is over just the right spot. Now someone opens the cabin door. Out come great, white parachutes. Tied to each of the parachutes is a cage. In each cage is a beaver. Now the cages are floating to the ground. Soon they will open by themselves. In no time at all the beavers will be making a dam.

The animals are taken by plane because it saves time. It might take days to walk to the same spot.

When beavers are set free in the woods, they soon find a stream. Then they will get right to work and start making a dam. The pond made by this dam will help stop forest fires. And the land around the pond will be kept very green. It is hard for a forest fire to start in wet, green woods.

No other wild animal works as hard as the beaver. Beavers can build a dam up to 200 metres long and more than 3 metres high. He builds his home of mud and sticks in the middle of the dam. Yet all he has to work with is a set of sharp teeth and two little hands.

With his teeth, the beaver keeps biting little pieces from the bottom of a tree trunk. Soon the tree falls. When it does, the little worker pushes and pulls to get the tree to the place where he wants it.

Why does the beaver work so hard to build a dam and make a pond? The reason is that he wants a house with water all around it. When he lives in an island home, no other animal can get to him. And when the cold winter winds blow, he stays warm in his home. For food, he eats twigs and bark from the trees.

The hard-working beaver asks for very little. About all he wants is a place to build a dam and live a quiet life.

DAM BUILDER IN A FUR COAT

1. (M) Why are beavers taken to their new homes by plane?

2. (D) After they have floated to the ground, how do the cages open?

3. (M) What does the beaver do as soon as he is set free?

4. (M) With which part of his body does the beaver cut down trees?

5. (M) Why does the beaver build a dam?

6. (D) What does a beaver eat?

7. (D) Where does a beaver hide in cold weather?

8. (D) In what way are beavers a help to man?

CLOWNS OF THE ANIMAL WORLD

Crows are as funny as clowns in a circus. Best of all, they like to trick each other.

When only a baby, the crow starts fooling others. He makes believe that he is sick, just to get more food. Even when he is old enough to take care of himself, he may still act helpless. Why should he look for food, when Mother crow will do it for him?

"Taking it easy" is what crows can do best. For example, to hunt mice, Mr Crow takes a ride on a pig's back. When the pig has caught a mouse, the crow hops off, grabs it, and flies off.

Even while building their nests, crows find time to play. Just for fun, one bird will take his neighbour's best nesting roots and put them in his own nest. When the robbed crow sees his roots missing, he goes looking for them. If he finds them, he takes them back along with a few things that don't belong to him! Back and forth they go, stealing from each other.

Hide-and-seek is another game crows like to play. One bird will hide in a tree hole and call for help. All the other crows will come to see what has happened. When they cannot find their friend, they fly away. But the crow keeps calling - and back they come again. This goes on until the crow comes out of hiding. Then they all have a good crow's laugh.

Now it's time for another game, a kind of ball game. The ball is a shiny shell. One crow holds it in his beak and flies off. The other crows follow him and make him drop his prize. Another crow will pick the shell up and start the game again.

Watching these birds, you will see that these clowns in feathers have as much fun as people.

CLOWNS OF THE ANIMAL WORLD

1. (M) When do crows start fooling others?

2. (D) Why do baby crows play sick?

3. (M) What do crows do best?

4. (D) How does the crow hunt for mice?

5. (M) What game do crows play when they are building their nests?

6. (D) Where do crows hide when they are playing hide-and-seek?

7. (D) What do crows use to play a kind of ball game with?

8. (M) Why does the author think that crows are like clowns?

CUSTOMS AT MEALTIME

In ancient times, people ate with their fingers. Their plate was a flat stone, or a large sea-shell or a banana leaf.

It was not until many 100's of years later that people sat at a table to eat their meals off a wooden or metal plate. They had a knife and spoon to help them. It had become the custom to eat in this way.

Forks were not used in Britain until the 16th century. An English man who went to Italy saw that the people there used forks. He brought one home with him. At first his friends laughed when they saw him use it. But soon they came to see that a fork was a good idea. It became the custom to use one, first with two prongs, then three and later four.

The first proper tables were just wooden boards resting on a trestle. The words "bed and board" meaning a bed and food came into use from those far-off days when a table was simply - just a "board". The "board" began a new custom. After that people began to eat sitting at a table which was raised off the floor.

By the Middle Ages, people had begun to pay attention to table manners. They made rules which were to be kept at meal times. We can read some of these old rules which were drawn up 400 years ago. Some of them have been passed down to us and are still in force today. A 16th century boy or girl was told to wipe his mouth after eating. He was told: "Do not dip your meat into the salt. Bring the salt to your plate." Another rule was: "Do not shuffle your feet while you are at the table."

Today we use spoons, knives and forks. We sit around a table. Do we remember our manners?

CUSTOMS AT MEALTIME

1. (M) What is one difference between the way people ate in ancient times and the way we eat today?

2. (M) What two items of cutlery were used at first?

3. (D) From which country did an English man bring forks back to England?

4. (D) How many prongs did the first forks have?

5. (M) What were the first proper tables made from?

6. (D) What did the words "bed and board" mean?

7. (M) When did people first begin to pay attention to table manners?

8. (D) Name one table rule taught to boys and girls at this time.

LIVING AT THE SOUTH POLE

In the summer of 1957, men built a small town at the bottom of the world. These were the first men to ever spend a winter at the coldest place on earth, the South Pole. They knew life would be hard. Still, they just went to study the stars, the air around them, and the snow and ice below them.

Everything they needed was flown in by plane. They had to work fast. With the beginning of winter they would be on their own. Planes would not be able to land again until next spring.

All buildings were joined together by snow tunnels. The men knew that for days it would stay more than -60 degrees C. Because of these snow tunnels they did not have to go outside very often.

Going outside when it is even -50 degrees C. is very hard on a man. It can make his breathing tubes bleed. Also he may become tired very quickly. And if he stays outside too long, his hands and feet may freeze in the bitter cold. To keep their faces from freezing, the men had to wear face masks.

The men found out many things during their stay. Balloons sent into the sky told them how heavy and cold the air was up high, and how fast the wind blew up above. They also found out that the snow at the South Pole is more than 1.5 km deep.

During the winter the sun did not shine at all. Then spring came, and the sun came out. Planes were able to land at the South Pole again. The men were able to return home and tell the world the many exciting new things they had learnt about the planet on which we live.

LIVING AT THE SOUTH POLE

1. (D) Name two of the things the men wanted to study at the South Pole.

2. (M) How was everything taken in to the place where they going to live?

3. (M) Why were snow tunnels built between the houses?

4. (D) How does very cold weather affect the breathing tubes?

5. (D) Why did the men have to wear face masks?

6. (D) Why were balloon sent up?

7. (M) How much did the sun shine during the winter?

8. (D) Why do you think planes could not land during the winter?

HIS HIGHNESS, THE CAT

In many ways the cat is not like other animals. He comes and goes as he pleases. To him, people may not mean much more than food and a place to stay. Few tame animals will become wild again as fast as the cat.

Cats don't seem to care much about people. We often hear about a dog saving someone. But we hear very little about cats doing the same. One of the few stories about a cat saving someone happened around 400 years ago. A man was put in jail and given no food. He would have died if his cat had not come with him. The cat caught birds and took them to the man.

Even if the cat does not make friends like a dog, some people think a lot of these "mouse catchers". The farmers of our country say that one cat save them $50 a year. Cats catch the mice and rats which would eat the farmer's corn, wheat and other crops.

About 2000 years ago people in Egypt believed the cat was some kind of god. Once some men from another country came to fight the people of a walled city in Egypt. When they could not break down the wall they thought of a strange way to get in. They threw some cats over the wall. When the people of the city saw what was being done to their gods they gave up.

We like to think that the cat belongs to us. But does he? We wait on him and give him a warm home and good food. He lets us pet him just a little. Then off he goes to the best chair to sleep like a king.

HIS HIGHNESS, THE CAT

1. (M) Why does the author think a cat is not like other animals?

2. (D) When left to themselves, what do cats become?

3. (D) Why does it seem that cats don't care much about people?

4. (D) How did a cat once save a man's life?

5. (M) Why do farmers like cats?

6. (D) How much per year can cats save farmers?

7. (M) What did the Egyptian people once think cats were?

8. (M) Why does the author think the cats don't really belong to people?

GOING SKIN DIVING?

Nothing else is like the feeling of being free as a fish - free to slide along and look for underwater life - free to swim up and down. A skin diver can do this. Skin diving is something like floating in space.

You have to be a very good swimmer to go skin diving. You must be able to swim at least 200 metres. You must know how to swim underwater for 30 metres or more, and you must be able to rest in the water at times.

There are some things you must have to go skin diving. You need a skin diver's mask. It has a glass face, and it covers your eyes and nose. It is important that it fits well. You also need fins for skin diving. They look something like frogs' feet, and they help you move much faster under water when you kick.

It is best to take along a brightly coloured tyre tube, too. It can be used as a resting place when you come up from below. It can show others the spot where you are diving.

Skin diving takes much training. Start by using the mask and fins in water that is only about a metre deep. After a while you may be ready for water that is a little deeper.

There are some things you must remember if you go skin diving. Don't go by yourself. Swim under water with someone else and make sure a grown-up is standing by. Stay in clear water only. Keep away from things that might cut you or hold you under. Most of all, never go down too far.

If you happen to be a really good swimmer, perhaps you can learn to skin dive. A skin diver sees many new and strange things under water.

GOING SKIN DIVING?

1. (M) What must you be before you go skin diving?

2. (D) How far under water must you be able to swim before you try skin diving?

3. (M) What two items of equipment must you have to go skin diving?

4. (M) What is one thing a tyre tube can be used for when you are skin diving?

5. (D) What depth of water should you first train in?

6. (D) Why do you think you should always go skin diving with someone else?

7. (M) What is the most important thing to remember when you are skin diving?

8. (D) What can a skin diver discover under the water?

THE BILBY

It was a warm evening. Bilby was alone. All around she could see the tops of empty burrows. A lot of her friends used to live here at one time, but now there were not many left. Bilby felt sad as she thought about them.

"Poor old Bandi," she thought. "He was just too slow to escape from that fox. And old Coot. He was too old to dig a good burrow. A cat got him. Why can't those 'two-legs' look after their cats? And then there was Bess. She went north a year ago. The 'two-legs' around here were too noisy for her. As soon as my babies get big, I will go north too. It's not safe for me to stay here any longer."

Just then Bilby heard the noise of a 'two-legs' machine. She darted down the burrow to her babies. They jumped into her pouch and lay quite still.

The noise of the machine stopped. Then Bilby heard the sound of digging above her. It was coming closer and closer. Bilby tried to dig down into the earth, but she was too late. A 'two-legs' grabbed her and pulled her out.

"Here's a beauty, Joe," a 'two-legs' said to his friend. "She has some young ones too - two babies. They are almost old enough to leave the pouch. What a good thing Bilbies are protected animals now. They are too pretty to kill off."

To Bilby's surprise, the 'two-legs' put her gently back in her burrow. "Well," she said to her babies. "I think I will stay here after all. At least some 'two-legs' are kind enough to look after us."

THE BILBY

1. (D) What kind of homes do Bilby's have?

2. (M) What had happened to most of Bilby's friends?

3. (M) Why did Bilby think it was not safe to stay?

4. (M) Who or what were the 'two-legs'?

5. (D) What in the story gives you a clue that Bilby was a marsupial?

6. (D) What is meant by an animal being protected?

7. (D) Why did the 'two-legs' think bilbies should not be killed?

8. (M) Why did Bilby decide to stay after all?

PANDAS

Far away, in the mountains of China, there lives a special kind of animal. It is called a giant panda. A full grown panda is about as big as a black bear. It is about 1.5m long and weighs about 160 kg. Every year the mother gives birth to one or two cubs. They are very tiny at birth, when they weigh only about 140g.

Giant pandas are furry and fat. They look like great big teddy bears, only they are not brown like teddy bears. They are black and white. Their legs are black. Their shoulders are black. Their ears are black, and the fur around their black eyes is black too. Everywhere else their fur is white. Pandas have white faces and white middles and short white tails.

In the mountains where the pandas live, it is cold and damp. Snow covers the ground during winter, and in summer it is rainy and wet. All the year round bamboo plants grow tall and thick.

Pandas mainly eat bamboo shoots. Then also eat other small plants, and sometimes they eat fish or mice. About every 100 years, the bamboos on which pandas live, produce seeds and die. After that it takes a number of years for new bamboo plants to grow. This last happened during the late 1970's. During that time about 1/4 of the pandas died.

Many years ago, hunters used to go to the mountains and shoot the pandas. Then the Chinese government said that nobody could shoot pandas any more. Now Chinese people sometimes climb the mountains to look for a baby panda. When they find one, they carry it gently down the mountains and take it to a zoo.

PANDAS

1. (M) In which country do pandas live?

2. (D) How many metres long do pandas grow?

3. (M) What colour are pandas?

4. (M) What is the climate like in the place where pandas live?

5. (M) What is the main food of pandas?

6. (D) Why did about 1/4 of the pandas die during the late 1970's?

7. (D) What did the Chinese government say people could not do to pandas any more?

8. (D) Nowadays, what do Chinese people do with a baby panda if they find one?

FEATHERS

Only birds have feathers. That's the special thing that makes a bird a bird. If it flies or not, if it sings or not, if it has feathers it is a bird.

Feathers are strong. Try to break or tear one, and you'll see how strong it is. Bend a feather and make the tip touch the bottom. Watch it spring back. It won't break.

Feathers are light. Hold one and you'll see how light it is. You've heard people say that a thing is "light as a feather".

Feathers are useful, too. They do many things for birds. First, the big flight feathers make birds the best flyers. Even though other living things can fly, none of them can fly as long or as far as a bird. Second, feathers help keep birds warm in winter. Watch a bird on a cold day. It looks like a fat puffball because it has puffed out its feathers to keep out the cold. Third, feathers help keep birds cool in summer. When it is hot, the bird keeps his feathers flat on his body. The heat from his body works its way out through the flat feathers. Fourth, feathers help keep birds dry in the rain. Put a drop of water on a feather and watch the water slide off.

Birds take good care of their feathers. Some birds bathe in water. Some bathe in fine dust. After their bath, they preen their feathers with their beaks. From an oil sack at the tail, birds take oil into their beaks. They use the oil to make their feathers waterproof, soft and straight.

After a while the feathers wear out. About once a year birds moult - their worn-out feathers fall out. Not all at once, just one or two at a time. And as the old feathers fall out, new ones grow in.

You may find some of these old feathers on the ground. Pick them up and look at them.

FEATHERS

1. (M) What makes a bird a bird?

2. (M) What do people mean when they say something is "light as a feather"?

3. (D) Which feathers make a bird a better flyer than any other living creatures?

4. (D) What does a bird do with his feathers so as to keep warm in winter?

5. (D) How do feathers help to keep a bird dry in the rain?

6. (M) What is one way that birds look after their feathers?

7. (D) Where on its body is a bird's oil sack?

8. (M) What happens to the old, worn-out feathers?

THE STORY OF BREAD MAKING

One of the best smells in the whole world is the smell that comes out of a bakery door early in the morning. What is that smell? It's bread baking. Usually we can smell the bread early in the morning because the baker makes bread while we are asleep at night. At dawn he takes the bread out of the oven, so we can have truly fresh bread.

Making bread takes time. First the baker mixer flour with some milk, oil and sugar, a bit of salt, and some yeast. The baker may use a big machine for mixing. The machine stirs and stretches the gooey dough, making it tough and rubbery. This stirring is called kneading.

Then the baker puts the dough aside, and the yeast begins to work. Yeast is the "magic" ingredient. A package of yeast is really many, many tiny plants all ready to grow if given the chance. In the wet, warm bread dough, the yeast plants begin to grow. The bread dough begins to swell, getting bigger and bigger.

But before the dough rises too high, along comes the baker and wham! He punches it down. Then he kneads the dough again. After a while, he may punch the bread down again. Then at last he shapes the dough into loaves.

These small loaves of dough are left to rise. When they are just the right size, the baker puts them in a large oven. As the loaves of bread heat up, they rise more quickly. Then, when they get very hot, they stop rising and start to brown.

THE STORY OF BREAD MAKING

1. (M) Why does the baker usually bake his bread at night time?

2. (D) Name two ingredients that are added to the flour for bread making.

3. (M) What is the word that means stirring and stretching the dough?

4. (D) What does the baker usually use to mix the dough?

5. (M) What is yeast?

6. (D) What two conditions are needed to make the yeast grow?

7. (M) What does the baker do before the bread rises too high?

8. (D) What finally causes the loaves to stop rising when they are in the oven?

LEAF-CUTTER ANTS

Leaf-cutter ants are insects which live in colonies. Millions of ants live in one colony. They live only in North and South America. They are also called Parasol ants because they cut leaves from nearby trees. As each ant returns to the nest it carries a piece of leaf over its head like a parasol.

Leaf-cutter ants live under the ground. They burrow with their jaws and front legs to make room for their babies and their garden under the ground.

Worker ants look after the babies and the queen. They clean the nest. At night time they leave the nest to cut leaves from trees, shrubs and other plants. Other worker ants cut up and chew the leaves to drop onto fungus to make it grow. Father ants have the job of mating. Soon after they have done this they die.

Beds of fungus are grown in the nest of the leaf-cutter ants. This fungus is their food. When a new queen flies from the nest she takes a small piece of fungus to grow in her new home to feed her new colony.

Leaf-cutter ants can be a real pest to the farmer because they strip the crops of their leaves. For example, they have been known to strip all the leaves off a grove of orange trees in one night.

LEAF-CUTTER ANTS

1. (M) Why are leaf-cutter ants also called Parasol ants?

2. (M) Where do leaf-cutter ants make their homes?

3. (D) Which ants look after the babies and the queen?

4. (D) What do leaf-cutter ants do with the leaves?

5. (M) What do they grow in their gardens?

6. (M) What do they eat?

7. (D) What does the queen take with her when she flies to a new colony?

8. (M) Why are leaf-cutter ants a pest to the farmers?

BIKES

No one knows who made the very first bike. The "Hobby-horse" was one of the first bikes that people began to ride. That is, if you could call it a bike. It had no pedals, and it was made of two wheels joined by a wooden bar. The rider sat on the bar and pushed himself along with his feet.

Then someone had a clever idea! Why not put pedals on the front wheel and push the bike that way! These bikes were heavy and had no brakes. The cobbled roads were very rough. Often the rider's teeth banged and his bones shook as he pushed his bike along. No wonder this bike was called the "Bone-shaker".

"There must be an easier way," thought one rider. "Perhaps if the front wheel was bigger, the bike might be easier to ride." So he invented the "Penny Farthing." What a sight! This bike had a huge front wheel and a tiny back wheel.

Then someone found that a bike could be pushed by using pedals connected by a chain to the back wheel. This made bike riding much easier.

Bike inventors didn't take too long to come up with another design - the "Tandem." The "Tandem" was a bike built for two people.

Until the 1960's the bike didn't change very much. In 1962, Alex Moulton made a new type of bike. His bike had smaller wheels with very hard tyres. He set the handle bars and seat on long tubes so that could be moved up and down.

Your modern bike is very much like Moulton's bike.

BIKES

1. (D) How did riders of the "Hobby-horse" bike push themselves along?

2. (D) When pedals were invented, which wheel were they put on?

3. (M) How did the "Bone-shaker" bike get its name?

4. (D) What was the name of the bike that had a huge front wheel and a tiny back wheel?

5. (M) What was done to the pedal to make bike riding much easier?

6. (M) What is special about a "Tandem" bike?

7. (M) What could happen to the handle bars and seat of Alex Moulton's bike?

8. (D) When did Alex Moulton invent his bike?

SEA HORSES

A sea horse is a tiny, bony fish. It is called a sea horse because its head looks like that of a tiny horse. It is usually less than 15 cm long, but one kind grows to about 30 cm in length.

Sea horses have tube-like snouts and many bony rings around their bodies. They move or hang in an upright way. They can change colour to match their surroundings and hide from danger.

Sea horses live in the ocean along the coasts of the warm seas. They live among seaweed. They are not good at swimming and prefer to use their long tails to hold on to coral or sea plants. Baby sea horses often form small groups by holding on to each other with their tails.

Sea horses eat many sorts of small sea creatures. They eat shrimps, sea insects, small worms and tiny baby fish. Sea horses suck food along with a rush of water into their tube-like mouths.

The mother lays her eggs in the father's pouch. She can lay from several dozen up to hundreds of eggs at one time. The eggs grow in the pouch until they hatch. The pouch provides oxygen and food for the eggs to grow. When the babies hatch, the father pushes them out of the pouch. After they hatch the baby sea horses look after themselves.

Sea horses do well in fish tanks. They are easy to keep and fun to watch.

SEA HORSES

1. (M) What kind of animal is a sea horse?

2. (M) Why is it called a sea horse?

3. (D) How do they hide from danger?

4. (D) What do sea horses use their long tails for?

5. (M) What do sea horses eat?

6. (D) How do they get the food into their mouths?

7. (M) Where does the mother lay her eggs?

8. (D) Who cares for the babies after they are hatched?

DOLPHINS

Dolphins live in the sea. They are not fish. They are mammals. A mammal feeds it baby with milk from its body.

A dolphin must come up to the air to breathe. It has a hole in the top if its head for breathing. When the dolphin is under water, it shuts this hole. Then water can not get in. It can stay under water for five or six minutes.

The dolphin is a very clever animal. He uses the hole in his head to speak. He speaks with clicks and squeaks.

He can do one thing better than man - he can hear better. He makes sounds under water. These sounds hit fish and come back to him. This is an echo. He can tell where the fish are, even if he cannot see them. They may be in muddy water or in some sea-weed.

Dolphins feed on fish. When they chase fish, they work as a team. They swim in a line. They drive the fish into shallow water.

All over the world men are keeping dolphins in pools. The dolphins can be trained to do many tricks. They can be trained to play water-polo. They can be trained to jump right out of the water to take fish from your hand.

There is a beach at Monkey Mia in Western Australia where the dolphins swim right up to the shore. They swim around among the swimmers and let the people pat them.

DOLPHINS

1. (M) How do we know that a dolphin is a mammal and not a fish?

2. (D) Where on his body is a dolphin's breathing hole?

3. (D) Why doesn't water get into his breathing hole when he is under the water?

4. (M) What can a dolphin do better than man?

5. (M) What do dolphins eat?

6. (D) How do dolphins work together to catch their food?

7. (D) What is one trick that dolphins can be taught to do?

8. (M) What is special about the dolphins that come to Monkey Mia in Western Australia?

INSECT SINGERS

Cicadas are insect singers. We hear them on hot days in summer. Only the male cicada makes a noise. This is done by a kind of drum on its body. It is not done by rubbing its legs together. That is how grasshoppers make a noise.

Cicada eggs are laid under the bark of a tree or shrub. The young grub comes out of the egg and finds its way to the ground. Then it digs down and lives in the ground. It may stay there for a long time. Cicadas often stay in the ground for three years, and some stay for 17 years.

When it is ready to come out, it digs its way up and out of the ground. This happens at night. It makes for the closest tree and climbs up the trunk. Its shell splits. Out comes a cicada. Its wings unfold.

If you look at the front legs left on the shell, you will see you strong they are. These are the digging legs.

The cicada is not a bad pest. It sucks the roots of trees while it is living under the ground. This does not harm the trees.

In Australia we have many names for cicadas. There are "Yellow Monday", "Double Drummers", "Millers" and "Bakers".

Listen next time to how they sing. One cicada starts to sing and another joins in. More and more join in the song, and soon the air seems to be full of music.

INSECT SINGERS

1. (D) What does the cicada use the kind of drum on his body for?

2. (M) Where does the mother cicada lay her eggs?

3. (D) For how long do the grubs stay under the ground?

4. (M) Where does the cicada go when it is ready to come out of its shell?

5. (D) Which of the cicadas legs are the digging legs?

6. (M) What do the cicada grubs eat?

7. (D) Give two Australian names for cicadas.

8. (M) How does a chorus of cicada singers get started?

HE KNOW THE WORLD WAS ROUND

Do you think the earth is flat? Do you think it is round? Five hundred years ago, nearly everybody would have said "It is flat". "If you sail far away from land, you will fall off the edge of the earth".

Christopher Columbus did not think the earth was flat. He said that he could go from Spain to India and China by sailing to the west. The King and Queen of Spain gave him three ships and 90 men.

Columbus set out in August, 1492. Most of his men were afraid. They soon wanted to turn back. The ships were small - the biggest was only 21 metres long. The wind blew behind them nearly all the time. The men said, "We will never be able to get back. This wind will blow us away from Spain for ever!"

After about seven weeks of sailing, there was still no land in sight. But soon they saw bits of wood floating in the sea. Birds flew over-head. Columbus told his men that they must be near land.

On the morning of October 6th, 1492, they saw land. Columbus said it must be India. The people had dark skins. So he called them Red Indians.

One of his ships ran on to a reef and sank. The other two ships sailed back to Spain. The King and Queen were very pleased.

Columbus made four trips to the new land. He had not found a short cut to India. He had found America!

HE KNEW THE WORLD WAS ROUND

1. (D) What did people of 500 years ago think would happen if you sailed too far from land?

2. (M) What did Christopher Columbus think that the world was shaped like?

3. (D) How many ships did Columbus take with him?

4. (M) In what year did Columbus set out on his journey?

5. (D) What was one thing that made the sailors afraid?

6. (D) After seven weeks, what did Columbus see that made him know that land was near?

7. (M) Columbus thought he had found a short cut to which country?

8. (M) What country had he really found?

APPENDIX 3.2

Instructional Materials

for the Reading Class Transfer Condition

ANIMAL SKY SCRAPER

We were on a trip through Africa. One day we passed through Kenya and saw a strange sight. Some workmen were making the telephone lines at least two metres higher. They had found that the lines were too low for one kind of animal to pass under. What animal? Yes, of course - the giraffe.

The giraffe is the tallest animal in the world. The male giraffe grows as high as five and a half metres. He can eat the leaves from very high trees.

You may think that, because he is so tall, the giraffe would be easy to see. When he is among the trees this is not so. The colour of his skin protects him. It is light yellow with rough brown squares on it. It looks like the shadows made by leaves. The giraffe seems to blend into the trees. His head, of course, often pokes over the tops of the trees. He can see all around him. His sharp eyes can see if danger is near. As soon as he sees danger he runs.

No living animal runs as the giraffe does. His legs move in pairs. First he moves the two right legs, then the two left legs. He runs smoothly and easily. He is wonderful to watch.

If he needs to, the giraffe can go without water for a few days. When he drinks he is funny to see. He has to spread out his long front legs so that his mouth can reach the water. His long neck cannot bend very much.

On his head the giraffe has two small horns. These have tufts of hair on top of them. He does not use his horns very much. He kicks with his strong legs when he has to fight. The giraffe is not able to make noises like other animals. The only noise he can make is a deep sighing grunt. He certainly is a strange animal.

The word giraffe means "one who walks swiftly". Do you think this is a good name for this splendid animal?

ANIMAL SKY SCRAPER

1. (M) What is the meaning of the word giraffe?

2. (M) Why were the men making the telephone lines higher?

3. (D) Why is it easy for the giraffe to hide among trees?

4. (D) What does the giraffe have to do when he wants to drink?

5. (D) Describe the noise a giraffe makes?

6. (M) How does the giraffe compare in height to other animals?

7. (D) How high can a giraffe grow?

8. (M) What does the giraffe do when he sees danger?

9. (D) Describe how the giraffe's way of running is different to that of every other animal.

10. (M) Why do you think this story is called "Animal Sky Scraper"?

LOST

Campers who get lost in the woods are in for a hard time. It's always good to know what to do if you lose your way.

One method which might help you to find your way is to look for and to follow man-made structures. For example, when one boy was lost, he found his way to a town by following power lines. Remember that power lines, fences and roads point the way to where people live.

There is also something which will help to keep you from circling. Circling is when you have been walking for a long time, and you realize that you are back at the place where you started from! To stop yourself from circling you should look for a tree or hill that is far away and walk towards it. When you reach this point, pick another tree or hill and head for that one. Of course, this doesn't help you if you are in a thick forest and cannot see things far away.

Another way which can be used to get back to where people live is called tracking. This means to turn round to follow back your own footprints or tracks. Of course this method will only work if the ground is soft enough to show your footprints, such as in snow or in very sandy ground.

The important thing to remember if you get lost is to stay calm. Lost campers make their big mistake when they become afraid. Then they forget to think! If you ever get lost, stay calm. Think hard! Then you will be sure to get home safely.

LOST

1. (M) Why is it a good idea for lost campers to follow man-made structures?

2. (D) Name two man-made structures mentioned in the story?

3. (M) What does circling mean?

4. (D) How can you stop yourself from circling?

5. (D) In what kind of country would it be difficult to stop yourself from circling?

6. (M) What does back tracking mean?

7. (D) When does back tracking not work?

8. (M) What is the important thing to remember when you get lost?

9. (D) Why is it a mistake for lost campers to become afraid?

10. (M) What does this story mainly tell us about?

SHE WATCHED THE STARS

"Maria", Mrs Mitchell called to her daughter. "Come down from the attic at once. A little girl shouldn't spend so much time looking at the stars." But Maria loved to look at the stars, and when the night was clear she would climb up to the attic to do just that.

Maria's father did not agree with his wife about the stars. He did not think it was bad for his daughter to watch them so much. In fact, her interest pleased him. He even gave her a telescope so that she could see the stars better.

One night her father told her to start watching for a comet. "Look sharp now", Maria's father warned. "Remember that a comet looks much like a star but it moves through the sky and it has a long tail."

Maria searched the skies for a comet for many years, and one night she found a comet. Maria was looking through her telescope, and all at once she saw a flash of light. It looked much like a star but it moved through space, and it had a long tail. At last she had found a comet.

After her find, the whole world wanted to meet Maria, and she became quite well known. She was asked to join scientific clubs, and to write books about the stars. She was even asked to teach about them. Her greatest honour came in 1905 when her name, Maria Mitchell, was placed in the American Hall of Fame.

SHE WATCHED THE STARS

1. (M) Who was pleased by Maria's interest in the stars?

2. (D) From which part of her house did Maria watch the stars?

3. (D) What did Maria use when she was watching the stars?

4. (M) What did Maria's father tell her to watch out for?

5. (D) How does a comet differ from a star?

6. (D) For how long did Maria search the skies before she found a comet?

7. (M) Why did the whole world want to meet Maria?

8. (M) What was Maria's greatest honour?

MEET MR SHARK

What would you do if you met a shark while swimming? Mr Tassos knows all about sharks. He has even taken a ride on a shark's back.

Don't swim in waters where there are sharks. But if you do, stay close to shore. Sharks in deep waters are the most hungry, and hungry sharks are the dangerous ones.

If you ever see a shark, swim slowly for shore. Don't kick hard and splash because this may excite him. You could never outswim a shark because he is one of the fastest fish in the sea. If Mr Shark comes too close, put your head under water and yell, "Go away, get lost." He can't hear what you say, but the sound under water may make him afraid.

But what if he still keeps coming? Mr Tassos says you should try to hit him on the nose, as a blow on the nose hurts him most. If he returns, do the same thing again.

Did you know that a very good swimmer can ride on a shark's back? When he does, he has men with spears go with him because he may need help. First, he looks for a mother shark because they are slower but just as big as others.

When he finds a mother shark, he takes hold of her fins just behind her gills. Then he puts his legs around her body. He can get a good hold because her skin is like sandpaper. And by holding on to the fins he can keep her from turning and biting off his legs.

The shark will roll over and over and jump like a wild horse. After a short time the rider will want to stop. He then puts his feet on the shark's back and pushes away fast and hard. If the fish turns on him, it is up to the men with spears to help!

Sharks are mostly found in the warm waters of the sea. However, there are sharks big enough to ride in deeper waters most anywhere. But if you want to go for a ride, hop on your bike. It will be much safer!

MEET MR SHARK

1. (M) If you don't want to be attacked by a shark, where in the ocean is the safest place to swim?

2. (M) If you see a shark what should you do?

3. (D) Why should you not kick and splash if you see a shark?

4. (D) Why will swimming fast not help you get away from the shark?

5. (D) How might yelling under water help?

6. (M) What should you do if the shark keeps coming towards you?

7. (D) How can the men with spears help the shark rider?

8. (M) Why is it safer for you to ride a bike than a shark?

HEAT UNDER YOUR FEET

There is a place on our earth where hot water and steam come up from under the ground. This place is in the North island of New Zealand.

The world on which we live is a ball of very hot rock. It is a good thing for us that the outside shell is cold. If it were not, no one could live here. What if our earth were only as big as an egg? Then the outside part would be as deep as the egg's shell.

The earth's shell has breaks in it in some places. In New Zealand this shell seems to have more breaks in it than other places of the earth. There are spots where the ground is so hot that it burns the bottom of your shoes. In some places, hot water shoots into the air from time to time. At other points, you can see steam coming up from ponds of hot water.

The Maori people who live in these places make use of the heat that comes from inside the earth. Some of them cook in the hot ponds. They put food in a basket and place it in the water. Washing clothes is done in much the same way.

Many people bring the hot water from below the earth into their homes by putting a pipe 30 metres or more into the ground. In this way they get hot water and steam for cooking, washing, and heating their homes.

For most of us, the heat under our feet is too far away to use. We must make heat by burning coal, oil, or gas. The people who get heat from inside the earth are lucky because it takes money to pay for coal, oil, or gas.

HEAT UNDER YOUR FEET

1. (M) Our earth is like a ball of what?

2. (D) What would happen if the outside shell of the earth was not cold?

3. (D) How hot is the ground in some spots in New Zealand?

4. (M) Name 2 ways that Maori people make use of the hot pools?

5. (M) How do the people get the hot water into their homes?

6. (D) What do you think heats the hot pools?

7. (M) Why can most of us not make use of the hot water that is under the ground?

8. (D) Why are people who can get hot water from inside the earth lucky?

BABY PLATYPUSES

Platypuses mate in the water some time between July and November. Mating time depends on the climate in which they live.

The female is ready to lay her eggs about four weeks after mating. She digs a new burrow from off the main burrow. At the end of this new burrow she makes her nest. She lines it with leaves and grass. She then gets a wad of mud and damp leaves. She brings this into the burrow. Then she uses her tail to push it all together to block the entrance.

The female usually lays two eggs. But she may lay only one, or as many as three. When the eggs are laid she curls herself around them to keep them warm. The mud and leaves blocking the entrance help to keep the air moist. This stops the eggs from drying out.

While she is hatching her eggs the female does not leave the burrow to feed. Her body lives on the fat stored in her tail. It takes about 10 days for the eggs to hatch.

A baby platypus uses a tooth to break out of its egg. The tooth falls off soon after. The baby is about 15 mm long. Its bill is short and soft so that it can suck milk from the milk patches on its mother's belly. The mother needs food to keep up her milk supply, so she hurries out of her burrow from time to time, feeds quickly, then returns.

The eyes of the baby do not open until it is about 11 weeks old. A week later it takes short swims close to the entrance of the burrow. Then it begins to search for its own food. It growls, squeaks and plays like a puppy. After 3 months it is fully weaned and able to look after itself.

BABY PLATYPUSES

1. (M) When do platypuses mate?

2. (D) What does the mother line her nest with?

3. (M) How many eggs are usually laid at one time?

4. (D) How does the mother keep them warm?

5. (D) How long does it take for the eggs to hatch?

6. (M) How does a baby platypus break out of its egg?

7. (M) What do the newborn babies eat?

8. (D) How old is the baby when it is big enough to look after itself?

INDIAN HEAD BANDS

Indians used feathers from eagles to put in their head bands. First they had to catch an eagle.

Each tribe had its own way of catching the birds. One tribe dug a pit in the ground at a place where eagles lived. An Indian brave would hide in the pit. Bait, such as a live rabbit or a piece of meat, was placed on branches across the pit. A hole was left in the branches so that the brave could grab the tail feathers of the bird as it landed and ate the meat. The bird would lose its feathers but was not hurt. It grew new ones later.

Some tribes caught young eagles in the nest. They took the birds back to the Indian village and tied them by a strong string round the leg. The eagles were kept for their feathers and plucked each time they grew new ones.

Any Indian could get these feathers. But they were not allowed to wear them until they had won them by a brave deed.

When an Indian did a brave deed he had to tell the old men of the tribe all about it. Other braves must be able to say that they saw him do the brave deed. If all the old men agreed he had done a brave deed then he could wear an eagle feather in his head band.

To touch an enemy without killing him and escape would be a brave deed. So save the life of an Indian in battle would also count. Indeed a brave might be given more than one eagle feather for these deeds.

Indian braves were very proud of their head bands. They took very great care of them.

INDIAN HEAD BANDS

1. (M) What did Indians put in their head bands?

2. (D) Why was a hole left in the branches over the pit?

3. (M) From where did some Indians get young eagles to take back to the village?

4. (D) How were the young eagles kept captive in the village?

5. (M) What did a brave have to do before he could wear eagle feathers?

6. (M) Who decided that a brave could wear the feathers?

7. (D) Name something that was considered to be a brave deed?

8. (D) Why do you think the Indians took such good care of their head bands?

I, THE ANT

Since I live underground, it is not easy to watch my life. But you can do so if you have your own ant-colony. All you need is a large glass jar, an old basin, a brick, and some thick brown paper.

First, find an ant-hill, and wait until it is cool so that most of us will be home. Dig around the ant-hill, about 30cm deep, then take off its top, and finally dig out its centre. Look out for the ant that is bigger than the others. It is our queen, who lays the eggs.

Now put the centre you dug out into your jar, with me and as many of my brothers as you can easily fit. Also add grubs, eggs, and cocoons from the ant-hill. Top it up with soil.

Now wrap the sheet of paper around the jar a couple of times. Next put water in your basin, and put the brick in the middle of the water. Lastly put your jar on the brick in the middle of the water, and remove the lid of the jar. All this is very important as the water will stop us from running all over the place. The lid must come off so that we can get all the air we need. Feed us with dead insects, bits of cake, bread, sugar, and a few drops of water sweetened with honey or sugar.

After four days take off the wrap and watch. Don't leave the wrap off too long. We don't like light. You can watch us every day for half an hour or an hour, but then put the wrap back.

To get a closer view of the way I live and work, look at me through a magnifying glass. How do I carry things? How do I lift things? What parts of my body are hairy? How many legs do I have?

I, THE ANT

1. (M) Why is it usually difficult to study ants?

2. (M) Why should you wait until it is cool before trying to dig up the ant-hill?

3. (D) Name two of the things you should put into a glass jar if you want to make an ant colony.

4. (D) Why should the glass jar be put in the middle of a basin of water?

5. (D) Why must the lid be left off the jar?

6. (D) Name 2 things you can feed to the ants in your ant-colony?

7. (M) Why should you not leave the wrap off for too long?

8. (M) What can you use to get a closer look at the ants?

THE EARTH AND THE MOON

The moon is our nearest neighbour in space. It seems bigger and brighter than the stars, but really is much smaller. It seems bigger because it is so much closer to us than any star. It is also smaller than our earth. If the earth were the size of a basketball, the moon would be the size of a tennis ball.

The moon travels around the earth just as the earth travels around the sun. It takes a little more than 27 days to go around the earth once. The same side of the moon always faces the earth. It does not spin round like the earth.

There are days and nights on the moon. But each day and night is two weeks long. During the two weeks of daytime the heat is so great that no human being could live. During the two weeks of night it is so cold that a man would soon freeze to death. The men who landed on the moon had to wear special clothes to protect them from the heat and the cold.

There is no air or water on the moon. That is one reason why plants can't grow there. When the astronauts landed on the moon they had to take their own food and air and water.

The moon is a very silent place. Sound is carried by air. Since there is no air on the moon, there is no sound. The astronauts had to talk to each other by radios. Radio waves can travel without air.

THE EARTH AND THE MOON

1. (M) Why does the moon looks to be bigger than the stars when it is really smaller?

2. (D) How long does it take for the moon to travel once around the earth?

3. (D) How many of our days equal one day on the moon?

4. (D) How were the astronauts protected from the extreme heat and cold on the moon?

5. (M) What is one reason why plants will not grow on the moon?

6. (M) Why are there no sounds on the moon?

7. (D) How did the astronauts talk to each other while they were on the moon?

8. (M) Give two reasons why it would be impossible for people to live on the moon.

SEALS

Seals live in the sea most of the time. But seals are not fish. A fish takes air from the water by breathing with gills. A seal breathes with lungs, just as we do. It must come to the top of the water to breathe air. When it has filled its lungs with air, it shuts its nose and dives down. It can stay under water for twenty minutes.

Seals live in the cold parts of the world. They have a thick layer of fat which keeps them warm. This fat is called blubber. The blubber is just under their skin. Most seals have thick fur which also helps to keep them warm.

The biggest seals live in the Antarctic. They are called Elephant seals. They have long snouts like trunks. They often grow 5.5 metres long. Some are over 6 metres long, and their bodies are almost 2 metres thick. Most seals are about 2 to 4 metres long.

A seal can only move very slowly on land. Some seals use flippers to push themselves along. Seals which have no flippers push themselves along with their tails. So it is easy for hunters to catch them on land. In the sea, they can move very fast, and turn very quickly.

Seals like to lie on the beach or on the rocks, in the warm sun. They lie on the beach when the seal pups are born. There may be thousands on one beach.

SEALS

1. (D) How do we know a seal is not a fish?

2. (D) How long can a seal stay under water, before it needs to come up for air?

3. (M) What kind of climate do seals live in?

4. (M) What does its layer of blubber do for the seal?

5. (D) What is the name of the biggest seals?

6. (D) How long do the biggest seals grow?

7. (M) Why is it easy for hunters to catch seals on land?

8. (M) Where do seals like to lie when the seal pups are born?

APPENDIX 3.3

Instructional Materials

for the Social Studies Class Transfer Condition

Social Studies Instructional Materials

Classroom 1 - Year 5

THE BULLOCKIES

Bullock teams were often the only form of heavy transport between the farms and the towns. Bullockies were often the only other people the farm hands would see for months. They were important to all farms because they brought their supplies. They also took the huge bales of wool from the farms to the market.

The bullocky's job was far from easy. He would have ten or more bullocks in his team. They would be yoked together to pull a large wooden cart called a dray. The bullocks could pull huge loads but were not as easy to handle as horses. The bullocky kept them under control with two things: his voice and his whip.

When starting the team, the bullocky would call each bullock by name and flick it on the side with his long whip. If they were well trained they would move off in a slow walk. The bullocky would walk beside the team, shouting at the bullocks and flicking his whip to keep them going.

The trip was always a slow one, for the bullocks could cover only about 15 km each day. If the going was tough they would not even go that far. Often it was very tough indeed. The tracks were very rough and when it rained they flooded or turned into a sea of mud which bogged the dray.

If there was more than one team on the track, the bullockies would join their teams together to help pull each dray out. But if he was alone, the bullocky had to camp until the ground dried out.

One big advantage the bullocky had was that he had plenty of room on the dray for his own supplies. He was able to live quite well and was always ready to share his things with other travellers.

THE BULLOCKIES

1. (M) What were bullock teams used for in the early days of Australian settlement?

2. (D) What was one advantage that bullock teams had over horse teams?

3. (M) What two things did the bullocky use to control the team?

4. (D) What would happen if the team was well trained?

5. (D) What was one thing that was carried on the drays?

6. (D) How far could a bullock team travel in one day in good conditions?

7. (D) What often slowed their rate of progress?

8. (M) How did the bullockies help each other?

9. (M) In what way was the bullocky able to live quite well?

10. (M) Give one reason why the bullocky would be a welcome visitor to the farm?

RAILWAY SAFETY

It was a long time before train travel became as safe as it is today. In the early days some accidents were caused by broken rails or broken wheels. Mostly they happened when two trains crashed into each other.

At first there were no proper signals. Men stood by the side of the track and signalled to the drivers with their hands or with flags. They would only allow a train to go past, if it came more than ten minutes after the train before. The problem was that they could not tell what was on the line ahead. If a train broke down once it passed them, there was no way that they could know about it. They might wave the next train past and it could crash into the one in front.

One time a signal man did not know that a bridge on the line ahead was being fixed up. He waved the train past. The train went ahead at full speed and fell through the bridge into the river below.

To make things safer, signals were placed on tall posts. These posts were easier to see than men. Men by the side of the rail worked these signals by pulling a cord or turning a handle.

Later on men could control the signals from signal boxes. They pulled a lever and the signals changed. They could find out by phone if the lines were clear. Today the signals are worked by electricity.

In some places today, train tracks have to cross roads. There is a 'level crossing' where they meet. When a train is about to cross the road a bell rings. Then a boom gate comes down to stop people and cars from going across. You should never try to cross the tracks after the bell has rung.

RAILWAY SAFETY

1. (D) What caused most train accidents in the early days?

2. (M) Why did trains often have accidents in the early days?

3. (M) How did the signal men first give signals to the drivers?

4. (D) In the early days how much time did the signal men allow between trains?

5. (M) What could the signal men not know?

6. (M) Where did they put the signals to make them safer?

7. (D) How are the signals worked nowadays?

8. (D) What signals today can keep you safe at a level crossing?

A SAILOR'S LIFE

The men who sail the ships of the world have a life all of their own. They have their own kind of sailor talk and their own kind of time. They live under strict rules, which they must obey. They can't go for a long walk, or take a drive. They can't decide to stay home from work and watch TV. Life is sometimes uncomfortable and even dangerous. But most sailors would not change it for a life ashore.

Once the life of a sailor was cruel and hard. He slept below deck with the other seamen. In bad weather, water came in the open portholes, soaking him and all that he owned.

There was no such things as tin cans and fridges; so the food was terrible. The only meat was salty and dried. Flour got mouldy. There were no fruits or vegetables. The water was bad. Sailors often got scurvy, a disease that comes from not having enough vitamins. If a sailor got sick, he either got well as best he could or died.

The captain ruled over all on board. Sometimes he was very cruel, but there was nothing the crew could do about it. During long trips, a sailor was out of touch with his family for two or three years. But men still went to sea.

Today, ships are clean and safe. Food is good and there is plenty of it. Aboard ship there are good books to read. And there is a store where he may buy what ever he needs. He gets mail at every port. Radio keeps him in touch with the world. If he gets sick, there are medicines on board. And if he gets very sick a helicopter can fly him off.

The sailor must still obey strict rules. But there are laws to see that he is treated fairly, and that he gets the right pay.

A SAILOR'S LIFE

1. (D) Name something that a sailor can't do while he is on board ship.

2. (M) Why was the food on the ship so bad in times past?

3. (D) What caused sailors to get the disease scurvy?

4. (M) How did the captain often treat the sailors in the days of long ago?

5. (M) In times past, how often did the sailor see his family?

6. (D) On today's ships, how can sailors keep in touch with their families?

7. (D) What happens today if the sailor gets very sick?

8. (M) How do today's laws help protect the sailor?

BOATS AND SHIPS OF LONG AGO

The first boats were just logs or branches of trees. If you can hold on to a log, it is not hard to get across a wide river. But you get wet!

It is much better to tie several logs together to make a raft. Then you can sit on top of the raft and keep dry.

Another way to keep dry is to make a canoe. A canoe can be made from a log with a hollow in it, or a big sheet of bark. Rafts and canoes have been used for many thousands of years.

Bigger and bigger boats were made. They had sails or oars. If a boat is very big, we call it a ship. Three thousand years ago, some ships were so big that they needed 30 men to row them. The men sat along each side of the boat and rowed. The ships also had a big square sail. When the wind was behind the ship, the rowers could have a rest.

The Vikings were good sailors. About a thousand years ago, they sailed from Norway to Iceland and Greenland. Some of them even sailed to America. Their ships were long and slim. They had oars, and one big square sail in the middle of the ship.

It was not safe to go far out to sea. The compass had not been invented. The Vikings could only guess which way they were going. They must have been brave men to sail from Norway to America without a compass.

BOATS AND SHIPS OF LONG AGO

1. (M) What were the first boats made of?

2. (D) Why was riding on a raft better than riding on a log?

3. (D) Name one thing that a canoe could be made out of?

4. (M) Name the two ways that the ships of long ago were moved along.

5. (D) How many men were needed to row the biggest ships of long ago?

6. (M) Which people from Norway were very good sailors?

7. (D) Name one country that these people from Norway sailed to.

8. (M) Why was it not safe to go far out to sea in those days?

NEW KINDS OF SHIPS

Travel by water is much slower than travel by land or air. This is because the drag of the water slows down the boats. Two kinds of boats have been made which can overcome this problem. They can skim across the top of the water.

The first one is called a **hydrofoil**. It has foils under the hull. They are like small plane wings and work in the same way. They tend to lift the boat, just as a plane's wings help to lift it as it flies through the air. As the hydrofoil gets up speed, the foils lift the boat out of the water. Only the foils are still in the water. This means the boat can travel very fast, but make little wash.

The second one is called a **hovercraft**. This boat floats on a cushion of air. Large pumps suck in air and pump it down to the hull. There it is kept in by a plastic or rubber 'skirt'. The air cannot escape and it makes a cushion. The hovercraft skims along on the cushion of air. It is moved along by propellers, just like a plane. It can move just as well on land or on water. A ramp is all that is needed for it to go onto the land.

Hydrofoils and hovercraft can go two or three times faster than ships. But they can only be used in calm seas. In rough seas they can easily turn over.

NEW KINDS OF SHIPS

1. (M) Is travel slower by water, land or air?

2. (M) How many kinds of boats have been made which can skim across the top of the water?

3. (D) Why can a boat travel faster if it skims over the top of the water?

4. (D) What do the foils do to the hydrofoil so that it can travel very fast?

5. (M) What does a hovercraft skim over the water on?

6. (D) Which kind of boat can travel on both land and water?

7. (M) How much faster than an ordinary boat can a hydrofoil and a hovercraft go?

8. (D) Why can't they be used in rough seas?

BALLOONS

Long ago men would dream of flying like birds. They fixed wings to their arms and jumped from high places. They flapped their wings. But nobody was ever able to fly like that.

The first men to fly used balloons. They filled a huge balloon with hot air from a fire. The hot air was very light. It rose up into the sky. The men rode in a basket which hung below the balloon.

Later they filled the balloons with gas. The gas was light too. The gas balloon could go farther than the ones filled with hot air.

Some people sent letters by balloon. They were sent to places where there were no roads.

Balloons were useful when the city of Paris, in France, was at war. The enemy were all around the city. Some of the soldiers used a balloon. They could float up above the city and look out for the enemy. Also the people used balloons to send messages in and out of the city. The people inside sent pigeons out by balloon. The birds landed beyond the enemy. People fixed messages to their legs. The birds would carry these on their legs when they flew back to the city.

Later on airships were made. An airship is like a long balloon. It is driven by an engine. People could travel inside the airship. But they were dangerous. They caught fire easily. So people stopped using them.

Today some people like to race in balloons. Their balloons are like those of long ago.

BALLOONS

1. (M) In what way did men first try to fly?

2. (M) How were men first able to fly?

3. (D) Why does hot air or gas make the balloons fly?

4. (D) Why are gas balloons better than hot air balloons?

5. (M) What could the balloons carry to places where there were no roads?

6. (D) What is one way that ballons were useful to the people in Paris when they were at war?

7. (D) What is an airship?

8. (M) Why did people stop using airships?

Social Studies Instructional Materials

Classroom 2 - Year 6

ENERGY

Where Does Energy Come From?

Almost all of our energy comes in the first place from the sun. The most important forms of energy from the sun are **HEAT** and **LIGHT**.

The Sun

The sun is not solid like earth, but is a huge ball of boiling gases. These gases are very hot. The temperature at the centre of the sun is about 12,000,000 C! Compare this to an average summer day in Australia which might be about 30 C.

This heat in the sun is so strong that it can split open the energy locked inside the gases. This energy is then radiated in waves or rays into the solar system, where most of it is lost in outer space. Only a very small part of all the sun's energy gets to our earth, but this is enough for all plants and animals to live. Without the energy from the sun there could be no life on our planet.

The sun is one of millions of stars in our Universe. It is over 150 million klms away from us, and it is about a million times bigger than our earth.

The Importance of the Earth's Atmosphere

The sun's rays pass through a number of layers of atmosphere on the way to our earth.

The UPPER atmosphere absorbs some of the sun's rays so that they are not too hot for us. Without this upper layer of the atmosphere all life would die because the heat would be too strong.

The LOWER atmosphere supplies the air we need for breathing. Without the air, man would die in a few minutes.

Other layers of the atmosphere absorb some of the dangerous energy rays from the sun such as the ULTRA VIOLET rays which can cause sunburn and skin cancer.

The atmosphere above the earth is very important to man's survival. We must never do things on earth which might damage the atmosphere.

ENERGY

1. (M) What is the sun made of?

2. (D) Where does most of the energy from the sun go to?

3. (M) What are the two most important forms of energy we get from the sun?

4. (D) How hot is the sun at its centre?

5. (M) What splits open the energy locked inside the sun's gases?

6. (M) What would happen if none of the sun's rays got through to the earth?

7. (D) How far is it from the earth to our sun?

8. (M) What is the main source of energy on this earth?

9. (D) How does the earth's atmosphere help us?

10. (M) Why is it important not to do things which might damage the earth's atmosphere?

ENERGY FROM FOSSIL FUELS - OIL

What is Oil?

Oil is one kind of fossil fuel. It was formed from the remains of dead plants and animals. Over the years these remains have been pressed down by earth, sand and rocks. They changed into liquid and gas forms that today we call oil and natural gas.

Crude Oil

Liquid oil as it comes out of the ground is called **CRUDE OIL**. It is not the same as the petrol used in our cars. Crude oil must go to a **REFINERY** to be made into the many types of oil we use today.

Where is Oil Found?

Crude oil can be found both under land and under the sea, but only in some parts of the earth. The first oil wells were drilled on land. Most of these were in the U.S.A. in the 1850's and in Arabia in the early 1900's. Of all the crude oil known to exist today, about half is under the sands of places in the Middle East such as Iran and Iraq.

A lot of oil has also been found under the sea. But it is only in recent years that special oil rigs have been built to get at this oil. They cannot be used in most of the oceans of the world as they are too deep. The men live and work on these rigs. It is much harder and more costly than drilling on land, but the demand for oil is so great that people are looking under the sea all the time.

Oil In Australia

The biggest oil field in Australia is on the ocean floor in Bass Strait. It was found in 1965. Other oil fields are found in Queensland and at Barrow Island off the coast of N.W. Australia. Today Australia has enough oil for most of its needs. Yet the demand for oil rises all the time. The oil in Bass Strait will most likely run out soon and new fields are needed.

ENERGY FROM FOSSIL FUELS - OIL

1. (M) What was oil formed from?

2. (D) How was oil formed under the ground?

3. (M) What is crude oil?

4. (D) Where is most of the oil in the world found today?

5. (D) Why was oil from under the sea not drilled until recent times?

6. (M) Where is Australia's biggest oil field?

7. (D) Is it cheaper to get oil from under the land or under the sea?

8. (M) Why do people keep looking for new oil fields?

ELECTRICITY

Electricity is one of the most useful forms of energy in our world today. It gives us light, heat and power, as well as radio, TV and the phone.

Electricity is a natural form of energy just like fossil fuels. It has always been there in nature in very small parts. It was first found in some rocks in Ancient Greece. But there is not enough in nature to be of any use to man.

In 1831 a man named Michael Faraday found out how to make electricity. He found that if he made a magnet turn round inside a coil of copper wire, it would create an electric current. Today, big power stations use this same idea to make electricity. This way they can make enough power for every one's needs.

The machine which makes the electricity is called a generator. Inside it, is a huge magnet which goes round and round inside coils of copper wire at a very high speed.

The machine which turns the generator is called a turbine. The turbine needs energy to make it turn around. This energy can come from three main sources - WATER POWER, WIND POWER or STEAM POWER.

Steam power is the most common way for turbines to get their energy. Steam comes from boiling water. COAL, OIL and NATURAL GAS can all be used to boil the water to make the steam. In Australia where there is plenty of coal, this method of making steam is the most common.

ELECTRICITY

1. (D) Name 3 uses of electricity?

2. (D) Where was natural electricity first found?

3. (M) Why can't we use the electricity that is found in nature?

4. (M) Who first discovered how to make electricity?

5. (D) What has to turn round inside a coil of copper wire in order to create an electric current?

6. (M) What is the name of the machine inside the power station which makes electricity?

7. (M) Name two of the three main sources of power which can be used for turning the turbine.

8. (D) Which is the common fuel used in Australia for making steam for electricity?

SOME OTHER FORMS OF ELECTRICITY

Storing Electricity

A battery can make and store its own electricity. It is made of zinc. Inside there is a chemical paste and a rod of carbon. When the carbon and zinc are linked by wires, they make electricity.

There are two main types of batteries. One is called a 'wet' battery. This is the type used in a car engine. It helps to start the engine. New energy can be put back into it while the car engine is running. It will last about 2 or 3 years.

The other kind is called a 'dry cell'. This is the kind we use in our radio or torch, or in many kinds of toys. Mostly, it cannot have new energy put back into it. When the chemicals are used up it is no good and must be thrown away. Some dry cells, however, can be re-charged. They cost a lot of money but they last a long time.

Electricity in Nature

In some oceans there is an animal called an electric eel. It makes its own electricity. It catches fish by giving them electric shocks.

Lighting is also a form of electricity. A flash of lightning is like a giant spark in the sky. It can be very dangerous. It can kill a person who is outside in a storm, or it can hit a tree and start a fire. It used to hit houses and burn them down. Today all houses have lightning conductors. This is a metal wire which goes from the top of the house to the ground. If lightning strikes the house, the electricity passes down this into the ground. It does not hurt the house or the people inside.

SOME OTHER FORMS OF ELECTRICITY

1. (M) What is a battery?

2. (M) What is a 'wet' battery used for?

3. (D) How long does a 'wet' battery usually last?

4. (M) What are 'dry cell' batteries used for?

5. (M) What kind of animal catches its dinner by giving it an electric shock?

6. (M) What is a flash of lightning?

7. (D) Name one way in which lightning can be dangerous?

8. (D) How does a lightning conductor protect a house from a lightning strike?

ELECTRIC POWER

How does electricity reach our homes?

An electric current can move or flow. After it leaves the power station it flows along thick wires. The wires are held up by tall steel towers called pylons. These wires have a very high voltage. This means they have a great deal of power in them. The wires go to sub-stations in each area. Here the electricity is broken down so that it does not have too much power.

It then moves along the power lines in each street. In some new housing areas the wires are under the ground. Many people feel that this is safer and looks nicer. This way they cannot fall down and hurt or kill people who might touch them.

This system of wires which takes power to all the houses is called the GRID SYSTEM, as the lines form a grid or pattern across the country. If a house is not joined to the grid it cannot use electricity from the big power station.

However the grid cannot reach every home and farm in such a large place as Australia. It would be too costly to take the wires to some places, as there are too few people living there.

In these place people make their own electricty. They have their own small generators which make just enough power for their own needs. The most common energy source for these small generators is diesel. In the future they may be able to use plant or animal wastes, or maybe even use the energy of the sun.

ELECTRIC POWER

1. (D) What do we mean when we say that the wires that leave the power station have a very high voltage?

2. (D) What happens to the electricity at the sub-stations?

3. (M) Why are power lines often put underground nowadays?

4. (M) What is the 'grid system'?

5. (M) Why are some homes and farms in the country not joined to the grid system?

6. (M) How do farms that are not on the grid system get their electricity?

7. (D) What is the main source of energy for small home generators?

8. (D) Name one possible future source of energy for small generators.

ENERGY IN THE FUTURE

As we have seen, the **fossil fuels, oil, coal and natural gas** give us much of the energy for our modern world. They supply energy for cooking, heating and transport. They are also used to heat the steam to make electricity.

As the supply of fossil fuels in the world gets lower, people are trying to make use of other forms of energy.

Nuclear Energy

Nuclear energy is used to make electricity in some parts of the world. It is quite cheap, but it is not always safe. A leak from a nuclear power plant can cause sickness or death for those living nearby. It can also damage the soil and the food crops. Also, great care must be taken to store nuclear wastes safely. They are often buried in concrete tanks deep in the earth or under the ocean. Even then they may leak and damage the earth for 1000's of years to come.

Solar Energy

Solar energy is energy direct from the sun. Many homes today use solar energy to heat their water. A solar cooker has also been made. Solar energy can also be used to make small amounts of electricity. But solar energy can only be used when the sun is shining. Also, at this stage it is very costly.

Many people feel that much more money should be spent in finding ways to make cheap solar energy. Then we can have a safe and clean source of energy to take the place of fossil fuels.

ENERGY IN THE FUTURE

1. (D) What are the three main forms of fossil fuels?

2. (D) Name 2 uses of fossil fuels in our modern world.

3. (M) Why are people trying to make use of other forms of energy?

4. (M) What can happen if there is a leak from a nuclear power plant?

5. (D) How are the wastes from nuclear power plants usually stored?

6. (M) Where does solar energy come from?

7. (D) What is one problem with using solar energy?

8. (M) Why do many people think that more money should be spent in finding ways to make cheap solar energy?

Social Studies Instructional Materials

Classroom 3 - Year 6

THE MERINO

People used to say that Australia rode on the sheep's back. What they meant was that Australia got most of its wealth from the sale of wool. Wool was the first product to be exported from Australia. It was the most important export for more than 100 years. Australia is still one of the world's largest producers of wool.

Sheep first came to Australia in 1788 on the ships of the First Fleet. They were the Bengal breed of sheep. They had long fat tails, and their wool was more like hair. The first settlers wanted meat, not wool.

The sheep which made Australia famous for its fine wool, the merino, came here almost by accident.

Merinos were very hard to get at that time. Most of them were in Spain where they had been bred for 2000 years. Because they had such fine wool the King of Spain did not want to sell them. He had given some to his cousin in Germany, and some to the King of France, but he would not give any to the King of England. Fortunately, he did give some to the Governor in South Africa, who bred a small flock from them. When he died, his widow decided to sell the flock.

By good luck, two Australian ships called at Cape Town in South Africa in 1797 to buy cattle and other goods to take back to Sydney. The Governor's widow wanted to sell them some of her sheep. Her offer was nearly turned down as the man in charge of the ships did not have any orders to buy sheep. However, the two ships's captains, Captain Kent and Captain Waterhouse, each bought 13 merinos for themselves. Some of the sheep died on the voyage, but the rest arrived safely in Sydney.

John Macarthur, who owned a large flock of Bengal sheep, bought four merino ewes and two rams from the captains. He began to breed from the sheep. He wanted to produce fine wool for sale to other places. He was successful and in 1807 the first Australian wool was sold to England.

THE MERINO

1. (M) What was meant by the saying that "Australia rode on the sheep's back?

2. (D) When did the first sheep arrive in Australia?

3. (D) What were the first sheep used for?

4. (D) How were these sheep different to the sheep we know today?

5. (M) Why did the King of Spain not want to sell his merino sheep to other countries?

6. (D) From which country did Captain Kent and Captain Waterhouse buy merino sheep to bring to Australia?

7. (M) What did John Macarthur want to use the merino sheep for?

8. (D) When was the first merino wool exported to England?

9. (M) What do you think the writer meant when he said that the first sheep came to Australia almost by accident?

10. (M) In what way had the merino sheep made Australia famous?

SHEARING

Ways of shearing the wool off sheep have changed a great deal from the early days.

At that time it was usual to wash the sheep before shearing. This was to remove the grease and dirt. At first this was done by making the sheep swim across a creek. Men stood in the creek and dunked the sheep as they went past. Later the farmers built special heated washpools. The sheep were washed in warm water by men who stood in the pool in empty barrels. After being soaked, the sheep were put into an almost airtight shed to sweat for half an hour. They were then washed again to remove the grease. After three days they were dry enough to shear.

The early shearers used a pair of blades to clip the wool from the sheep. The blades made a knocking sound when they came together at the end of each cut. This was called 'the click of the shears'. Shearing with blades took a lot of skill and it was very tiring. A good shearer might shear 70 or 80 sheep a day. Some could do more than that.

Today the shearers use electric clippers. They are easier to use then blades. Also, they can cut closer to the sheep's skin and so remove more wool. Shearing still takes a lot of skill and it is still very tiring. A good shearer can shear between 100 and 130 sheep a day. Some men have been known to shear 400 sheep in one day.

Shearers will not shear sheep that are wet, and never have. They say that wet sheep are a hazard to their health. These days the sheep farmer yards his sheep under cover on the day before shearing is to begin, so they will not get wet.

Today wool is not washed before shearing. It is sold as greasy wool. It is washed later before it is made into yarn or cloth.

SHEARING

1. (M) In the early days why were sheep washed before they were shorn?

2. (D) How did the men wash the sheep?

3. (M) When is the wool washed today?

4. (M) What did the early shears use to clip the wool with?

5. (D) What was 'the click of the shears'?

6. (D) About how many sheep did the early shearers shear in one day?

7. (M) What is used for shearing sheep today?

8. (D) About how many sheep are usually shorn in one day today?

9. (M) Why will shearers not shear wet sheep?

10. (D) How does the farmer stop his sheep from getting wet before they are shorn?

THE RABBITS

Did you know that rabbits once nearly wiped out the Australian wool industry?

Rabbits were first brought here in 1859. A few were let loose on a farm in Victoria. At first this seemed like a good idea. Rabbits had good fur. And in the bush they could be used for food. Some people called them 'underground mutton'.

The problem was that the rabbits did very well in Australia. Their numbers grew by the million. Within 40 years they had spread to all parts of Australia. Soon they were right out of control.

The results were very bad. Rabbits ate the grass lands much faster than the sheep did. Even in a good year, the land could not carry many sheep, as the rabbits ate most of the grass. During a dry spell the rabbits would take what ever feed there was.

The farmers tried their best to kill as many rabbits as they could. One farmer in NSW killed more than 370,000 in one year. Yet there seemed to be just as many as before. Another farmer wrote at the time, "It is a case of the rabbits or us. We must beat them or the place will be ruined".

But it was very costly to beat the rabbits, or even to keep down their numbers. The men had to first kill the ones on their own farms. Then they had to build rabbit proof fences to stop any more rabbits from moving in.

Rabbits were still a problem until well into this century. Then the CSIRO was able to develop a virus which kills them. This caused a big drop in the number of rabbits. So today they are not such a pest to the sheep farmer.

THE RABBITS

1. (M) When were rabbits first brought to Australia?

2. (D) In which state of Australia were they first let loose?

3. (M) What was one reason why people thought at first that it was a good idea to let rabbits run wild?

4. (D) How long did it take for them to spread to all parts of Australia?

5. (M) Why were rabbits such a problem to sheep farmers?

6. (D) How many sheep did one NSW farmer kill in one year?

7. (D) Why did the farmers need to build rabbit proof fences?

8. (M) How did the CSIRO help sheep farmers?

WALTZING MATILDA

Many years ago, men who worked in the Outback had to walk from one job to the next. A man may have been shearing sheep for a number of weeks. At last the work would finish. Then he would walk to the next place and shear sheep there.

He would camp each night on the way. He would carry a billy can to cook in, and a blanket to sleep under. He would carry some food in a cloth bag, called a tucker bag.

The blanket was rolled up and he would carry it on his back. The rolled up blanket was called a swag. A man who carried a swag was called a swag-man. And carrying a swag was called "Waltzing Matilda".

A billabong is a big pool of water in the bed of a creek. It would be a good place to camp. The swag-man could get water there. He could find wood for his fire under the trees by the water.

"Waltzing Matilda" is a song about a swag-man. He camped by a billabong. A jumbuck (a sheep) came down to drink. The swag-man grabbed the sheep and put some of the meat into his tucker bag.

The squatter (the farmer) who owned the sheep rode up. Three policemen rode up with him. The swag-man jumped into the billabong to get away from them.

WALTZING MATILDA

1. (M) Many years ago, how did men travel from shearing job to the next?

2. (D) What did the swag-man take with him to cook his food in?

3. (D) What did the swag-man carry his food in?

4. (M) What was a swag?

5. (M) If a man was "Waltzing Matilda", what was he doing?

6. (M) What is a billabong?

7. (D) What is a jumbuck?

8. (D) Why did the swag-man jump into the billabong?

NEW KINDS OF TRANSPORT

Some exciting new ways have been developed to make travel by sea and by train much faster. These new boats and trains skim over the top of the water or the train tracks. In this way they are not held back by the drag of the water or the tracks.

The first boat is called the **hydrofoil**. It has foils under the hull. They are like small plane wings and work in the same way. They tend to lift the boat, just as a plane's wings help to lift it as it flies through the air. As the hydrofoil gets up speed, the foils lift the boat out of the water. Only the foils are still in the water. This means the boat can travel very fast, but make little wash.

The second one is called a **hovercraft**. This boat floats on a cushion of air. Large pumps suck in air and pump it down to the hull. There it is kept in by a plastic or rubber 'skirt'. The air cannot escape and it makes a cushion. The hovercraft skims along on this cushion of air. It is moved along by propellers, just like a plane. It can move just as well on land or on water. On land it is very useful for going over places where there are no roads, such as swamps or desert. A ramp is all that is needed for it to go onto the land.

A **hovertrain** is much like a hovercraft. A huge fan forces jets of air between the train and the track, lifting the body of the train just above the track. It glides along on this cushion of air.

The newest kind of very fast train is the **maglev train**. Powerful magnets help to lift the train off the track and propel it along at speeds of up to 800 km per hour.

There are plans to use a very fast train track to link Sydney and Melbourne. It will cut the travel time to just 3 hours.

NEW KINDS OF TRANSPORT

1. (M) Why can a boat travel faster if it skims over the top of the water?

2. (D) What do the foils do to the hydrofoil so that it can travel very fast?

3. (M) What does a hovercraft skim over the water on?

4. (D) Which kind of boat can travel on both water and land?

5. (M) How is a hovertrain like a hovercraft?

6. (M) What holds a maglev train off the tracks and moves it along?

7. (D) How fast can a maglev train go?

8. (D) If the very fast train service is built between Sydney and Melbourne, what will be the travelling time?

EDISON THE INVENTOR

A man named Edison invented many of the things we use today. He lived over 100 years ago. He wanted to find out how things worked. He even sat on eggs to try to hatch them. Once, when he was a boy, one of his experiments went wrong and he blew up his workshop.

When he grew up, Edison invented about 3,000 things. Here are some facts about a few of them.

Edison invented a machine to record sounds. He called it a phonograph. It was the first record player. Some people thought it was a trick. They called Edison a wizard.

Edison made the first electric light bulbs. He wanted everyone to see his new light bulbs, so he lit up his own factory and garden. Many 1000's of people came to see the new lights.

He made an electric power station. It made electricty for many homes. Then he made an electric train. It went round his garden.

He invented a motor that could be fitted to a sewing machine. Before then sewing machines had to be worked by hand. His motor made sewing much easier and faster.

He made the first movie camera, and the first movie projector. He made many films in his own film studio.

Edison did not invent the first telephone. A man called Bell did that. But Edison invented a machine that could make phones work better. It made the sound of voices much more clear. It was called a telephone transmitter.

EDISON THE INVENTOR

1. (D) How long ago did Edison live?

2. (M) About how many things did Edison invent?

3. (M) Which invention of Edison's did some people think was a trick?

4. (D) How did Edison get people to see what his new light bulbs looked like?

5. (M) Which invention of Edison's provided electricty for people's homes?

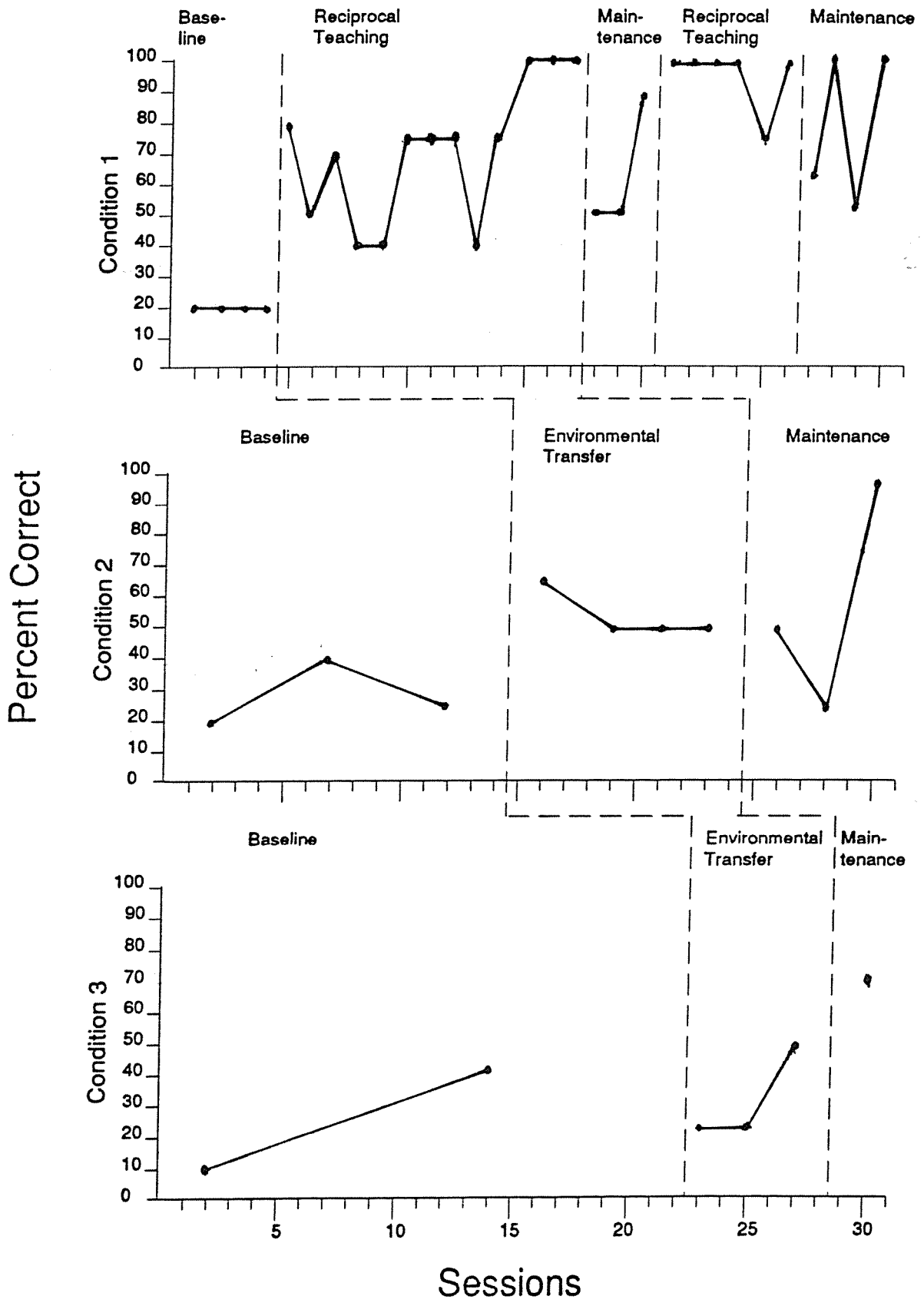
6. (M) What invention helped to make sewing faster and easier?

7. (D) Who invented the first telephone?

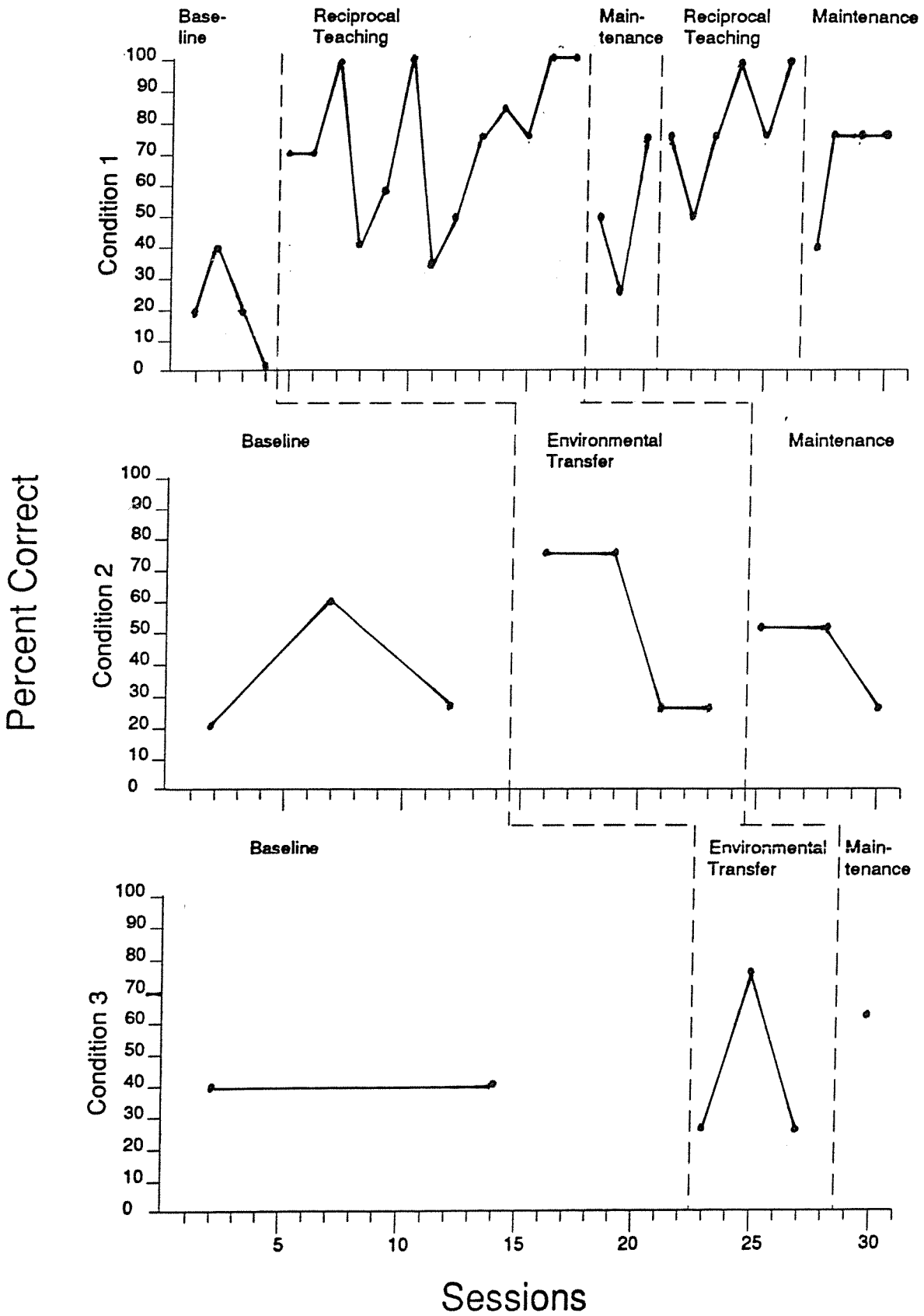
8. (D) In what way did Edison make the phone work better?

Appendix 4.1

Graphs for the Individual Students



Main idea scores across phases in the 3 conditioins for Student 1



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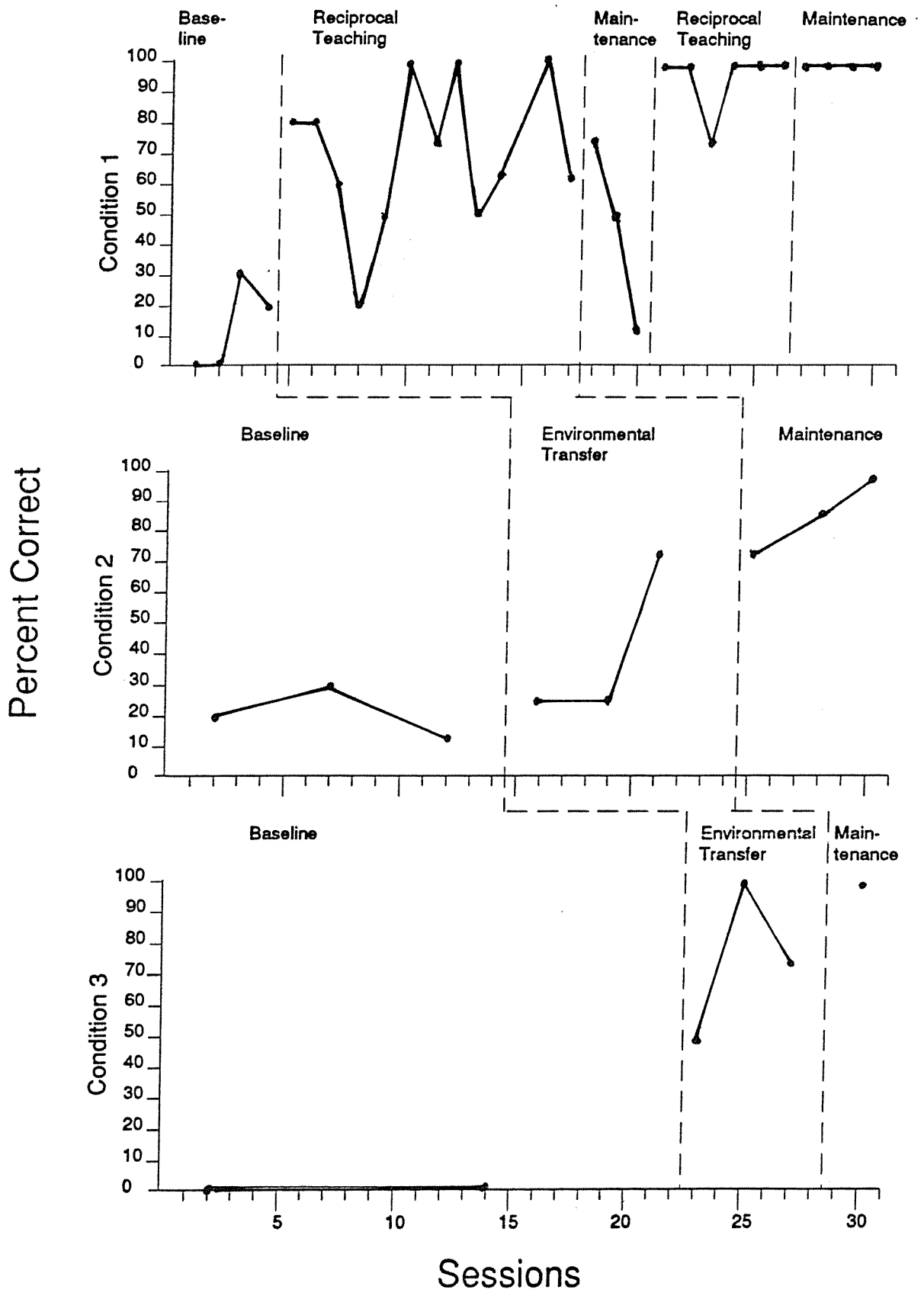

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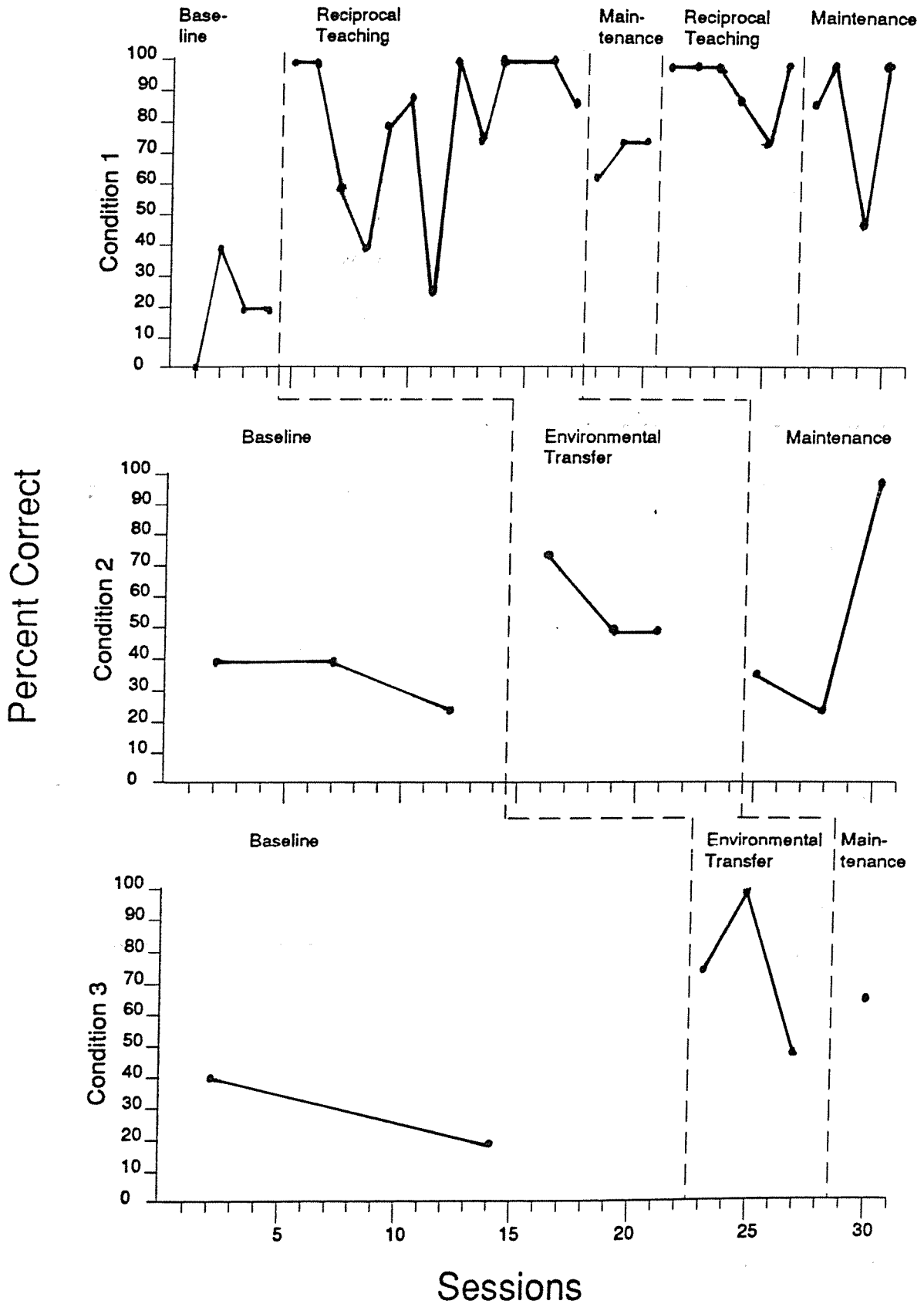

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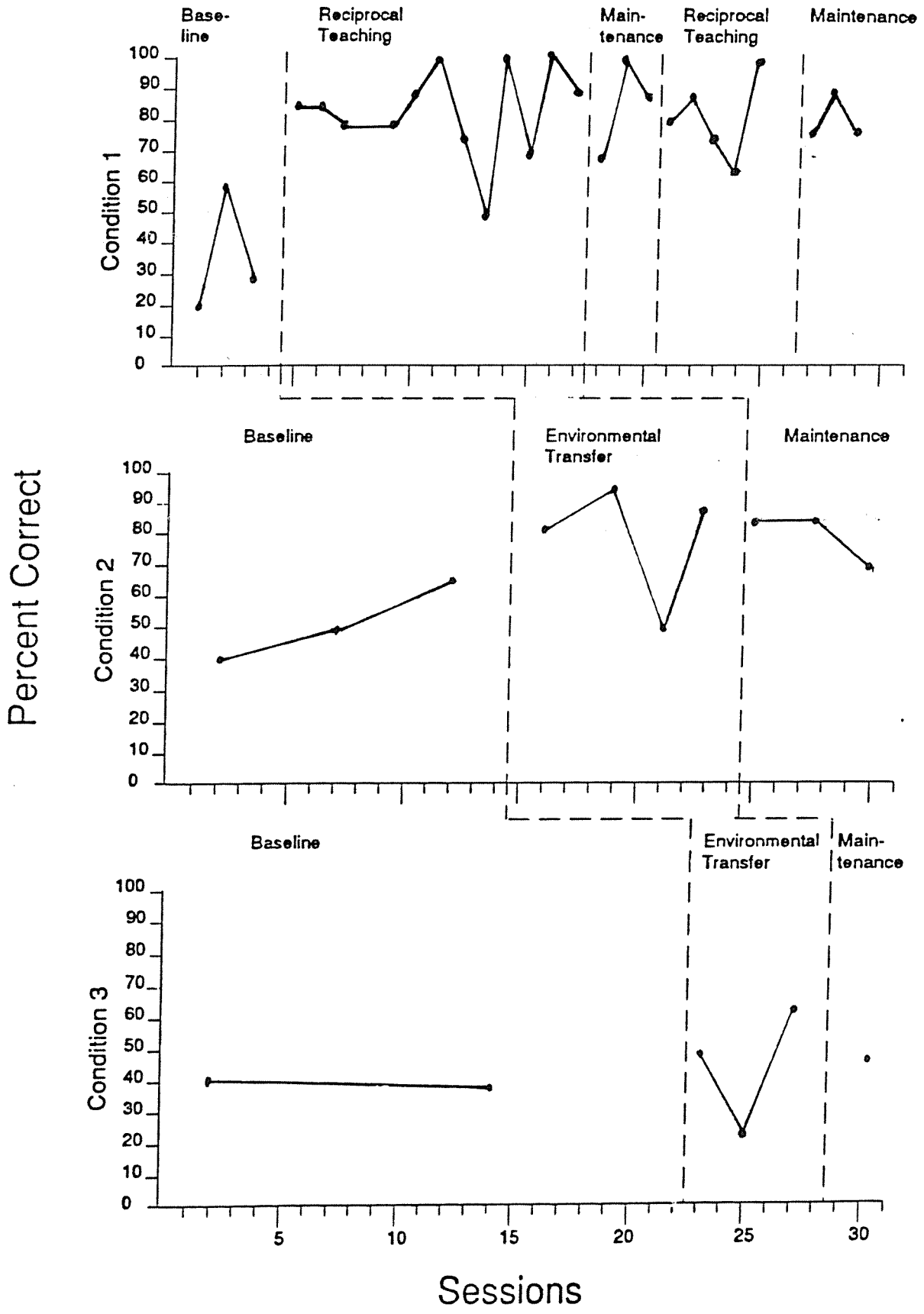

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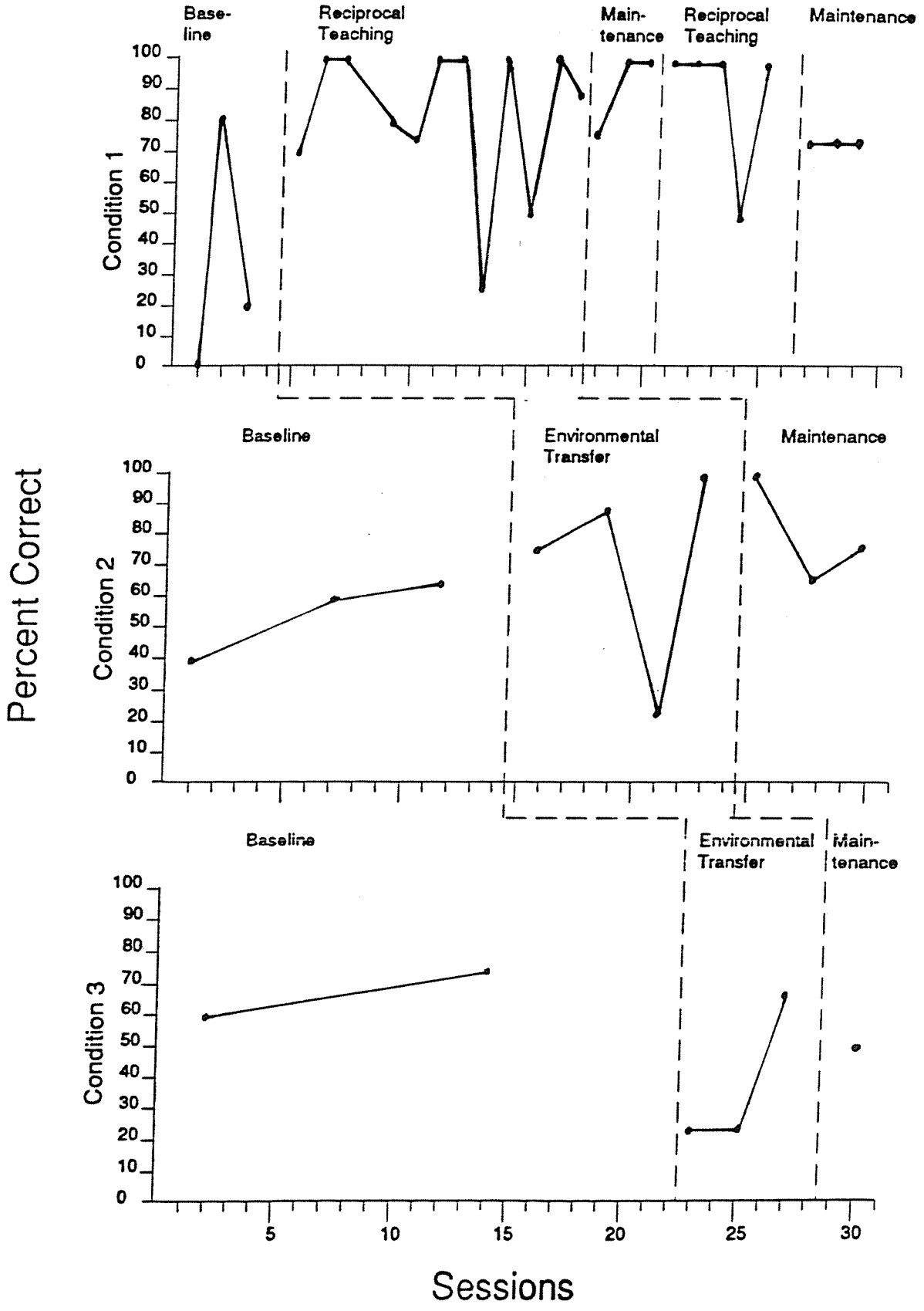

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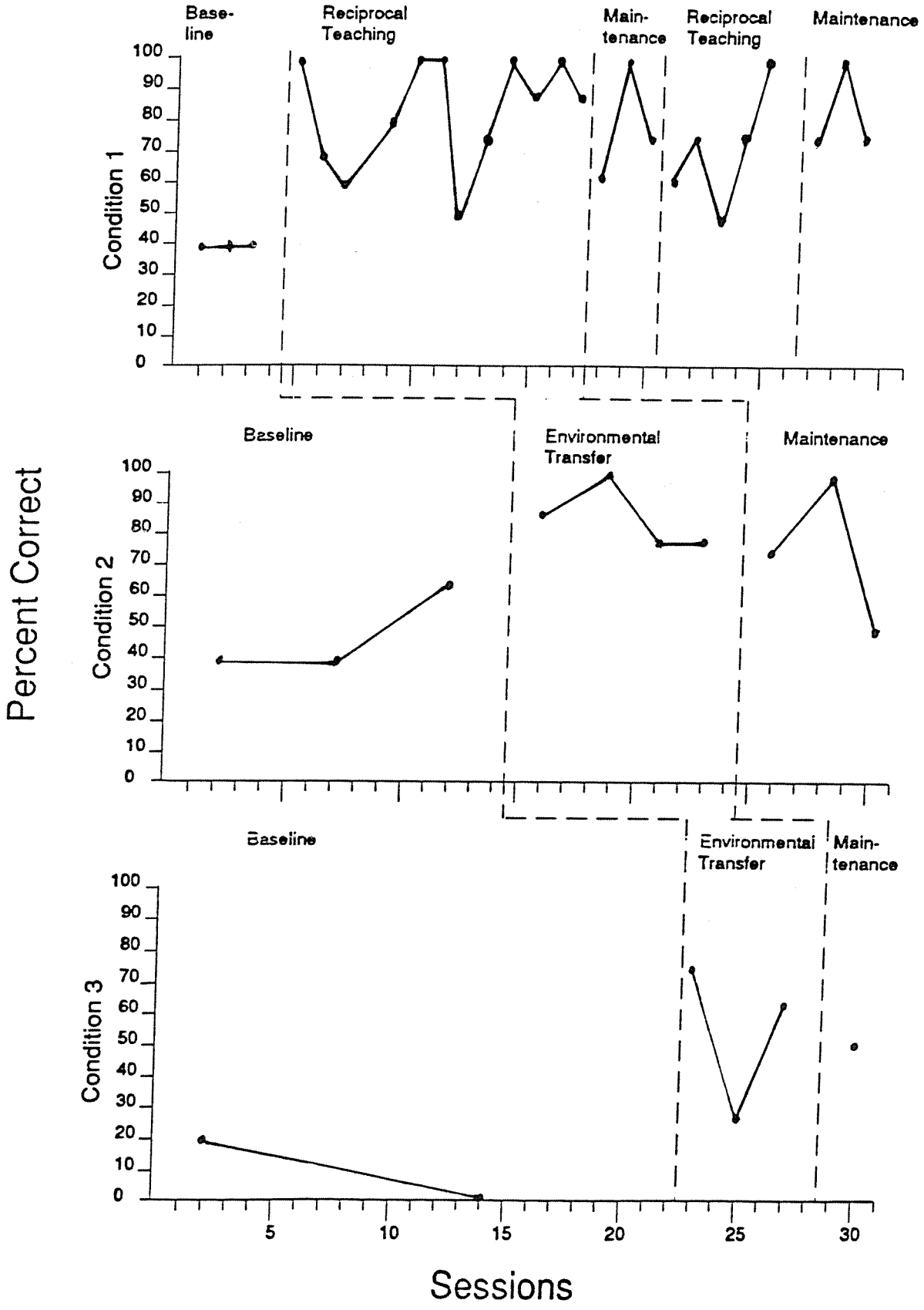

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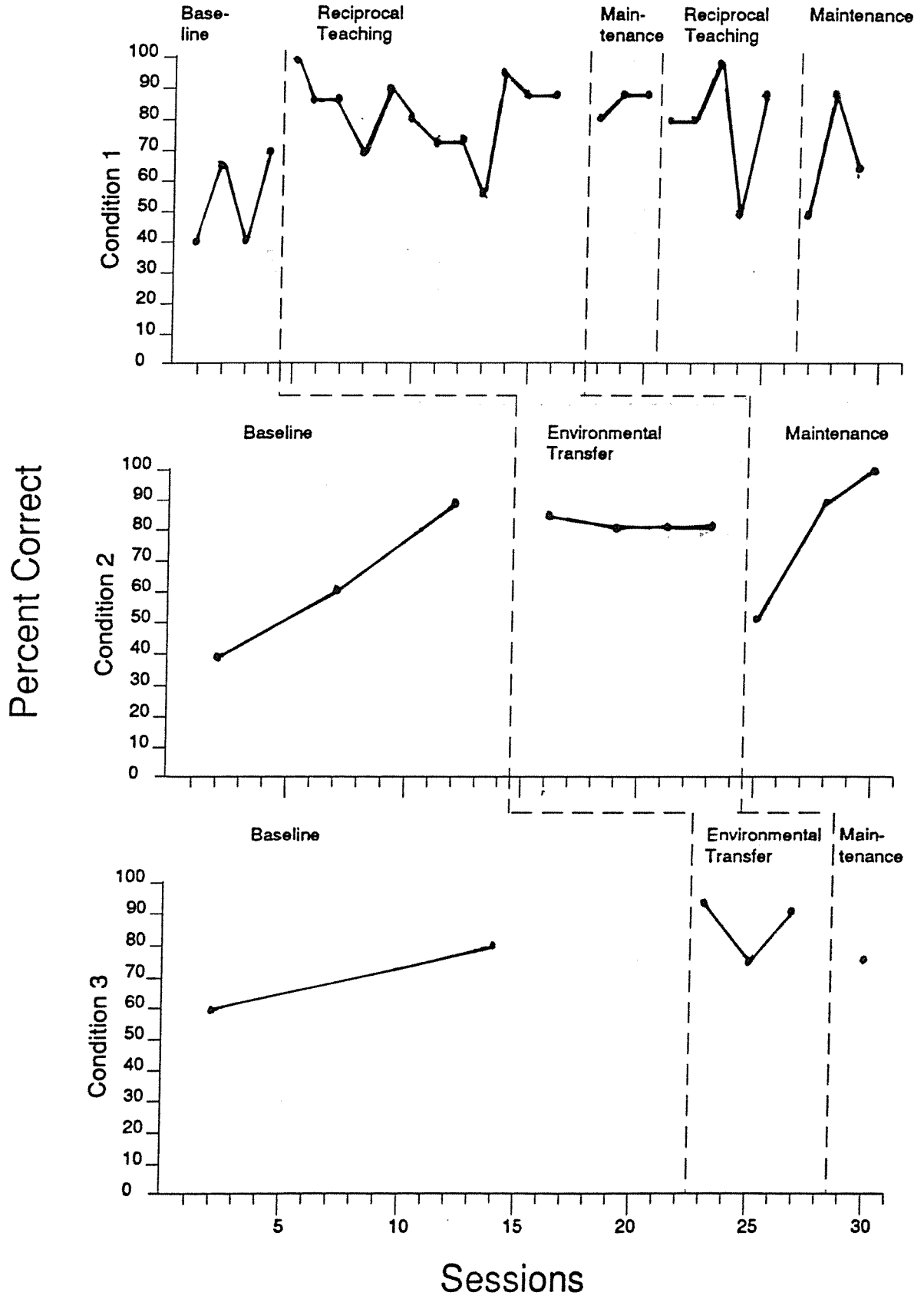

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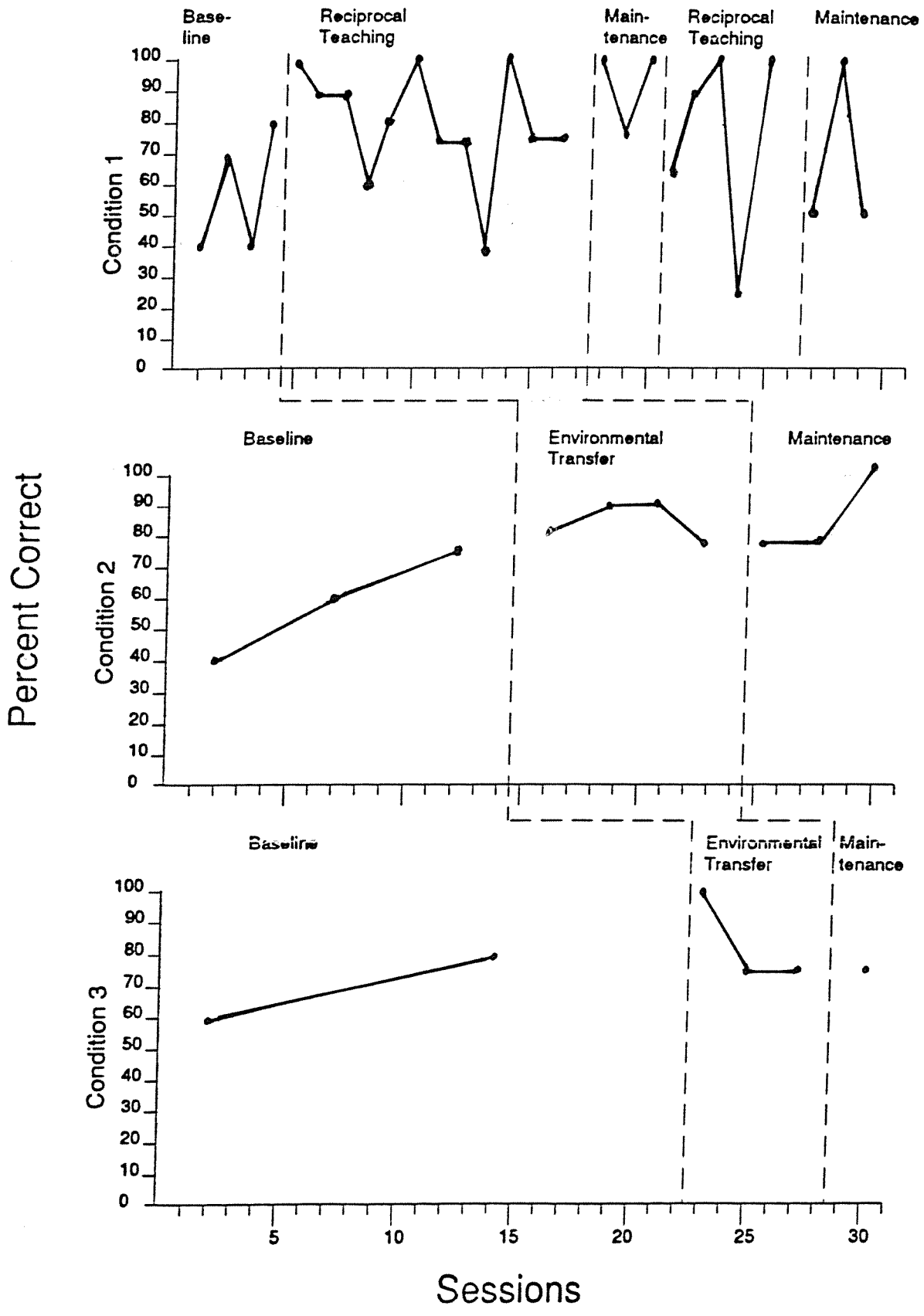

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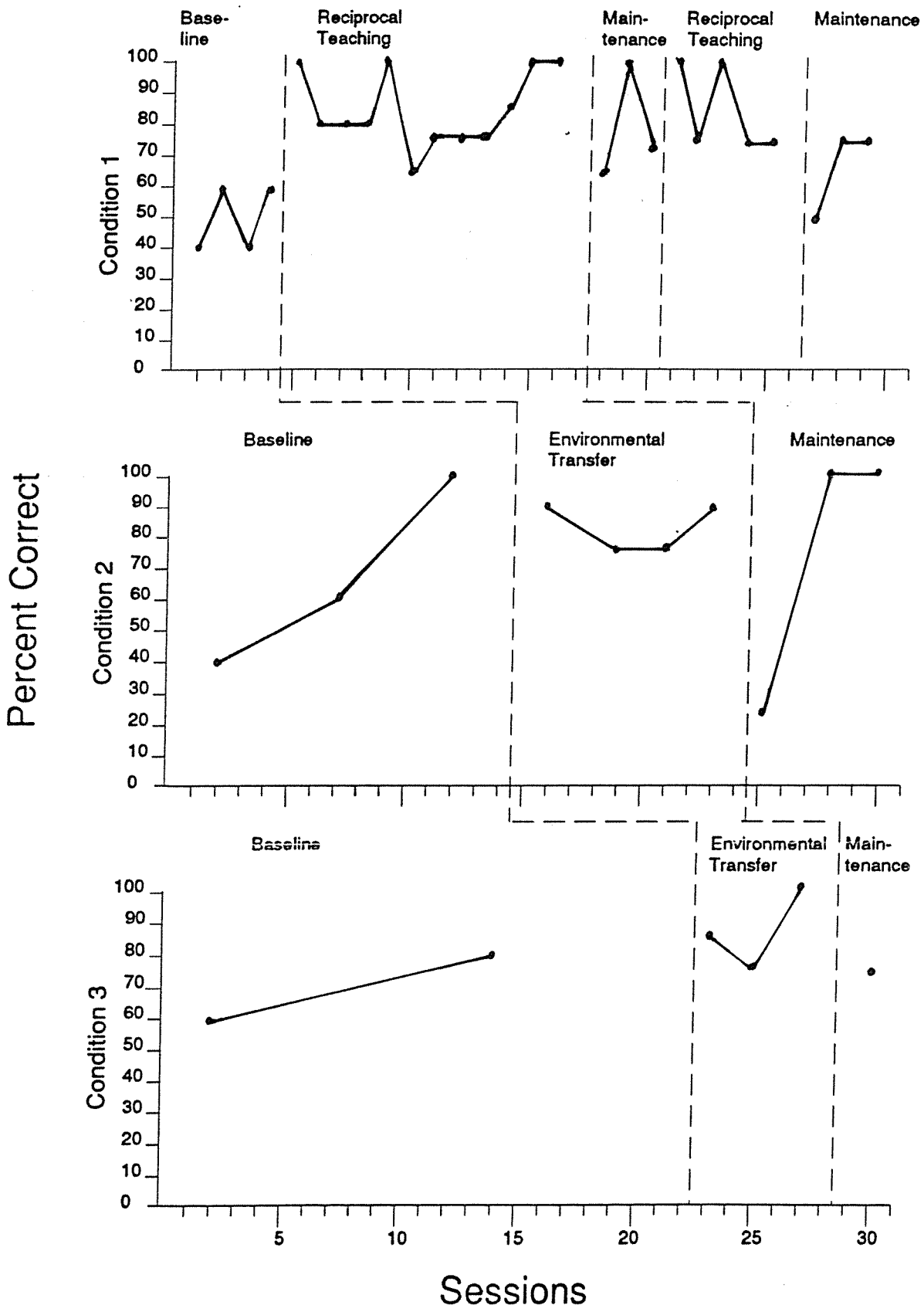

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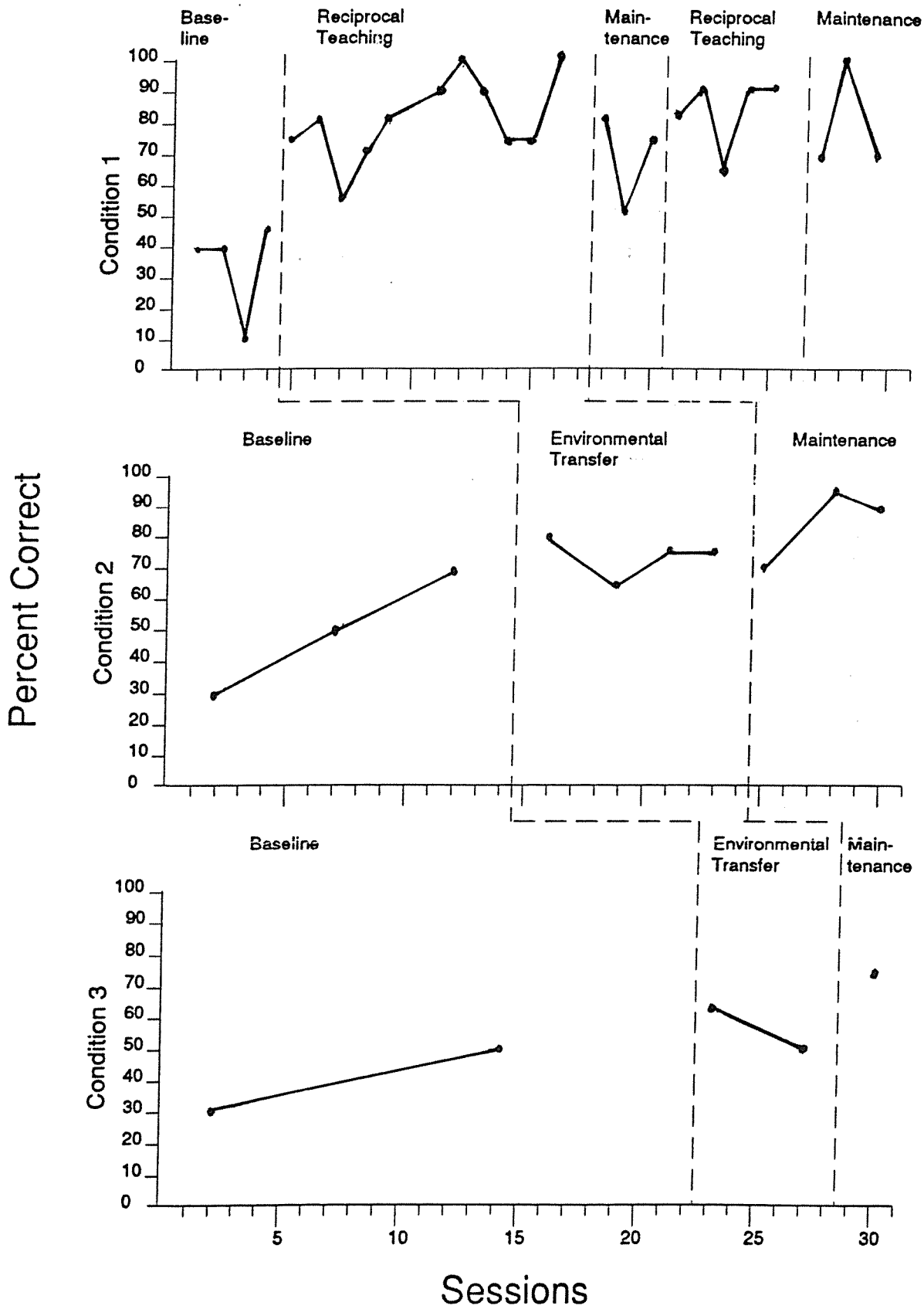

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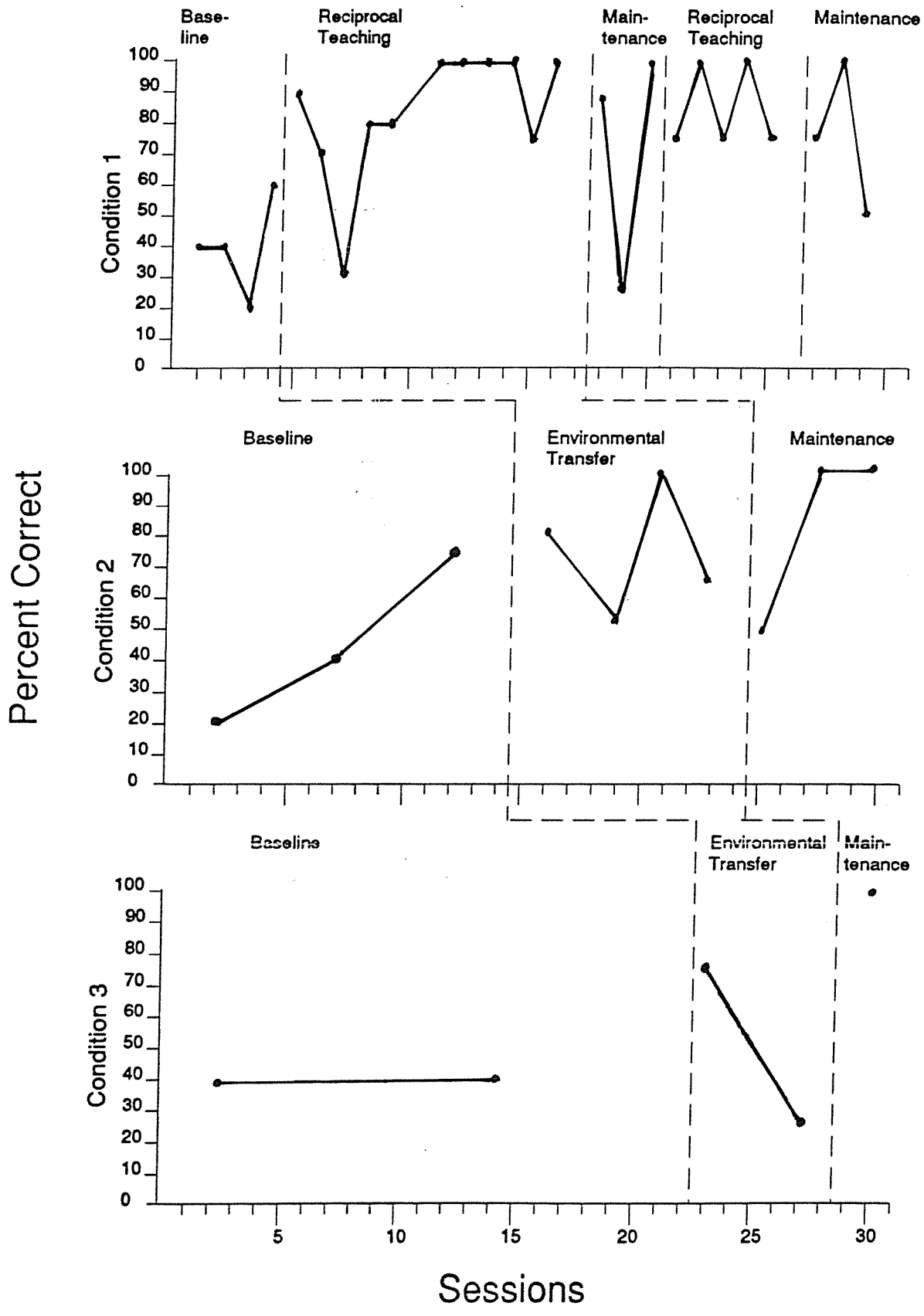

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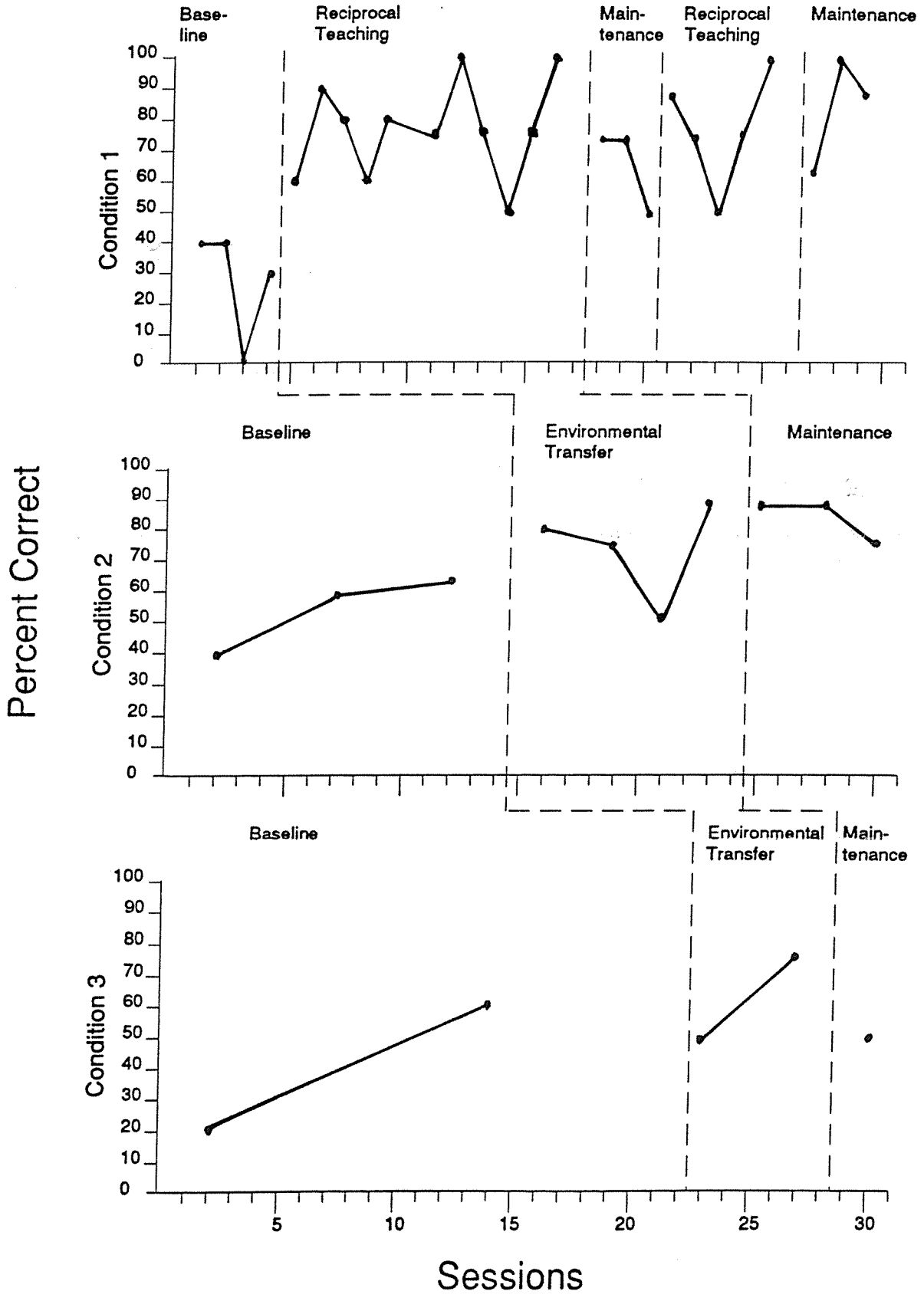

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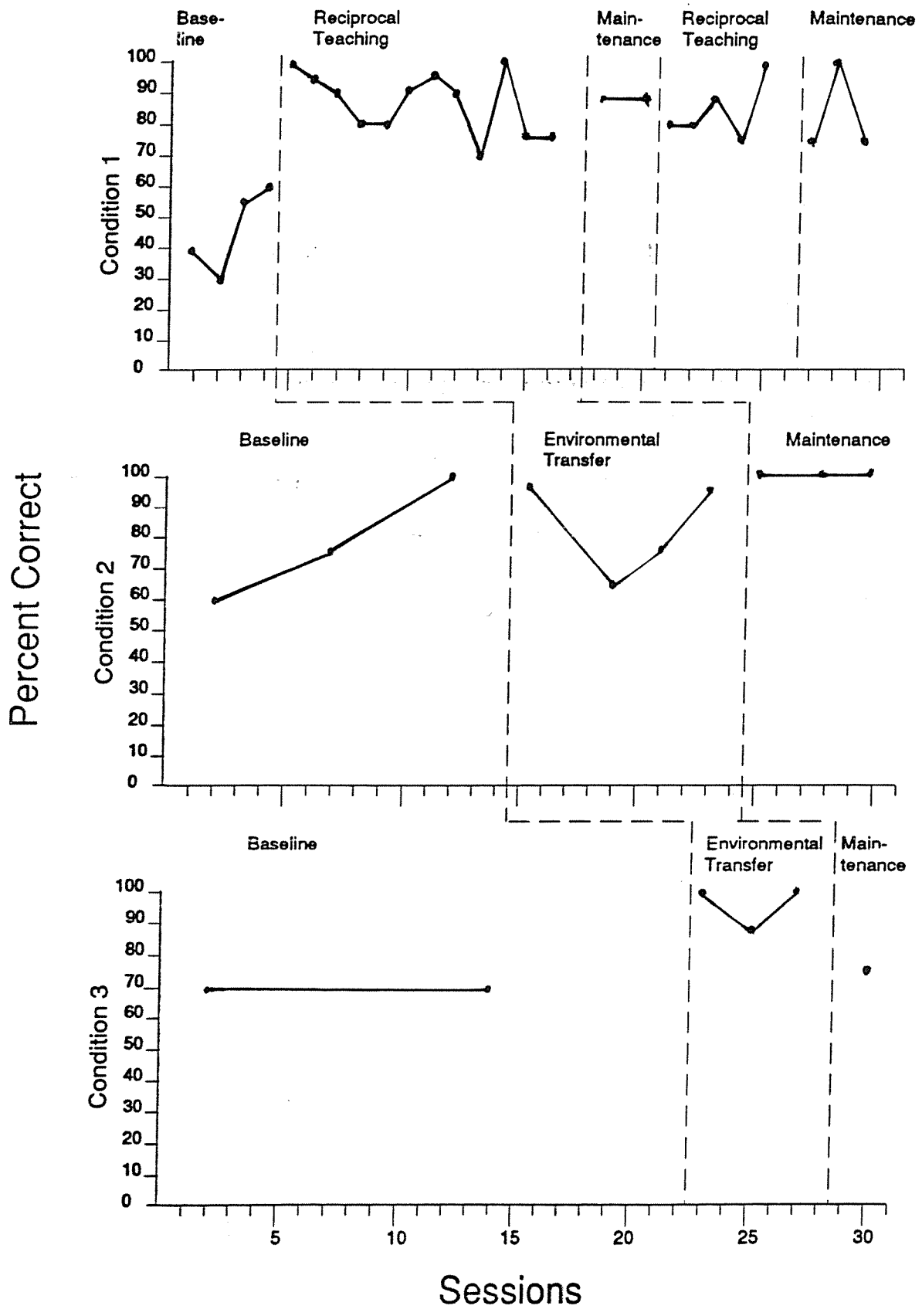

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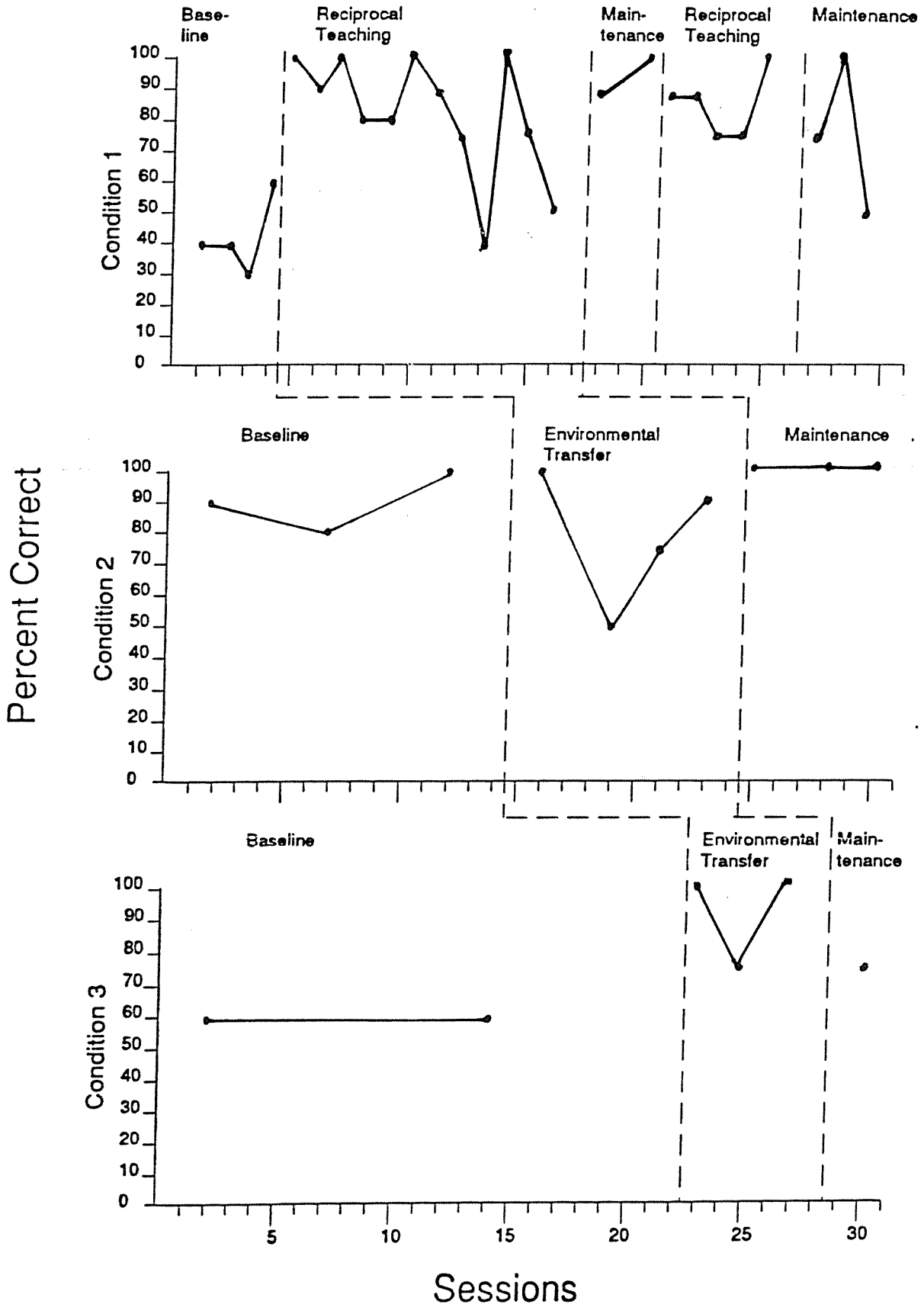

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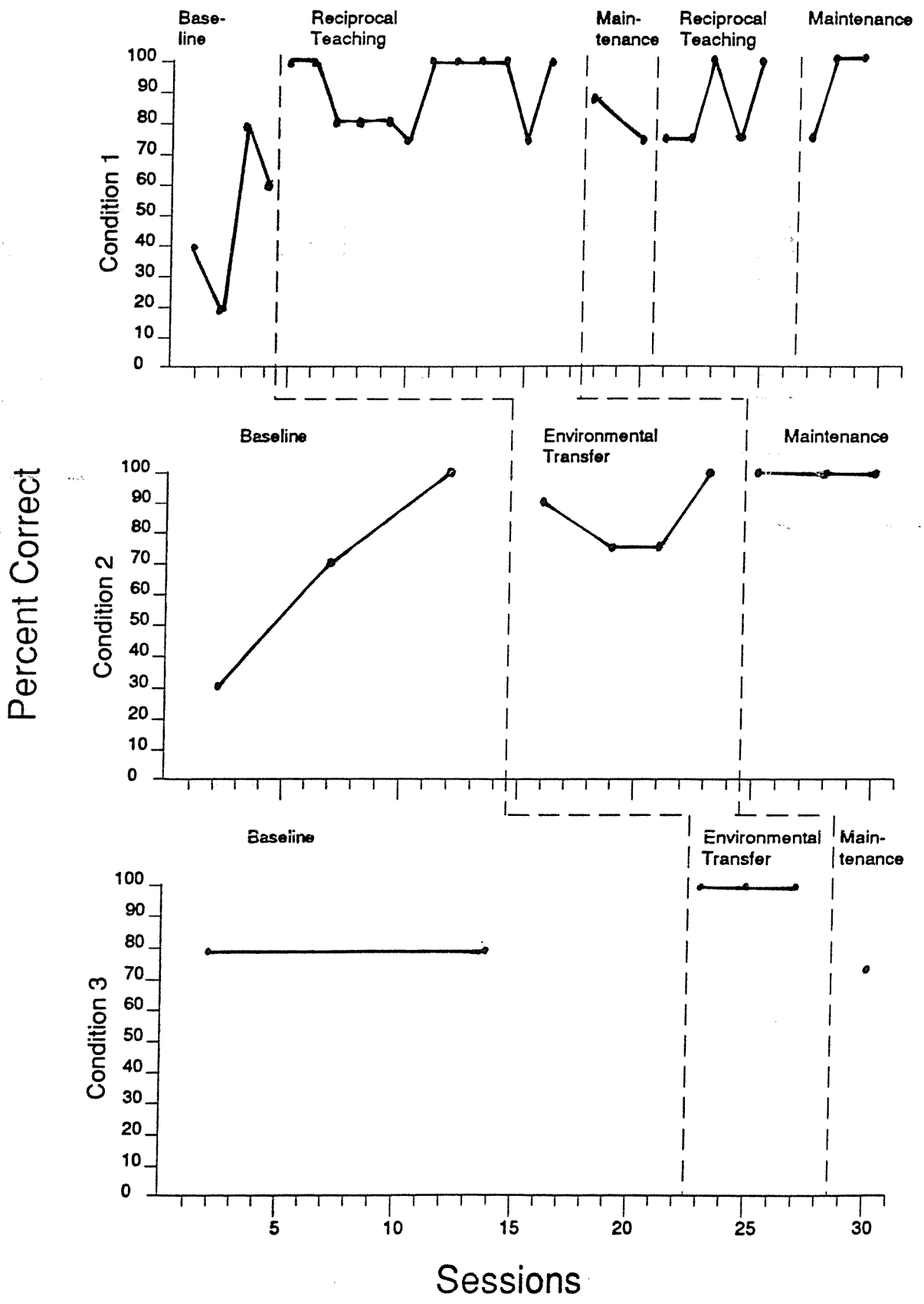

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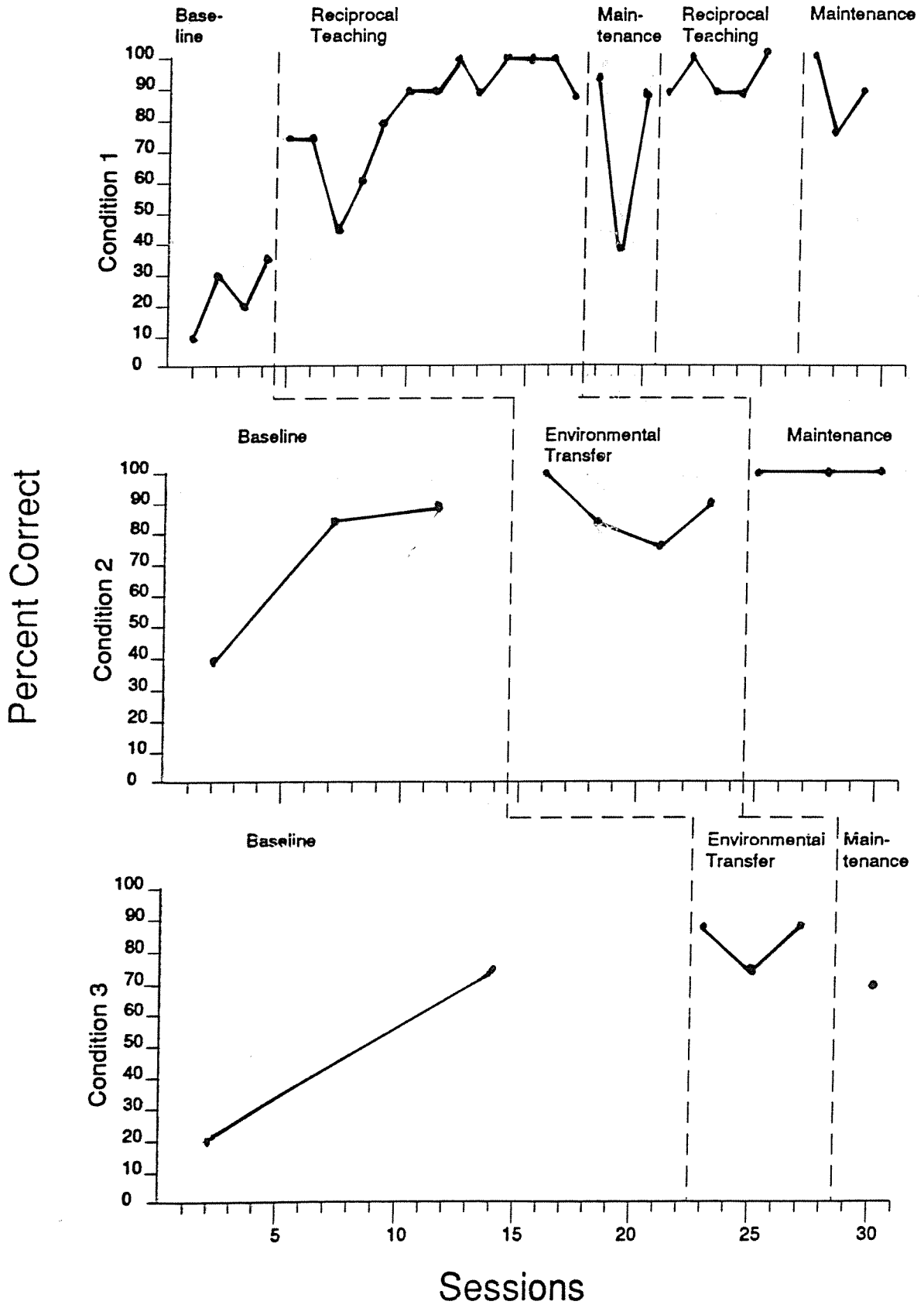

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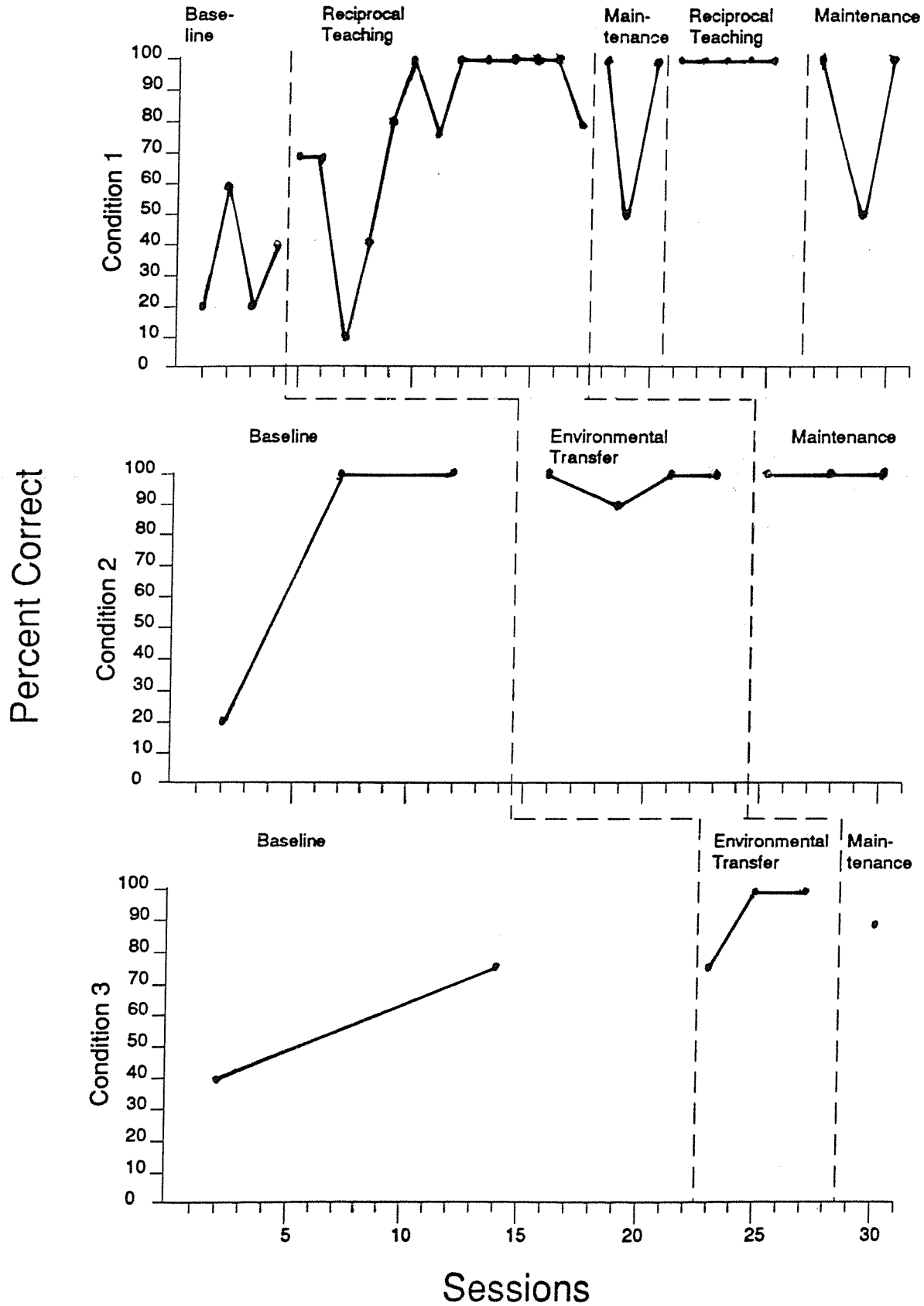
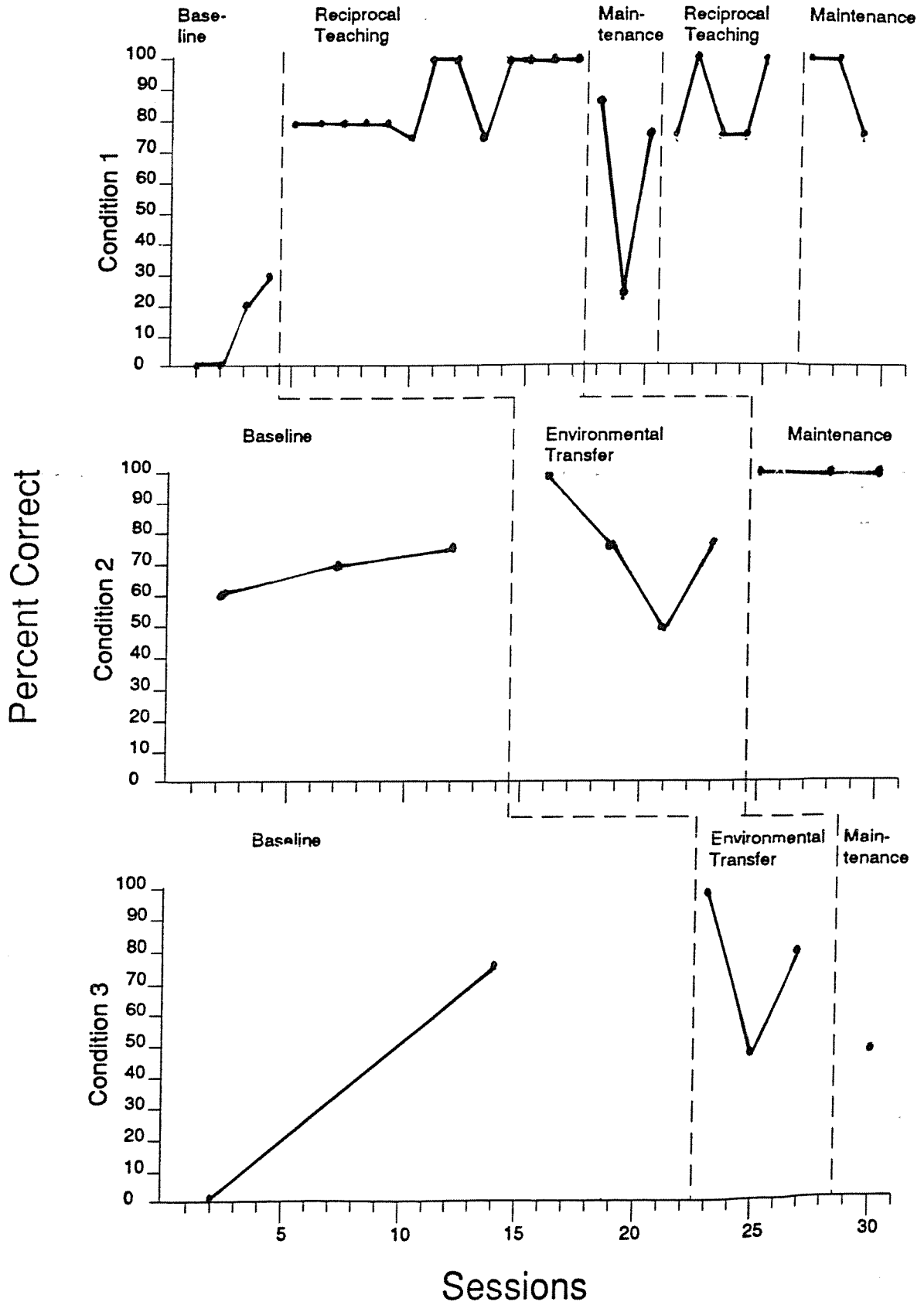


Main idea scores across phases in the 3 conditions for Student 7

AVONDALE COLLEGE LIBRARY



Detail scores across phases in the 3 conditions for Student 7