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The Effects of Graphic Organizer Strategy Training and Typographical Cueing on Children's Processing of Instructional Text

Loretta Noella Di Vita

A Thesis

in

The Department

of

Education

Presented in Partial Fulfillment of the Requirements
for the Degree of Master of Arts at
Concordia University
Montréal, Québec, Canada

September 1985

Abstract

The Effects of Graphic Organizer Strategy Training and Typographical Cueing on Children's Processing of Instructional Text

Loretta Noella Di Vita

Fourth and fifth grade students (N=91) participated in a six-week training study. The experiment was designed to test the effectiveness of graphic organizer strategy training in combination with typographical cueing for facilitating recognition and recall of content-area instructional text. During the training phase, experimental subjects received instruction and practice in the use of graphic organizers. The control subjects were not exposed to the strategy. Subjects, during the target testing phase, read a passage with typographical cueing or one without cueing. A partially elaborated interactive-type graphic organizer accompanied both versions of the passage. Subjects in the "with strategy training" condition achieved significantly higher scores on an immediate free-recall measure, than those without training. Subjects in the "without-cueing" condition performed significantly better than those in the "with-cueing" condition on an immediate free-recall test. The results of this experiment reinforce the contention that young, inexperienced readers may depend upon instructional intervention, in the form of learning strategy training, for improved processing of instructional content.

DEDICATION

This thesis is dedicated to my parents and my brother, who will always be my inspiration. Thank you for your never-ceasing love and encouragement.

ACKNOWLEDGEMENTS

Thanks to my friends, Cheryl, Paul and Clara, with whom I've shared Bob's grant, hard work and most of all, good company.

I am especially grateful to my advisor, Dr. Robert Bernard, for his assistance and professionalism throughout the completion of this thesis.

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Chapter 1

Introduction

As technology continues to flourish in all sectors of society, its impact is clearly felt in the educational domain. Schools have become inundated with a variety of educational media. However, upon sifting through this mound of innovation, the expository textbook used in content-area instruction still remains the major form of instructional resource (Searls, 1980). Considering the textbook's die-hard tradition, research efforts directed at the improvement of text-design and textual processing seem well warranted. Research in these areas becomes particularly justified, if not crucial, given the rampant, inferior quality of standard texts (Gagne, 1978; Guthrie, 1978) and the less than optimal processing skills that readers rely upon when tackling such material (Collins & Haviland, 1979).

Research concerned with the facilitation of learning from text has focused on both textual and instructional variables that maintain students' attention to the material being read (Anderson, 1970; Frase, 1970; Craik & Lockhart, 1972; Jenkins & Pany, 1981). What has emerged from this area of research is that better learning of text is determined not only by one variable, but by an interaction between the learner and the instructional material (Reder, 1980; Alvermann, 1981; Bovy, 1981).

Reading to Learn

The notion of the reader interacting with the text and actively searching for meaning can be traced to early Humanist concerns. Moore, Readance & Rickleman (1983), in a history of content-area reading instruction, quote a pioneer Humanist as saying, "to suffer children to read without understanding is one of the most flagrant cases of incompetent teaching" (Mann, 1894, reprinted in Caldwell & Courtis, 1925). Humanists and progressivists emphasized the need for students to reason and derive their own meaning from what they read (Resnick, 1977). However, educators soon realized that strategy intervention would be necessary, in order for students to advance beyond a passive, verbatim role in the reading act (Moore, Readance & Rickleman, 1983).

Learning Strategies

The rapport between those variables, inherent in the textual material, and brought to the text by the reader, can be activated or controlled through instructional strategies. Winn (1982) describes instructional strategies as efforts made to induce learners to apply the appropriate mental skills to particular learning tasks. These mental skills, whether self-generated, or prompted, function as learning strategies. Rigney (1978) has distinguished between "detached" and "embedded" strategies. Detached strategies are independent of the subject matter and usually generalizable over repeated or varying learning situations (e.g., instructions on note-taking). Embedded strategies

are incorporated directly into the instructional material (e.g., inserted questions). While detached strategies are flexible, embedded ones cannot be bypassed (Bovy, 1981).

Learning How to Learn

As learners expand their repetoires of learning skills, they develop self-regulating learning processes (Gagne & Briggs, 1974) or "learning how to learn behaviors" (Canelos, Taylor & Altschuld, 1982). These behaviors function as resources that the learners employ in order to cope with the task demands of a given learning situation.

Canelos, Taylor and Altschuld caution that some students may not develop appropriate learning strategies autonomously; consequently, they may be left at a disadvantage. This concern is shared by Weinstein (1978) when she states that "the assumption that the abilities involved in learning are either innate or naturally acquired by every child is probably fallacious" (p. 32). Bruning (1983) lends some optimism to the perceived stituation by asserting that cognitive or learning processes can be trained.

Elementary Students and the Textbook

Instruction on "learning to learn" from expository text appears to be particularly appropriate for students in the intermediate grades. It is at this stage that children first encounter textbooks in the classroom. Considering the textbook as the nucleus of instruction, and that academic

success may be closely associated with strong reading skills, it seems logical to try to instill such skills in learners before they develop their own potentially inferior ones (Adams, Carnine & Gertsen, 1982).

Smirnov (1973) claims that while most adults formulate a general plan of content organization while they read, children do not. It appears, then, that elementary-grade students may be most in need of instruction-imposed processing procedures.

Advance/Graphic Organizer Strategy

Advance organizer. Ausubel (1960, 1968) proposed the use of advance organizers in the learning and retention of meaningful materials. Advance organizers are defined as short, introductory passages stated at a higher level of abstraction, generality and inclusiveness than the learning material (1963). Ausubel (1978) describes the principal function of the organizer as being to bridge the gap between what the learner already knows and what he needs to know before he can successfully learn the task at hand" (p. 22).

Ausubel argues that only language can accomodate the general, abstract and inclusive concepts contained in an advance organizer. Mayer (1978, 1980) affirms that any graphic construct that represents the top-level structure (i.e., a general statement followed by specifics) of the content will stand as an advance organizer, in its own right. Mayer and Bromage (1980) reinforce this point by describing an advance organizer as a stimulus that serves to logically

integrate new information (p.211). Bernard, Petersen & Ally (1981) concluded that the form of the organizer is not necessarily an issue, provided that it offers a meaningful representation of the structure of the accompanying text.

Graphic organizer. Barron (1969) extended the basic advance organizer proposed by Ausubel (1960), to include graphic elements. Hence, the graphic organizer was developed. Indebted to both verbal and graphic features (i.e., lines and boxes), the graphic organizer can represent the hierarchical ordering of principles, concepts and details contained within the body of the subject matter. Like its predecessor, the advance organizer, it also can establish a link between the knowledge structure of the learner and the specifics of the content (Estes, Mills & Barron, 1969).

Content-area instruction. A critical dimension in the acquisition of content is the ability of the learner to apply comprehension strategies that will permit her to acquire meaning from what is read (Carney, 1978). The graphic organizer strategy has been recommended for content-area teaching by several sources (Barron, 1969; Carney, 1978; Lunstrom & Taylor, 1978; Thelan, 1982; Vaughan, 1982; Boothby & Alvermann, 1982, 1984). Content-area reading requires being able to handle vocabulary which represents abstract concepts involving relations. The verbal-pictorial nature of the graphic organizer renders a suitable vehicle for the teaching of relational concepts that are so pervasive in content-area texts (Gagne, 1970).

Singer and Bean (1983) suggest that the graphic organizer could be a valuable instrument in content-area instruction since it holds the potential to represent the non-linear nature of knowledge structures. The graphic organizer could function outside the parameters of linear, printed discourse.

Graphic Organizer Strategy Training

Despite the widespread advocacy of the graphic organizer, research findings have indicated contradictory results for the strategy (Barnes & Clawson, 1975; Moore & Readance, 1980). Luiten (1980) speculated that negative findings might have been attributable to inadequate training in how to use the strategy.

Relatively few researchers have extended their attempts at strategy instruction beyond the inclusion of a set of disposable instructions. Boothby and Alvermann (1984), however, did consider extended training as a variable in their study of the graphic organizer strategy.

Age focus. With the exception of Boothby and Alvermann (1984), it appears that research on strategy training, directed specifically at the use of the graphic organizer, has tended to ignore learners in the elementary grades.

The irony in this emerges with the realization that this training might be most effective with neophyte learners (Singer & Bean, 1980; Adams, Carnine & Gertsen, 1982; Boothby & Alvermann, 1984). It has been suggested that fourth and fifth graders' general difficulty in making the

transition from narrative to expository text, might benefit from graphic organizer instruction (Boothby & Alvermann, 1984).

Typographical Cueing

In the intermediate grades, when students receive their first exposure to content-area texts, it is of paramount importance that they are made aware of optimal processing strategies. However, the sometimes dismal state of the standard textbook (Frase & Schwartz, 1979) defeats the purpose of the provision of training in such strategies. Strategy training could be a waste of resources when textbooks fail to consistently organize material for ongoing learning or subsequent retrieval of information (Adams, Carnine & Gertsen, 1982, p. 49).

One approach to better organization of textual material is the employment of typographical cueing devices (i.e., headings, subheadings, indentation, and segmentation) (Guthrie, 1981).

The general consensus within textual research seems to be that typographical intervention results in positive learning and memorial consequences (Glynn, 1978; Frase & Schwartz, 1979; Winn, 1982; Bruning, 1983). Still, in light of the benefits of typographical cueing, some publishers and authors are reluctant to employ the strategy in educational texts. Fowler and Barker (1974) suggest that one factor contributing to their inertia, may be the responsibility to designate some material as more worthy of reading attention

than some other. This "exit from responsibility syndrome" may, in fact, be leaving the reader at a disadvantage. Glynn (1978) explains how individuals learn in a selective fashion, in which "propositions deemed most important are selected out and particular study behaviors are applied to them" (p. 7). Without the aid of perceptual rules, represented by typographical cueing, readers are forced to identify and classify important propositions of information within the limited parameters of their own processing systems (Frase, 1970). Typographical cueing could exert some control over the reader's selective attendance of those parts of a text that are crucial toward its comprehension (Ausubel, Novak & Hanesian, 1978).

Chapter 2

Review of the Literature

Prose Learning Research

In the last ten years, considerable research effort has been channelled into finding better ways to help students understand and retain information from textbooks. A line of research aimed at the acquisition of improved reading comprehension has focused on prose-learning strategies. These strategies encompass both the reader and the text.

Dana (1980) has isolated those strategies most relevant to the field of prose-learning research. They have been grouped into three categories: (a) changing the structure of the text, (b) employing adjunct aids, and (c) developing learner-imposed techniques (p. 17).

The first two categories involve manipulation of the text, while the third addresses the reader's behavior. Changing the structure of the text can be achieved via typographical cueing, reading-level modification, and/or general re-organization. Employing adjunct aids, that support or reinforce the text, involves the inclusion of objectives, questions and/or advance/graphic organizers. The third category involves instructional intervention geared to equipping the learner with appropriate processing skills.

The current study was interested in an application of the three categories outlined. This experiment focused on

the manipulation of text structure (i.e., typographical cueing), the employment of an adjunct aid (i.e., graphic organizer), and the preparation of the learner (i.e., graphic organizer strategy training). The research literature pertinent to these variables will be reviewed in the following sections.

Cognitive Framework

The concern of contemporary research, focused on the reader and the text, suggests the influence of the cognitive paradigm. Researchers of this inclination view the reading act as an interactive process between the reader and the textual material (Winn, 1979; Reder, 1980; Bovy, 1981; Brody, 1981; Bruning, 1982). The cognitive model acknowledges the reader's role as that of active participant, rather than that of passive recipient (Wittrock, 1979). Cognitive researchers have become increasingly interested in finding ways to stimulate the interaction between the learner and the instructional display. One route, towards that, appears to lie in the provision of effective instructional strategies. Rothkopf (1971) has suggested that "mathemagenic behaviors" (i.e., behaviors that give birth to learning), can be controlled or shaped through strategies that maintain students' attention to the material being read. In effect, these variables are manipulations of the instructional display (Merrill et al., 1981), as well as of the cognitive processes present in the learner (Bruning, 1983).

Advance Organizer Research

Ausubel's theoretical rationale for the justification of the use of the advance organizer lies in the contention that "the most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly" (1978; p. 163). The advance organizer could function as a link between the knowledge that the learner already holds, and that which he needs to attain.

Ausubel's theory, postulating that advance organizers would facilitate learning and strengthen retention (1978; p. 174), was questionned by subsequent research. Barnes and Clawson (1975) found that of 32 studies reviewed, 12 supported the view that advance organizers facilitate learning, while 20 reported that they do not.

In a reply to Barnes and Clawson, Lawton and Wanska (1977) criticized the review. They argued that the authors incorrectly interpreted Ausubel's theory, compared highly divergent studies, and showed lack of independency among several of the studies cited.

In defense of the advance organizer, Ausubel (1978) accuses researchers of not having followed his instructions for organizer construction. According to Ausubel, many researchers have not made the organizers more general, abstract and inclusive than the subject matter. Mayer (1978, 1980) argues that advance organizers do not have to represent subsuming concepts not contained in the prose passages, provided that the organizer explicates top-level

structures that allow for the assimilation of lower-level concepts.

Luiten, Ames and Ackerson (1980) concluded, after a meta-analytic review of advance organizer research, that advance organizers do appear to produce superior performance over control conditions. They note, however, that the inconsistency of the effects makes generalizations difficult. They attribute the disparate findings to the fact that advance organizers are difficult to construct since they require an understanding of subsuming concepts extant in the learner as well as those contained in the text. In short, the apparently unreliable technology for advance organizer construction may be to blame for the somewhat erratic research findings (Barnes & Clawson, 1975; Hartley & Davies; 1976).

Pearson and Gallagher (1983) summarize the research findings by saying:

> ... all one can say is that advance organizers tend, on the whole, to help readers; however, their specific effect is so sensitive to contextual factors... that few generalizations about their effect tend to hold universally (p. 325).

Graphic Organizer Research

The Moore and Readance (1980) meta-analysis, of the effect of graphic organizers on students' comprehension and retention of text, found little evidence to support the

curiously widespread praise for the strategy among content-area instruction specialists.

A review of the general state of affairs in graphic organizer research indicates a recent move (1980-1985) away from the original form of graphic organizer first introduced by Barron (1969). Researchers have shifted their attention to an interactive-type organizer resembling Gordon and Brown's (1981) macro-cloze technique for filling in deleted text structure.

Alvermann (1984) describes the modified organizer as a paper and pencil task requiring students to complete a diagram by using key vocabulary terms from the text (p. 6). Key terms and headings derived from the text serve as headings interconnected by lines and arrows. Spaces or empty slots are provided, so that while the students read the accompanying passage, they write in facts that develop the main idea(s). This form of organizer provides an outlet that could allow the reader to interact with the content (Dana, 1980; p.14).

Anderson (1969) points out that learning is facilitated when overt, constructed responses are made, provided that the response is relevant to what is to be learned. While the interactive graphic organizer insures some degree of interaction through its embedded response opportunities, the Barron organizer lacks any built-in devices to protect it from going unnoticed or unprocessed.

Elaborated vs. interactive organizer. Barron (1971) found significant differences between a graphic organizer

group and control group of tenth-grade biology students on tests measuring knowledge of biology terms. Results of a test on the general content did not indicate differences. These findings could be due to the nature of the organizer employed in the experiment. The Barron-type or fully elaborated organizer, originally developed for vocabulary instruction, appears to be useful for the presentation and subsequently, the learner's attainment of factual information involving classification and categorization. In the case of the study previously cited, the elaborated organizer may not have lent itself to more substantative learning that is reflective of the subject matter as a whole and not only a mere regurgitation of particular terms.

Moore and Readance (1980) reviewed studies using fully elaborated organizers. The researchers reported that the effect size for vocabulary measures was approximately .30 (i.e., treatment group nearly 1/3 of one standard deviation above the control group). Alvermann (1984), in a study employing a partially elaborated graphic organizer, found an effect size of .98 and .99 for the immediate and 48-hour delayed comprehension measures. A comparison of effect sizes suggests that the fully elaborated organizer may influence vocabulary attainment, while the interactive slant of the Boothby and Alvermann organizer may promote more meaningful or non-verbatim learning.

Dana (1980) employed an interactive graphic organizer in her study, in response to a suggestion made by Smith

(1973) to encourage learners to use active processing operations while reading. Dana's study was designed to determine if using a graphic organizer before, during and after reading would improve 6th-graders' comprehension of written text. Results indicated that the graphic organizer did not facilitate comprehension of single-theme text, but that it did facilitate comprehension of multithematic text. These findings suggest that multithematic text, demanding meaningful learning of interrelated ideas and facts, might be easily represented by the graphic organizer.

Advance/Graphic Organizer Strategy Training Research

One problem that surfaces in the advance/graphic organizer research, is that some students do not understand the intended use of the organizer (Dana, 1980; Luiten, 1980; Zeitoun, 1983; Boothby & Alvermann, 1984). Kozlow (1978) holds that if students are unable to understand advance organizer information, the opportunity for subsumers to be established in their cognitive structures will not be realized (p. 146). Hence, the advance organizers would not have the chance to function as they were designed to, that is, to facilitate learning or retention.

Generally, the few studies that have investigated the effects of extended training in the use of graphic organizer strategy have yielded results in favour of training.

In one study conducted by Bean and Singer (1983), two groups, one of which had previously received summarization training, were instructed in a procedure for constructing

graphic organizations of history-lesson concepts, while the third group generated traditional outlines. Subjects in the graphic organizer group with training, achieved significantly higher scores than either of the other groups.

Barron and Stone (1974) report that in a debriefing session in a previous organizer study, students without training in the strategy admitted that rather than relating the organizer to its corresponding passage, they treated it as a discrete piece of information.

In an attempt to ensure students' understanding and appropriate application of the organizer, Jerrolds (1977) included training sessions in his study. Although significant differences were not found between the "instruction" condition and the "no-instruction condition", comparisons showed that for several stratified groups, the subjects benefited significantly from the training.

Boothby and Alvermann (1984) acknowledged the need for instruction in the use of the graphic organizer. Upon investigating a meta-analysis on graphic organizer research (Moore & Readance, 1980), they suspected that the generally low effect sizes obtained for the strategy might have been the result of inadequate instruction, or even no instruction at all. In order to substantiate their claim, the researchers conducted an experiment (1984) investigating the effectiveness of the graphic organizer strategy for facilitating comprehension and retention of 4th-grade social-studies text. Two conditions were established: One

condition received instruction and practice, while the other did not. Results indicated that the treatment group recalled a greater number of total idea units than the control group did, for both the immediate and 48-hour delayed testing. The effects of training in Boothby and Alvermann's study seem to have influenced comprehension scores considerably. Their findings become especially attention-worthy, in light of previous results from graphic organizer studies reported by Moore and Readance.

Reading level. As encouraging as Boothby and Alvermann's results may appear to be, attempts at generalizations would demonstrate an over-enthusiastic interpretation of the findings. The researchers point out that the students' apparent ability to profit from the graphic organizer instruction could be indebted to their above average verbal-ability (p. 334). They relate this observation to Moore and Readance's report of a large measure of association (M = .43) between organizers and textbook learning for high verbal-ability subjects.

Boothby and Alvermann's study stands unique among the literature, since it not only reflects an awareness of the need for graphic organizer strategy training, but also identifies the intermediate grades of being in greatest need of such training.

Typographical Cueing

One characteristic that distinguishes expository textbooks or text-like material from narrative text, is the

inclusion of typographical cueing. Research evidence (Frase and Schwartz, 1979; Jonassen, 1981; Pepper, 1981; Shebilske and Rotondo, 1981) is increasingly indicating the importance of prominantly displayed cueing devices to help students learn from text.

In a series of five experiments, Frase and Schwartz, (1979) examined the effects of two typographical manipulations, segmentation and indentation, on learners' comprehension of text. Results showed that both manipulations improved performance over control conditions, with segmentation acting as the more potent of the two.

Shebilske and Rotondo (1981) compared a standard typographical layout with one which contained both typographical and spatial cueing. The researchers found that the layout featuring the combination of cueing elements, improved learning and retention of both intentional and incidental information.

In the first of two experiments, Pepper (1981) tested the effect of two different styles of computer programming textbooks. One group received outline format textual material, while another group received an informal, conversational format text. Subjects were asked for feedback on the style of text that they received. Their recommendations for improvement of the texts were encouraged. Students' evaluations did not indicate a preference for one style over another; however, their comments suggested that both formats were less than adequate.

Pepper (1981) conducted a second experiment, using the students' evaluations as a basis for improvement. The experimental material was redesigned by incorporating graphical and textual aids into it. After the revised material was compared against the original experimental text, findings revealed that the improved experimental material contributed to higher memory and comprehension scores. The revised format also received higher student ratings.

Bernard and Janega (1984) investigated the relative effects of typographical cueing and instructions on how to use a logical picture (i.e., graphic organizer) as an organizational memory aid. Analysis of the data disclosed a disordinal interaction among the three variables of typographical cueing, strategy instructions, and reading ability. Upon finer-grained examination of this interaction, it was found that only higher-level readers profited from the combination of organizational cueing systems. No differences existed for middle and lower-level readers.

It still remains to be seen if such relationships would surface in a younger, elementary grade-level sample. Boothby and Alvermann (1984) recommended future research which would include elementary-grade school children, representative of varying reading abilities, in combination with passages "that vary on the amount of signaling [cueing] present" (p. 334).

In a response to Boothby and Alvermann's suggestion for methodological improvement, the current experiment proposed to extend upon their study of the graphic organizer strategy, by investigating the effects of training on elementary grade-level learners of varying reading ability. In addition, typographical cueing was included as another variable in the study.

Chapter 3

Method

Sample

The sample was derived from two schools (Northview and Seignoiry) located in Pointe Claire, on the West Island of Montreal. The school communities are primarily Anglophone ones, comprised of lower and middle-class working families.

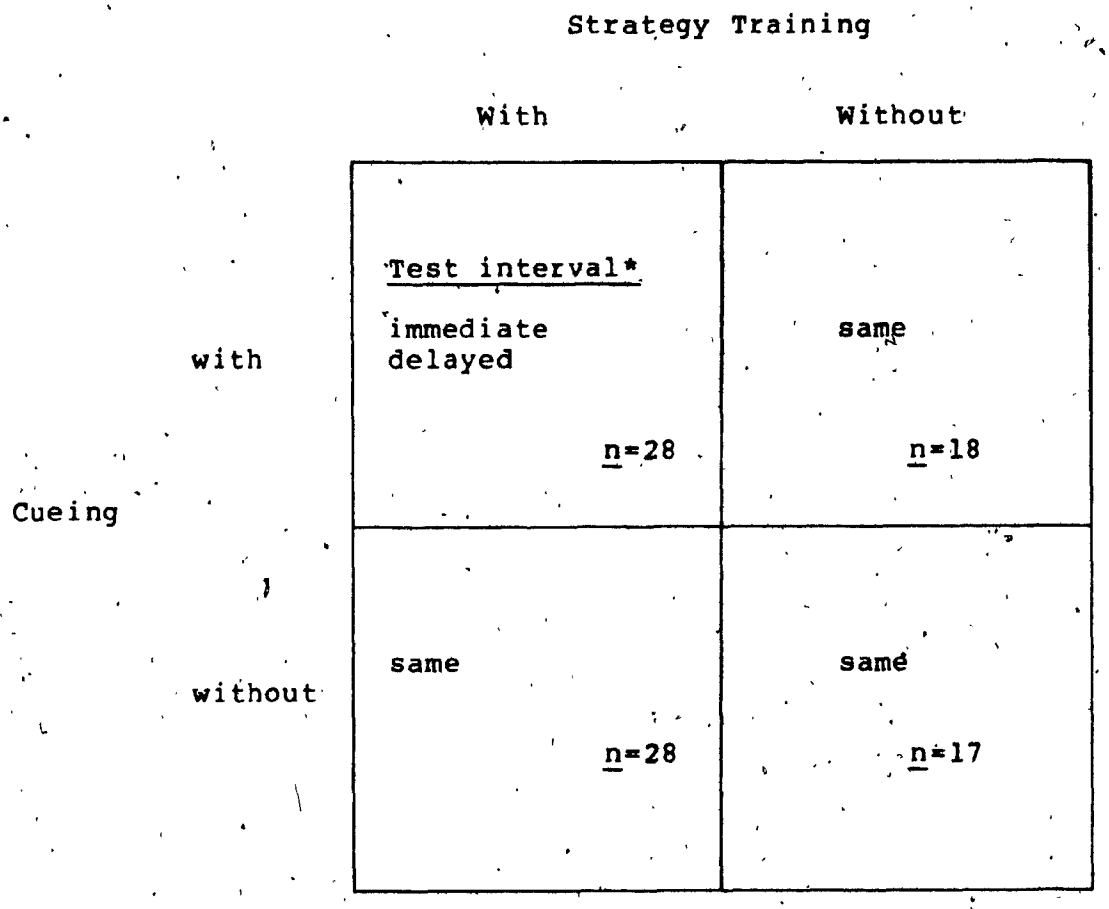
The sample consisted of 91 Anglophone, fourth and fifth-grade boys and girls. Subjects were randomly assigned to four experimental conditions (See Figure 1). A control group was included in the design.

Randomization was employed so as to increase the likelihood of equivalence between the control and the experimental group. In theory, this ensured the apportionning out of extraneous variables, between the groups, that could conceivably have affected the independent variables (Cohen & Manion, 1980, p. 161).

Experimental Design

The design of the experiment constituted a 2 x 2 x (2) factorial with repeated measures on the dependent variable. The two between-group variables were Strategy Training (with training vs. without training) and Typographical Cueing (with cueing vs. without cueing). The dependent measures consisted of an immediate (24-hour) and delayed (3-week) posttest to assess student performance in terms of recognition and recall. Since the study was concerned with

Figure 1. Experimental Design.



* The immediate and the delayed posttests represent the repeated dependent measure.

evaluating the effects of learning strategy training, (i.e., process over product), a pretest was thought to be superfluous, and therefore not included. It's omission was also decided upon, in recognition of potential testing effects.

Instrumentation

Recognition test. The target passage was evaluated by a recognition test composed of 19 items (see Appendix G). Two different randomized versions of the test were produced (A & B) from a pool of 30 question-items created by the research team. The two versions would provide for counterbalancing within the design. Counterbalancing was included as a precautionary measure to guard against possible test-retest effects that could develop between immediate and delayed testing. Each test was comprised of the following groups of items: (a) 7 multiple-choice, (b) 5 true or false, and (c) 7 fill-in-the-blank. All multiple-choice questions consisted of a main stem with four options, only one of which was the correct answer. The fill-in-the-blank (or short-answer) items were created so as to require a single word or a short phrase to answer the question.

Free-recall test. The free-recall test preceded the objective test (on both testing occassions) in order to guard against the objective criterion acting as a cue for subsequent recall of the target passage.

Scoring of the recall protocols was carried out by the main experimenter and a co-researcher. This scoring was

conducted in adherence to a master-list of idea units compiled from the independent evaluations of the target passages by six raters (see Appendix H). Three raters evaluated the cued version of the passage, while the remainder evaluated the uncued version. The free-recall tests were scored by two judges, both of whom were blind to the experimental condition of each subject. The recall protocol for each subject was broken down into idea units. If an idea unit was recalled as an isolated entity, it was counted as one point. Under the circumstances that an idea unit was coherently integrated into a sentence or a phrase containing other idea units from the original passage, it was awarded 2 points.

Reading test. Since the experiment was concerned with the processing of expository text material, Test 2: Reading Comprehension, (Medden et al., 1972), excerpted from the Stanford Achievement Test Battery (Intermediate Level 1), was administered to all subjects 10 days prior to the commencement of training. It was thought that these tests would serve as adequate predictors of subsequent reading performance. The reading tests were given to the subjects by their own reading teachers, in their regular classrooms. Students were allotted 50 minutes to complete the test. The teachers did not inform the students of any link between the test and the appendent experiment. The reading tests were scored by the researchers.

Materials

Pre-training session. A slide presentation entitled, "What is Research?", was produced by the author, for use in a pre-training orientation session. The slides illustrated the concepts of; (a) research-team, (b) research-question, (c) treatment and control group, (d) random selection, and (e) research findings.

Treatment group (training phase). Exercises featuring short expository passages, accompanied by Boothby and Alvermann-type (1982) elaborative graphic-organizers, were developed by the research team. The passages were extracted from various publications geared to the upper elementary grade-levels (e.g. 3-2-1 Contact, Enter, and Electric Company, published by the Childrens' Television Workshop; Hidden Worlds, Far out Facts, and World magazine published by National Geographic, and other sources, including World Book Encyclopaedia.

The graphic organizers were constructed following Alvermann and Boothby's (1982) recommendations for "making content reading successful" for grades 4-6. Steps involved in the development of the organizers included: (a) listing on index cards all the words representative of the concept being taught, (b) arranging the words to show relationships, (c) transferring that arrangement to paper and substituting empty slots for certain words, and (d) presenting the fully elaborated organizer via overhead transparencies.

Varied-format tests were designed to expose the subjects to the test-modes selected for the target phase of the experiment.

Training phase (control group). Three 30-minute films, from a social-studies series entitled, "Children of the World", (Canadian Broadcasting Company [CBC], 1978), were selected for the placebo activities. Each film was screened in two 15-minute parts (over the course of two sessions). The films aimed at upper elementary grade North American children, were entitled: (a) "Guatemala", (b) "Thailand", and (c) "Sri-Lanka". Four tests were designed, based on the film's content. The formats of the tests were equivalent to those administered in the treatment conditions and at the target testing phase. These tests enabled the investigator to monitor the students' progress from session to session. They also functioned to eliminate the threat of "test effects" (Campbell and Stanley, 1963) on the internal validity of the investigation. The design of this study, involving immediate and delayed testing, rendered it vulnerable to testing weaknesses. A portion of the change from immediate to delayed performance could have been caused by test practice. Had the students not been familiar with the testing modes, the immediate test could have taught them how to perform on the delayed test. However, with more frequent exposure to the target testing formats, differences between testing occassions would be less attributable to test-practice effects.

Target phase. One expository passage, titled, "Going out for a Breath of Gross Air?", was selected for the testing or target-phase of the experiment. The passage was extracted from a social-studies booklet, entitled, Conserving the Earth's Natural Resources, published by Mcdonald Educational Holywell House (London, 1974). This reading material was assessed by the Fry Readability Formula (1968) as being appropriate for the 5th-grade level.

Two versions of the passage were produced: (a) with cueing (336 words), and (b) without cueing (339 words). These target passages provided for the two levels of the Cueing variable. The content was held the same for both versions. Both passages contained the same number of idea units.

One partially elaborated graphic-organizer was constructed, following Alvermann and Boothby's directions (1982). The organizer represented the top-level structure of the target passage.

Procedure

Pre-training session. Two instructors, one of whom the author, the other a member of the research team, presented the slide show to all the subjects. Group discussion was encouraged. General questions regarding the nature and purpose of experimental research were answered; however, details concerning the design and hypotheses of the current study were not divulged. It was explained to the students

that they could not be told which group they were assigned to, since that information could influence their behaviour in the experiment. This explanation was made in an attempt to reduce possible Hawthorne effects (Drew, 1980) that could result from one group feeling more attention-worthy than another.

Training phase (treatment groups). The training phase extended over a 6-week period. Training sessions occured once a week for a period of 30 minutes each. These sessions, or lessons, were held in "real world" classrooms in the subjects' own schools. This arrangement attempted to ensure a degree of ecological validity which may be lacking in more artificially contrived experimental situations (Snow, 1980).

The lessons were conducted by the current investigator and a Ph.d candidate in Educational Technology, with expertise in teaching reading skills. Teaching responsibilities were designated during the lesson-planning stage, in order to avoid any in-classroom awkwardness that could ensue from having two teachers in one classroom.

Week one. The students engaged in a verbal analysis of four slides depicting various scenarios (see Appendix A). The instructors encouraged the students to note the details contained in the visuals and to title each scenario. It was explained that details could act as "clues" that lead to the main idea expressed by the pictures.

After this preliminary exercise, the instructors introduced the concept of graphic organizer. The organizer

was introduced as an aid that would help the students to read and study better. This was done following a suggestion to inform the learner of the purpose for learning a strategy (Brown, Campione & Day, 1981). It was described how graphic organizers are composed of different details that culminate into higher-order or main ideas. The instructors presented two slides with accompanying partially elaborated graphic organizers (see Appendix A) drawn on overhead transparencies. The slides and corresponding organizers were projected simultaneously on two adjacent screens. This arrangement enabled the students to compare the organizers' top-level structures with their respective visuals.

Week two. The second training session began with the presentation of three photo-clippings and corresponding organizer work-sheets (see Appendix B). Through group activity, the class isolated important details shown in the pictures. The students were encouraged to predict the word or words that would make the most sense in the organizers' empty slots. Their predictions were compared to fully elaborated examples presented via overhead transparencies.

A second exercise marked a transition from visual stimulus material to the use of verbal material. Students received an exercise featuring a short paragraph and a partially elaborated organizer, as well as a photograph (see Appendix B). The information contained in the photograph was not crucial for the completion of the organizer;

however, it was included so that the transition from visual to verbal stimulus material would be less abrupt. The students compared their attempts at elaboration to fully elaborated master-examples shown on overhead transparencies.

Week three. This session marked a complete transition to verbal instructional material only. One exercise, requiring individual practice, presented an interesting twist. This exercise provided the reader with a fully elaborated organizer that would have to be translated into a short paragraph (see Appendix C).

After a brief class discussion of the first exercise, the students were given a short passage to read and a partially elaborated organizer to complete (see Appendix C). A 5-minute multiple-choice test (see Appendix C) based on the passage's content followed.

Week four. The students continued with individual practice in indentifying both superordinate and subordinate ideas in reading passages. They were given two passages and accompanying organizers to complete (see Appendix D), and were tested on one of the reading passages by a 5-minute objective test, comprised of true or false and short-answer items (see Appendix D). Correct-answer sheets were made available to the students. They compared their choices to the correct answers.

Week five. This session continued with two work-sheets involving reading passages and partially elaborated organizers (see Appendix E). The students were tested for free-recall on the content of one of the reading passages.

The students' attempts at recall were discussed in class.

Week six. This last session involved a review of the nature and purpose of the graphic organizer. Students received two reading passages with accompanying partially elaborated graphic organizers (see Appendix F). These organizers presented a more sophisticated level of difficulty than in the previous sessions. One exercise involved a 5-minute multiple-choice test (see Appendix F). Answer-sheets were provided and students' answers were discussed in class.

Training phase (control group). The "training" phase for the control group was conducted over a 6-week period. Each week the control subjects were "instructed" for a 30 minute period. The students viewed a film for 15 minutes, after which they engaged in short group-discussions, sometimes followed by 5-minute practice-tests based on the film's content. These tests were administered during the same weeks that the experimental subjects received tests. The test modes were equivalent to those given to the treatment groups and followed the same order of appearance. The subjects were informed that these tests would not affect their school grades in any manner.

Target phase (immediate testing). Twenty-four hours following the last training session, the first target posttest was administered to all subjects. The testing procedure was conducted at both schools involved in the study. Testing for the first school (Northview) occured in

the morning, while testing for the other (Seigniory) proceeded in the afternoon of the same day. The subjects were tested in their own home-room classrooms by an external monitor. It was assured to the subjects that their scores on the tests would not influence their regular school grades in any manner.

Subjects were given 30 minutes within which to complete the test requirements of the posttest. All subjects were given a test package prelabelled with the corresponding subject's name. The envelopes contained one pencil and the following 3 pages: (a) directions, (b) target-passage (cued or uncued), and (c) partially elaborated graphic-organizer (see Appendix G). The subjects were told to remove the three sheets from the envelope and to turn the directions-sheet face-up on their desks. They were asked to read the directions carefully and to procede as specified. The subjects were allowed 10 minutes within which to read the target passage and to complete the organizer. They were informed to turn their papers face-down on their desks, once they had finished. They were permitted to draw on the reverse side of the directions-sheet while waiting for others to finish, if they so desired. After the first 10 minutes, the students were asked to return the papers back into their envelopes. All the envelopes were collected by the monitor.

Both a free-recall measure and recognition test-items were included in the testing procedure, since either used independently could have presented an unfair testing

situation. With free-recall alone, the student might not have had sufficient cues to inform him of what he was supposed to be able to recall. A multiple-choice test alone might have left to be desired, since it would have provided an outlet for some information only.

One loose-leaf sheet was handed to each student. The students were reminded to write their full names on a top corner of the sheet. They were informed that they had 10 minutes in which to write down, in any form, as much as they could remember about the text and the graphic-organizer that they had just read. They were assured that incorrect spelling would not influence their scores. All the sheets were collected by the investigator. The objective tests (see Appendix G), prelabelled with name of subject, were handed face-down to the appropriate student. The students were asked not to turn the papers over until informed to do so. Again, 10 minutes were allotted for the completion of the test task. Tests and pencils were collected by the monitor. Students' participation was rewarded with decorative stickers.

Target phase (delayed testing). Three weeks after the first posttest, the delayed testing was conducted. Subjects in both schools were tested in their own home-room classroom by one monitor. Since this test was assessing students' delayed recognition and recall of the target passage, the text and its accompaniments were not included on this date. All the subjects received one sheet of loose-leaf on which

to write down as much as they could remember about the text they had read one month earlier. Students were given 10 minutes in which to do so. When the allotted time had passed, all the sheets were gathered by the monitor. Students were then given the appropriate version of the recognition test (A or B) in order to follow through on counterbalancing plans. Rows of seats in the classes, alternated between designation of "A" and "B". To some extent, this prevented the subjects from the temptation, or rather, from having the opportunity to copy their neighbors' answers. The tests and pencils were collected by the monitor. The students were thanked for their participation and cooperation.

Chapter 4

Results

The purpose of this study was to investigate the effects of typographical cueing in combination with graphic organizer strategy training on children's processing of instructional text. In order to do so, a 2 x 2 x (2) factorial was conducted, with immediate and delayed testing (Time) serving as repeated measures. Reading ability, as measured by the Stanford Achievement Test Battery (Intermediate Level I), served as the covariate.

Assumption of Homogeneity

Test of parallelism. The first series of statistical analyses performed on the data were tests of parallelism on all the dependent measures. Both the immediate and the delayed test were comprised of four categories of test items: (a) multiple-choice, (b) true or false, (c) fill-in-the-blank, and (d) free-recall.

The tests of parallelism were used to ascertain whether the assumption of homogeneous regression slopes for the treatment groups was tenable. Analyses revealed parallel regression lines (see Tables 1 and 2), thereby justifying the subsequent use of multivariate analysis of covariance (Huitema, 1980). The calculation of the variance due to regression yielded a significant multivariate effect for the covariate, $F(4, 73) = 17.65$, $p < .001$. The within-cells regression on each of the four dependent variables the

available in Table 3. Means and standard deviations for the covariate (i.e., Reading) are shown in Table 4. All raw scores obtained for each subject are listed in Appendix I.

Test of Design

Mancova. Multivariate analyses of covariance (Mancova) were conducted to test the hypothesis of differences due to the main effects for cueing, the main effect for training, and their interactions. However, a preliminary Mancova, including School and Grade-Level effects, was conducted to determine if any interactions of these variables with the primary design were present. Such interactions, if significant, would make interpretation of the results of the primary analysis difficult.

Since Grade-Level and School did not appear to interact with the primary factors in the experiment,[1] the two variables (i.e., School and Grade Level) were collapsed into

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[1] The multivariate findings are as follows: Time, $F(4, 62) = 15.17$, $p < .001$; Training x Time, $F(4, 62) = 1.78$, $p = .143$; Cueing x Time, $F(4, 62) = .61$, $p = .658$; Grade x Time, $F(4, 62) = 1.42$, $p = .237$; School x Time, $F(4, 62) = 1.90$, $p = .121$; Training x Cueing x Time, $F(4, 62) = .99$, $p = .422$; Training x Grade x Time, $F(4, 62) = .32$, $p = .861$; Training x School x Time, $F(4, 62) = .65$, $p = .625$; Cueing x School x Time, $F(4, 62) = 1.22$, $p = .311$; Cueing x Grade x Time, $F(4, 62) = .98$, $p = .427$; Training x Cueing x Grade x School x Time, $F(4, 62) = 1.21$; $p = .314$; Training, $F(4, 61) = 4.83$, $p = .002$; Cueing, $F(4, 61) = 3.04$, $p = .02$; Training x Cueing, $F(4, 61) = .67$, $p = .616$; Training x Grade, $F(4, 61) = .46$, $p = .764$; Training x School, $F(4, 61) = .28$, $p = .890$; Cueing x Grade, $F(4, 61) = 2.00$, $p = .105$; Cueing x School, $F(4, 61) = .76$, $p = .553$; Training x Cueing x Grade x School, $F(4, 61) = .58$, $p = .68$.

the design for subsequent multivariate analysis of covariance. The means and standard deviations for free-recall across treatment levels are presented in Table 5. For means and standard deviations of multiple choice, true or false, and fill-in-the-blank measures; see Tables 6-8.

Time effect. Analysis on the main effect for Time (immediate and delayed) disclosed a significant difference between the two levels $F(4, 74) = 16.16$, $p < .001$. Univariate results indicated that the difference pertained to the free-recall dependent variable only (see Table 9). This difference was in favour of the immediate level of Time ($M_I = 23.40$ vs. $M_D = 15.04$), (see Table 5).

Training and Time was found to be non-significant, $F(4, 74) = 1.89$, $p = .12$, (see Table 10).

Cueing x time effect. Analysis on the interaction of cueing and Time did not disclose a significant result, $F(4, 74) = .64$, $p = .63$, (see Table 11).

Training x cueing x time effect. Analysis did not suggest a significant interaction for this effect, $F(4, 74) = 1.01$, $p = .405$, (see Table 12).

Training effect. A significant main effect for the between-subjects variable, Training, was found, $F(4, 73) = 4.86$, $p = .002$. This effect was present in the free-recall dependent variable only (see Table 13). The difference was in favour of the "with-training" condition, as predicted, ($M_{T1} = 22.4$ vs. $M_{T2} = 14.57$). Table 5 provides the means and standard deviations across treatment levels.

Cueing effect. A main effect for the between-subjects variable, Cueing, reached significance, $F(4, 73) = 2.54$, $p = .04$. This effect was significant in relation to the free-recall dependent measure only (see Table 14). The means and standard deviations reveal that the "without-cueing" condition was superior to the "with-cueing" one, ($M_{C1} = 29.33$ vs. $M_{C2} = 15.87$), (see Table 5).

Training x cueing effect. Statistical analysis did not find a significant interaction between the Training and Cueing variables, $F(4, 73) = .60$, $p = .660$, (see Table 15).

The results of the scores obtained by the reading test proved to be a significant predictor of subjects' performance on the dependent measures. A significant main effect was found for the Training variable, in favour of the "with" condition. For the Cueing variable, a significant difference favoured the "without condition". Both main effects emerged in the immediate free-recall measure only. The next chapter will discuss these findings.

Table 1

Test of Parallelism:

Regression of Reading Ability on Immediate Measures

Source	SS	df	MS	F	p
Multiple-Choice					
Interaction	.0543	3	.0178	1.53	.22
Error	.8135	81	.0100		
True-False					
Interaction	.0324	3	.0108	1.00	.40
Error	.8756	81	.0108		
Fill-in-the-Blank					
Interaction	.0098	3	.0032	.427	>.50
Error	.6241	81	.0077		
Free-Recall					
Interaction	.0033	3	.0011	.137	>.50
Error	.6490	81	.0080		

Note. Interaction refers to Strategy x Cueing x Reading Ability.

Table 2

Test of Parallelism:

Regression of Reading Ability on Delayed Measures

Source	SS	df	MS	F	p
Multiple-Choice					
Interaction	.0033	3	.0011	.122	>.50
Error	.7304	81	.0090		
True-False					
Interaction	.0447	3	.0149	1.96	.13
Error	.6208	81	.0076		
Fill-in-the-Blank					
Interaction	.0028	3	.0009	.143	>.50
Error	.5314	81	.0065		
Free-Recall					
Interaction	.0412	3	.0137	1.32	.28
Error	.8458	81	.0104		

Note. Interaction refers to Strategy x Cueing x Reading Ability.

Table 3

Within-Cells Regression of Covariate on Dependent Measures

Measures	r	r^2
Multiple-Choice	.5279	.2787
True or False	.3081	.0949
Fill-in-the-Blank	.6739	.4541
Free Recall	.4892	.2393

Table 4

Means and Standard Deviations for Reading Measure

Group	n	M	SD
With Strategy/ With Cueing	23	42.95	12.29
Without Strategy/ With Cueing	16	43.06	10.20
With Strategy/ Without Cueing	25	46.56	9.81
Without/Strategy/ Without Cueing	17	44.82	14.52

Table 5

Means and Standard Deviations for Immediate and Delayed Free-Recall Measures

Levels of Strategy	n	Measures: Immediate	Measures: Delayed
		With Cueing	
With	23		
M		22.90	15.17
SD		11.16	8.49
Without	16		
M		14.18	8.43
SD		6.91	4.76
		Without Cueing	
With	25		
M		32.30	18.8
SD		13.59	14.5
Without	17		
M		19.7	15.5
SD		11.7	9.72

Table 6

Means and Standard Deviations for Immediate and Delayed Multiple-Choice Measures

Levels of Strategy	n	Measures: Immediate	Measures: Delayed
		With Cueing	
With	23		
M		4.69	4.86
SD		1.55	1.68
Without	16		
M		4.62	5.00
SD		1.36	1.31
		Without Cueing	
With	25		
M		4.68	4.72
SD		1.31	1.69
Without	17		
M		4.70	4.70
SD		1.57	1.72

Table 7

Means and Standard Deviations for Immediate and Delayed True-False Measures

Levels of Strategy	n	Measures: Immediate	Measures: Delayed
		With Cueing	
With	23		
M		2.86	2.43
SD		1.01	1.12
Without	16		
M		2.86	2.50
SD		1.08	.81
		Without Cueing	
With	25		
M		3.08	2.88
SD		1.11	1.01
Without	17		
M		3.11	3.11
SD		1.21	.99

Table 8

Means and Standard Deviations for Immediate and Delayed Fill-in-the-Blank Measures

Levels of Strategy	n	Measures: Immediate	Measures: Delayed
		With Cueing	
With	23		
M		3.78	3.43
SD		1.92	1.61
Without	16		
M		3.93	4.06
SD		1.98	1.52
		Without Cueing	
With	25		
M		4.40	4.43
SD		1.58	1.72
Without	17		
M		4.00	3.94
SD		2.44	2.04

Table 9

Effects of Time Variable

Measures	SS	df	MS	F	p
Multiple-Choice	.75	1	.75	.64	.43
Error	90.01	77	1.17		
True-False	1.78	1	1.78	2.47	.12
Error	55.70	77	.72		
Fill-in-the-Blank	.50	1	.50	.49	.49
Error	78.85	77	1.02		
Free-Recall	29.20	1	2829.20	64.22	<.001
Error	3392.03	17	44.05		

Table 10

Effects of the Interaction of Training and Time

Measures	SS	df	MS	F	p
Multiple-Choice	.06	1	.06	.05	>.50
Error	90.01	77	1.17		
True-False	.62	1	.62	.86	.37
Error	55.70	77	.72		
Fill-in-the-Blank	.56	1	.56	.54	.46
Error	78.9	77	1.02		
Free-Recall	325.41	1	325.41	7.39	.01
Error	3392.03	77	44.05		

Table 11

Effects of the Interaction of Cueing and Time

Measures	SS	df	MS	F	p
Multiple-Choice	.54	1	.54	.47	.50
Error	90.01	77	1.17		
True-False	.36	1	.36	.50	.48
Error	55.70	77	.72		
Fill-in-the-Blank	.07	1	.07	.07	>.50
Error	78.87	77	1.03		
Free-Recall	75.67	1	75.67	1.71	.19
Error	3392.03	77	44.05		

Table 12

Effects of the Interaction of Training and Cueing and Time

Measures	SS	df	MS	F	p
Multiple-Choice	.14	1	.14	.12	>.50
Error	90.01	77	1.17		
True-False	.03	1	.03	.04	>.50
Error	55.70	77	.72		
Fill-in-the-Blank	.50	1	.50	.49	.49
Error	78.87	77	1.02		
Free-Recall	129.19	1	129.19	2.93	.10
Error	3392.03	77	44.05		

Table 13

Effects of the Training Variable

Measures	SS	df	MS	F	p
Multiple-Choice	.19	1	.19	.07	>.50
Error	199.61	76	2.63		
True-False	.08	1	.08	.06	>.50
Error	105.27	76	1.38		
Fill-in-the-Blank	.19	1	.19	.06	>.50
Error	245.50	76	3.22		
Free-Recall	2177.58	1	2177.58	14.25	.003
Error	11612.81	76	152.80		

Table 14

Effects of the Cueing Variable

Measures	SS	df	MS	F	p
Multiple-Choice	2.79	1	2.79	1.15	.31
Error	199.61	76	2.63		
True-False	5.02	1	5.02	3.6	.10
Error	105.27	76	1.38		
Fill-in-the-Blank	.93	1	.93	.29	>.50
Error	245.05	76	3.22		
Free-Recall	1095.61	1	1095.61	7.1	.01
Error	11612.82	76	152.80		

Table 15

Effects of the Interaction of Training and Cueing

Measures	SS	df	MS	F	p
Multiple-Choice	.07	1	.07	.03	>.50
Error	199.61	76	2.62		
True-False	.71	1	.71	.51	.48
Error	105.27	76	1.38		
Fill-in-the-Blank	3.51	1	3.51	1.09	.30
Error	245.05	76	3.22		
Free-Recall	4.16	1	4.16	.03	>.50
Error	11612.82	76	152.80		

Chapter 5

Discussion

The results of the experiment lead to the following conclusions: Graphic-organizer strategy training can facilitate the recall of textual information. Furthermore, it appears that typographical cueing, divorced from the strategy training, produces negative learning outcomes.

The findings of the current experiment demonstrate the benefits of strategy training that previous studies have already claimed (Gordon, 1980; Alvermann, 1981; Hansen, 1981; Hansen & Pearson, 1982). All of these studies confirm the notion that learning performance seems to improve as a direct consequence of instructional intervention that informs the learner on how to use a particular processing strategy (Bovy, 1981).

One study, (Boothby & Alvermann, 1984), which inspired the current experiment, dealt specifically with learning strategy training in the use of graphic organizers. The researchers found that the treatment group performed almost one standard deviation (.99) higher than the control group on the immediate recall measure. Considering the length of training in Boothby & Alvermann's procedure (26 hrs), compared to the duration of training in this study (3 hrs), the effect-size found here (.89) is impressive. Moreover, the extended period of training in the Boothby and Alvermann study was still not enough to gain any significant differences between the two groups for the one-month delayed

test. Moore and Readance (1980), in a meta-analysis of the effect of graphic organizers on students' comprehension and retention of text, considered length of treatment as a variable. Of the 18 studies Moore and Readance evaluated, 7 used one treatment session only, while 11 extended the treatment to include repeated sessions (the average being 16). A uniformly low effect was found, regardless of treatment length. The present study which managed to find a relatively respectable effect-size, with only 6 treatment sessions, throws new light on the length of training controversy.

Taking into account the advance/graphic organizer's unstable reputation (Barnes & Clawson, 1975; Moore & Readance, 1980), Boothby and Alvermann's (1984) recommendation for future studies to implement three months of concentrated training appears to be excessive. When the "real-world" time and personnel constraints restricting classroom activity are considered, Boothby and Alvermann's prescription seems highly unrealistic. What is needed in the graphic organizer line of research is further studies investigating more parsimonious applications of strategy training.

While it was not particularly surprising that strategy training in the current experiment reaped positive results, the negative results associated with the Cueing variable were unexpected. Findings, here, have refuted the near-unanimous belief that typographical cueing encourages

text retention. The conflicting results found in this experiment may be explained, to some extent, by the rationale used to justify training in the use of the graphic-organizer strategy. Just as it cannot be assumed that the learner would be able to use the graphic-organizer strategy without adequate instruction, it cannot be taken for granted that typographical cueing systems would be spontaneously processed. The young, inexperienced reader may be left at a disadvantage. Until the novice reader becomes familiar with cueing devices incorporated into the body of instructional text, he may be left unable to profit from what was originally intended to serve as an aid.

The subjects in the current study may have found themselves in the predicament just described. The learners, being in the fourth and fifth grade, were in a transitional stage in school, where they were only beginning to convert from narrative to expository texts (Boothby & Alvermann, 1984). Given that one common characteristic that distinquishes expository text-books from narrative ones is typographical cueing (Guthrie, 1981), the subjects' unfamiliarity with expository text, and consequently cueing devices, may have limited their performance. Previous research studies intended to assess the facilitative effects of typographical cueing were conducted with adult or more sophisticated readers (Frase & Schwartz, 1979; Pepper, 1981; Janega, 1983). Therefore, their positive findings cannot be generalized to include elementary-grade students.

The retention advantages associated with cued (i.e., intentional) information incurred at the expense of non-cued (i.e., incidental) information (Herschberger & Jerry, 1965; Fowler & Barker, 1974; Coles & Foster, 1975) might explain why the superior performance of the without-cueing conditions occured only on the free-recall measures. Cueing in the target passage might have distracted the reader from attending to other parts of the text (i.e., incidental) that could have been recalled. The without-cueing conditions may have had the advantage of recalling both intentional and incidental information, indiscriminately.

Following this argument, readers who received the cued passage should have performed better on the recognition posttest items than those who did not. However, the results do not show a consistent pattern suggesting that this happened. What has transpired is that on both the multiple-choice and the fill-in-the-blank sections of the delayed posttest, those students who did not receive training but did receive the cued version of the target passage achieved higher means than those without training and without cueing.

Another factor which might have contributed to the without-cueing condition performing better than the with-cueing one, is the extent of cueing in the target passage. Typically, other experiments have isolated one or only a few cueing features. In the current experiment, the target passage was heavily cued to the extent where it may have reduced the saliency of some otherwise important

information. The variety and degree of cueing might have called for more sophisticated processing skills, leaving the young readers overwhelmed.

The cued target passage, because of its more complex appearance and presentation, may have required more reading time than the uncued version. Given this premise, subjects in the uncued condition might have profited from having time to re-read the passage. Reading over the text is a review technique commonly used for strengthening retention (Ausubel, 1978, pp. 318-319).

As already noted by Day (1980), even with practice and repeated exposure, learners could benefit more by practice accompanied by strategy training. Following this assumption, future research needs to establish not only who may profit most from detached strategy training, but also the opportune point for introducing such intervention. It seems plausible to suspect that learners may evolve through different developmental stages that might render them more susceptible to training in specific learning strategies, as in the case of young learners who have not already fixed their own processing habits. On the same token, a learner's facility at acquiring and applying imposed learning strategies may depend upon a host of historical factors (e.g., prior knowledge, reading experience, familiarity with an instructional device). Until these areas of inquiry are studied, the adoption of learning strategy training into the classroom may prove to be a futile investment of already

exhausted resources.

This experiment, because of its field-study nature, was forced to sacrifice some degree of internal validity in exchange for external or ecological validity. The constraints imposed by the school environments (i.e., schedueling, noise, hallway shuffle) presented a challenge for the smooth operation of the experiment.

Unlike more "sterile" and contrived experiments, which function best under "controlled" conditions, field-studies thrive on potential real-life obstacles. It was advantageous to the current research effort to base its experiment "on-the-spot", in order to arrive at findings that would be directly relevant to real-world classroom activity.

Unquestionably, a difficult balancing-act was involved in respecting both internal and external validity, simultaneously. Compromises were made by considering the practical application to which the study was addressed. It has been pointed out by Drew (1980) that:

> ...If external validity is a serious objective, care must be taken to arrange the research setting as much like the target setting for generalization as possible (p. 175).

Clearly, from the results of the current study, more attention should be directed to the effects of typographical cueing on children's processing of content-area text. It appears that the positive effects of typographical cueing on

adult samples may not surface with young or inexperienced readers.

The attempt at typographical cueing in the present experiment may have been an overly ambitious one. If individual cueing devices function in unique ways to stimulate the reader's perception (Frase & Schwartz, 1979), the complex mixture of typograpical cues used in this experiment probably produced an ineffectual concoction. The fact that the effects of typographical cueing in this study conflict with prior research may suggest that yet unidentified relationships could exist among isolated cueing variables and the maturity-level of the reader. The operationalization of incidental and intentional learning as dependent variables might be useful in throwing some light on this murky picture. In concluding, before this intricate web of variables is better analyzed, it would be over-zealous to attempt any global explanations.

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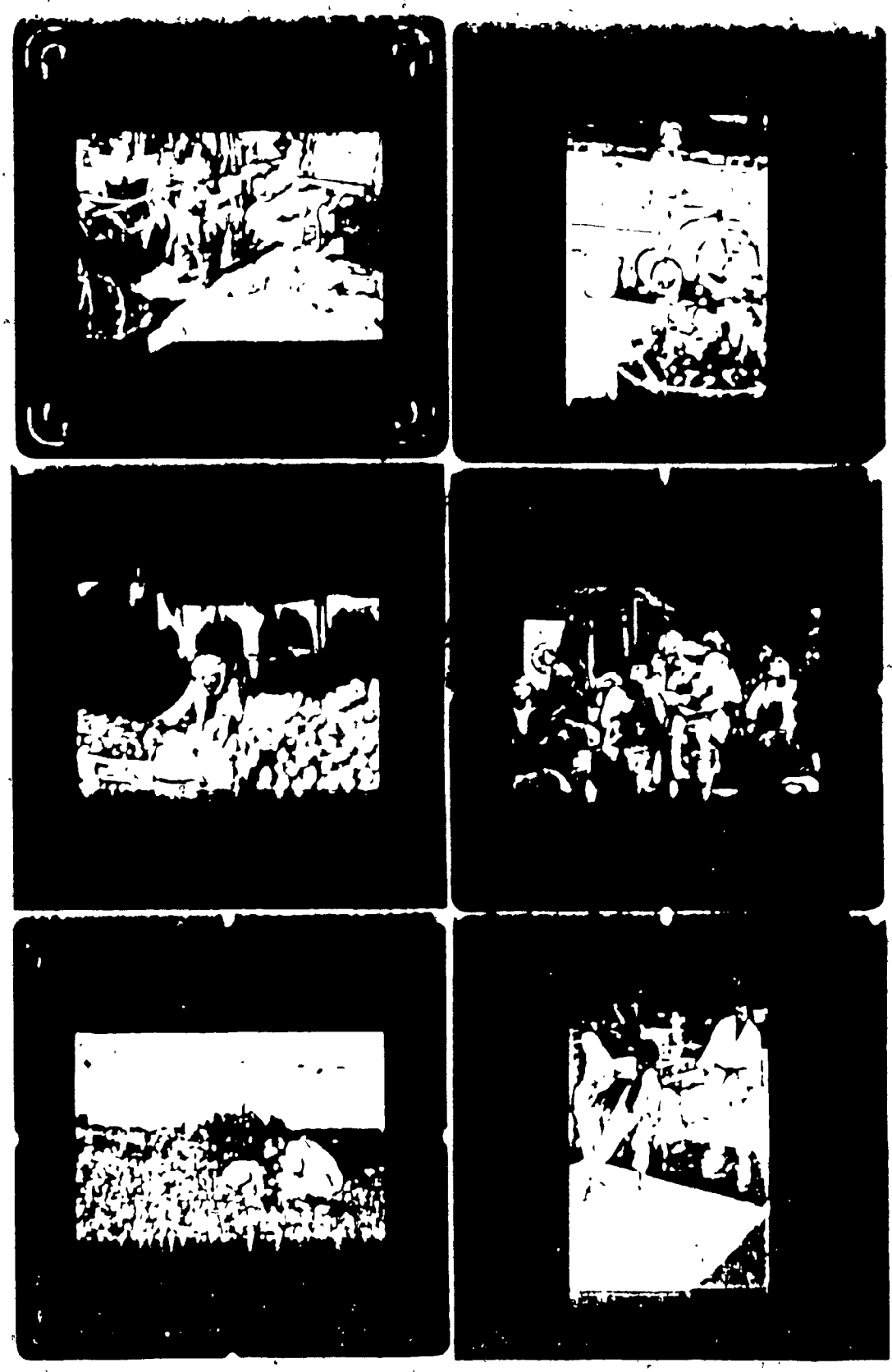
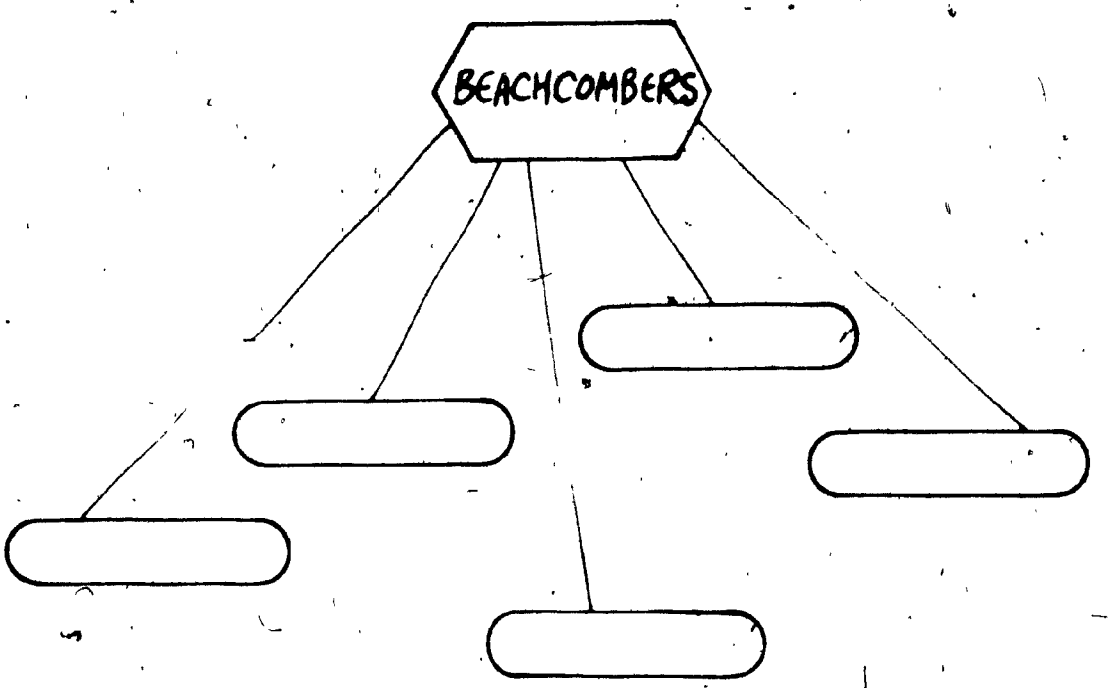
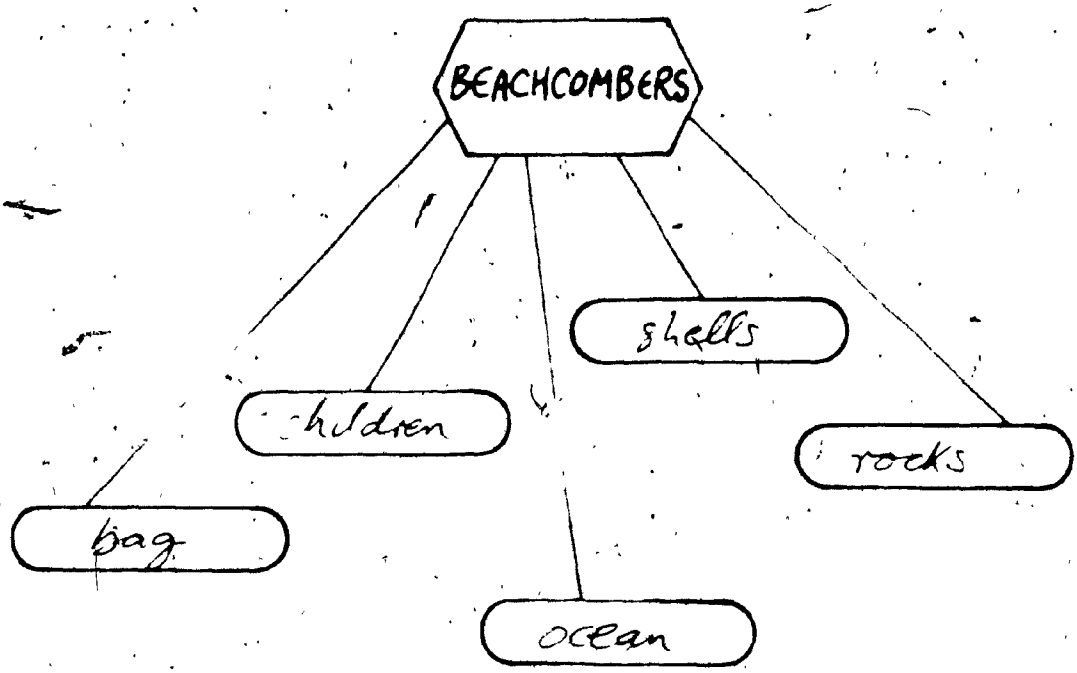
Appendices

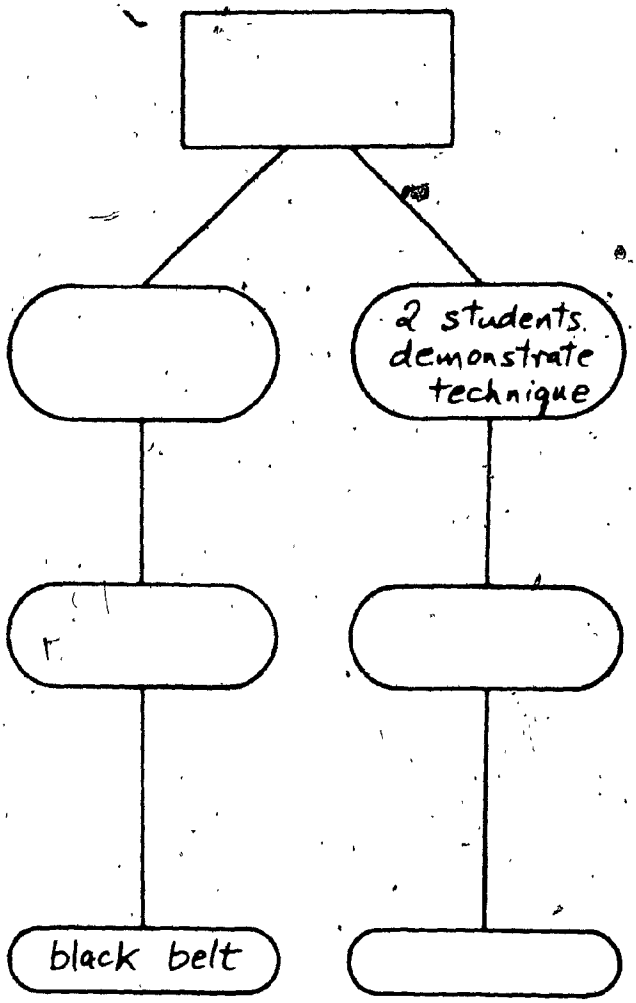
APPENDIX A

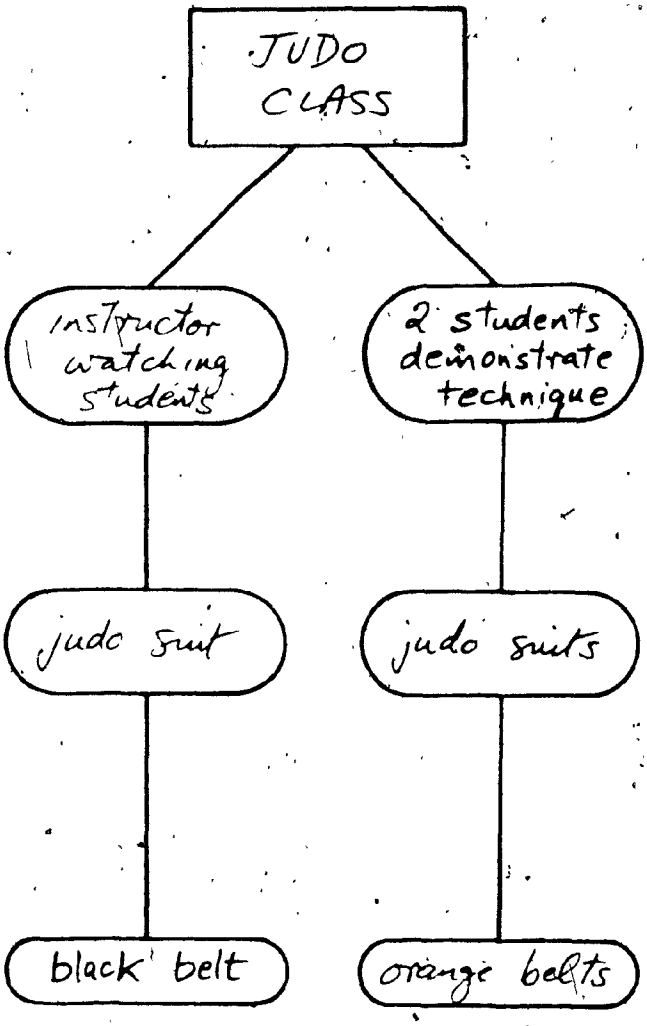
Week One




BEACHCOMBERS

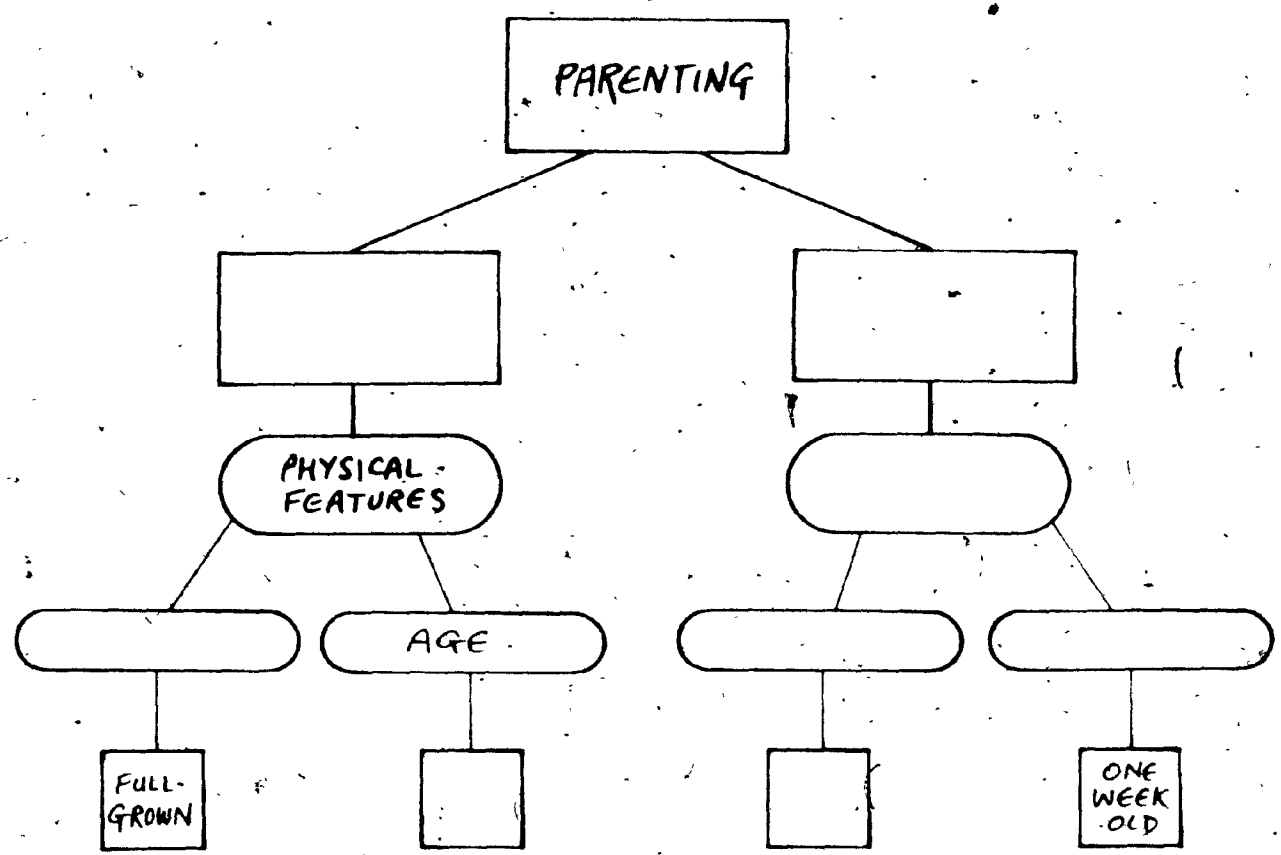

BEACHCOMBERS
children
shells
rocks
bag
ocean

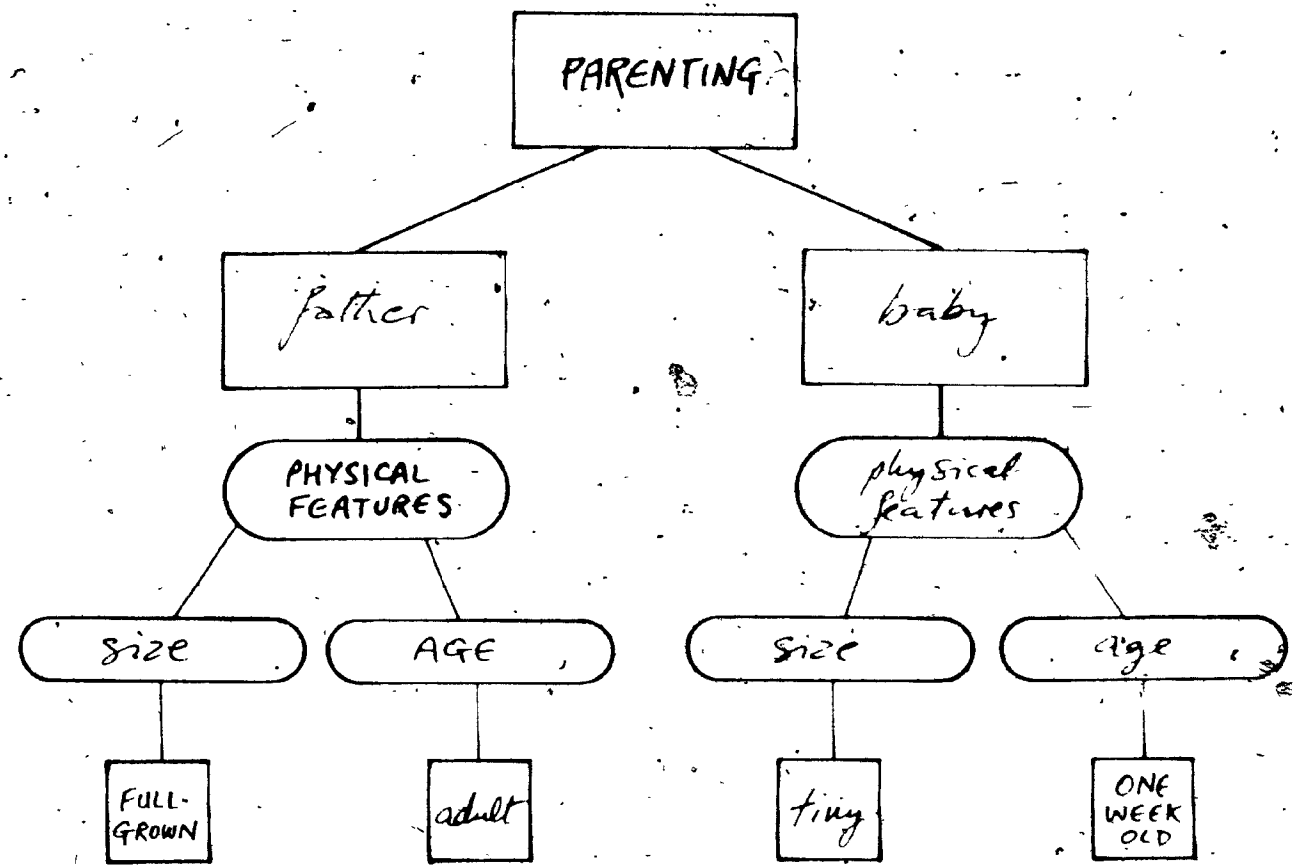

2 students demonstrate technique
black belt

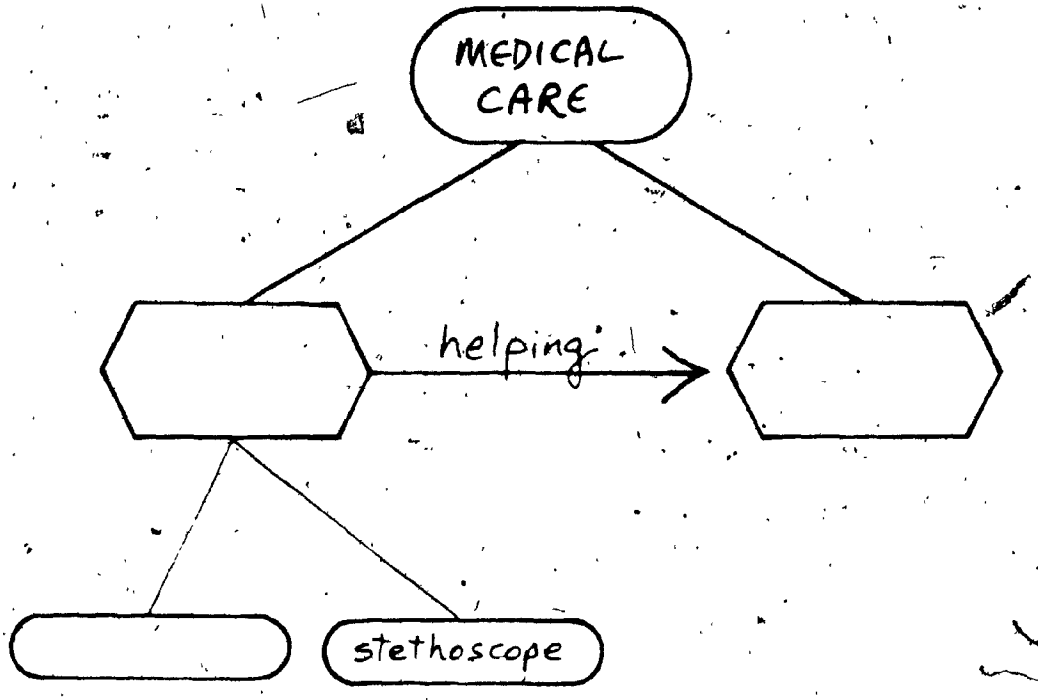

JUDO CLASS
instructor watching students
2 students demonstrate technique
judo suit
judo suits
black belt
orange belts

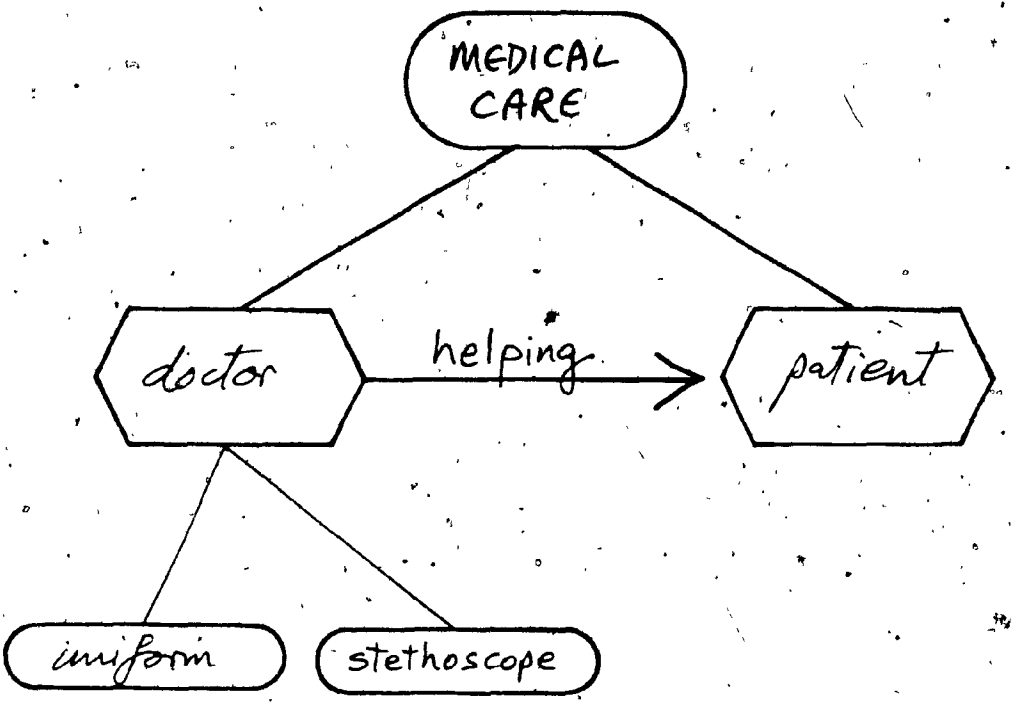
APPENDIX B

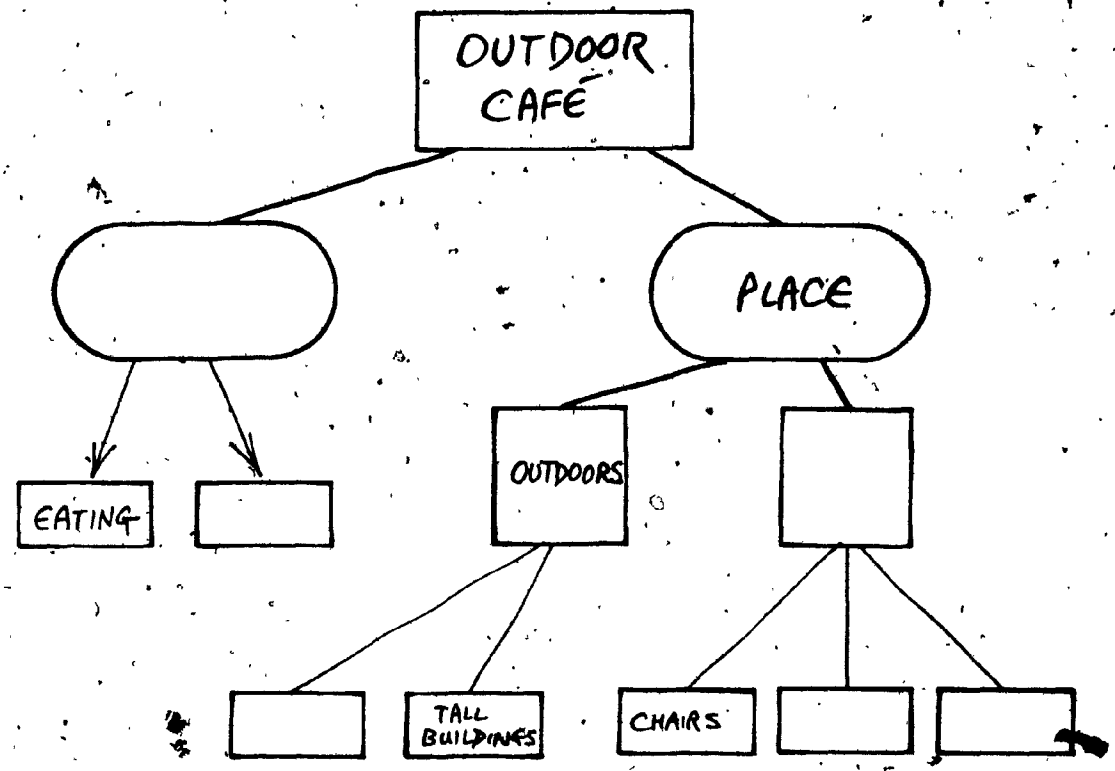
Week Two

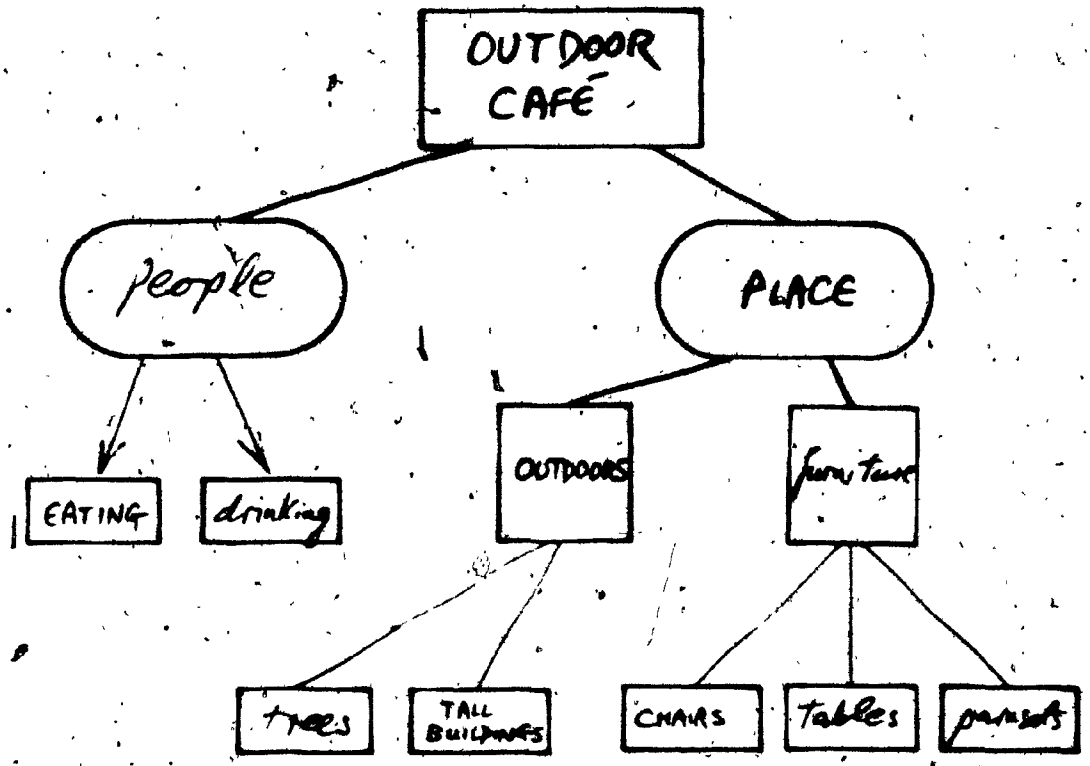

PARENTING
PHYSICAL FEATURES
AGE
FULL-GROWN
ONE WEEK OLD


PARENTING
father
baby
PHYSICAL FEATURES
physical features
size
AGE
size
age
FULL-GROWN
adult
tiny
ONE WEEK OLD


MEDICAL CARE
helping
stethoscope

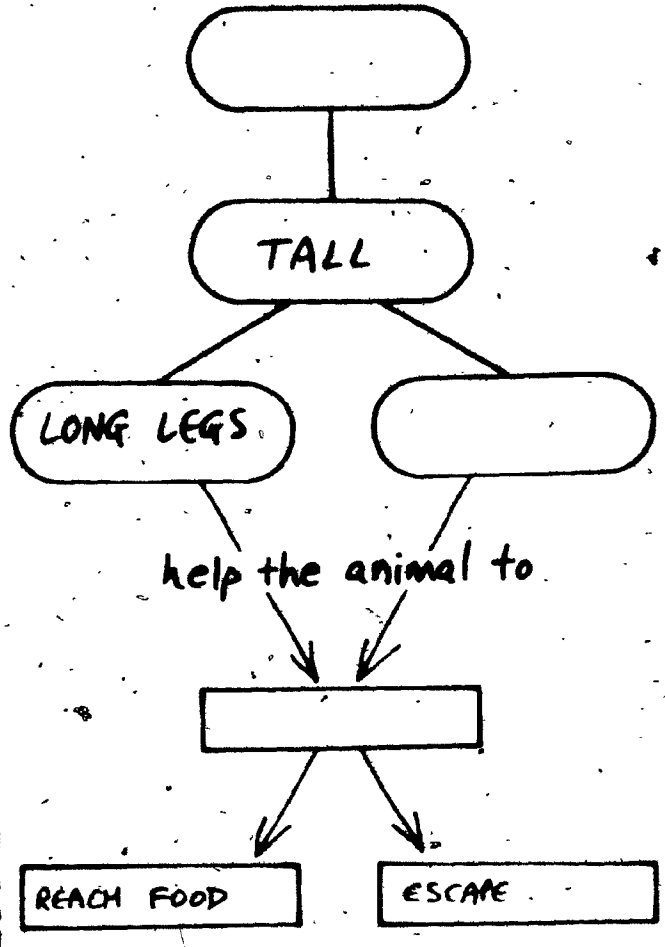

MEDICAL CARE
doctor
helping
patient
uniform
stethoscope


OUTDOOR CAFÉ
PLACE
EATING
OUTDOORS
TALL BUILDINGS
CHAIRS


OUTDOOR CAFÉ
people
PLACE
EATING
drinking
OUTDOORS
furniture
trees
TALL BUILDINGS
CHAIRS
tables
parasols

TALL

If the giraffe had dumpy legs and a short neck it probably wouldn't survive long. It wouldn't be able to find enough food on the hot African plains and it would soon fall prey to lions. To a giraffe, being tall is very important.



TALL

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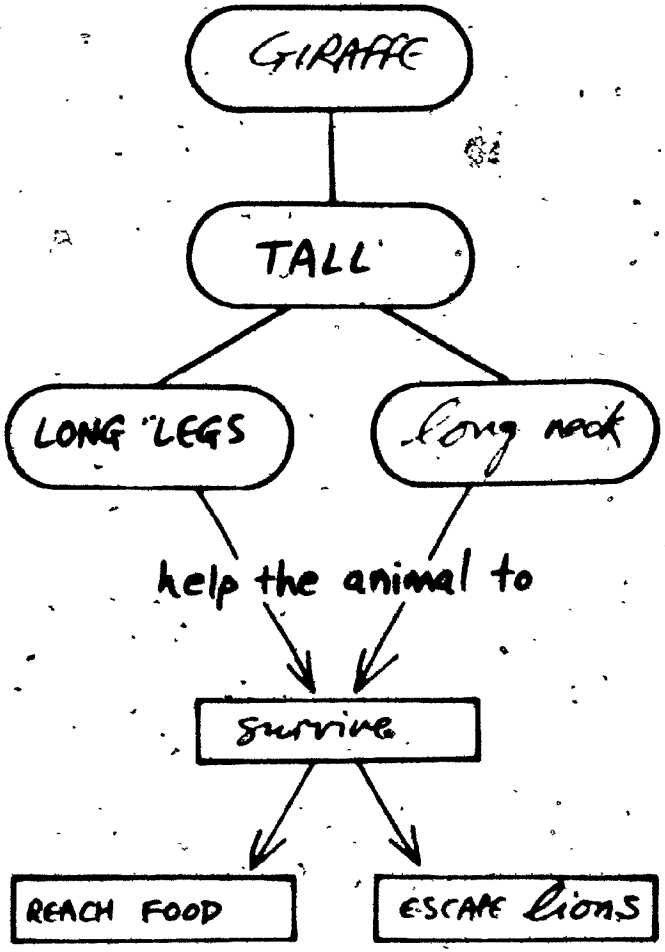


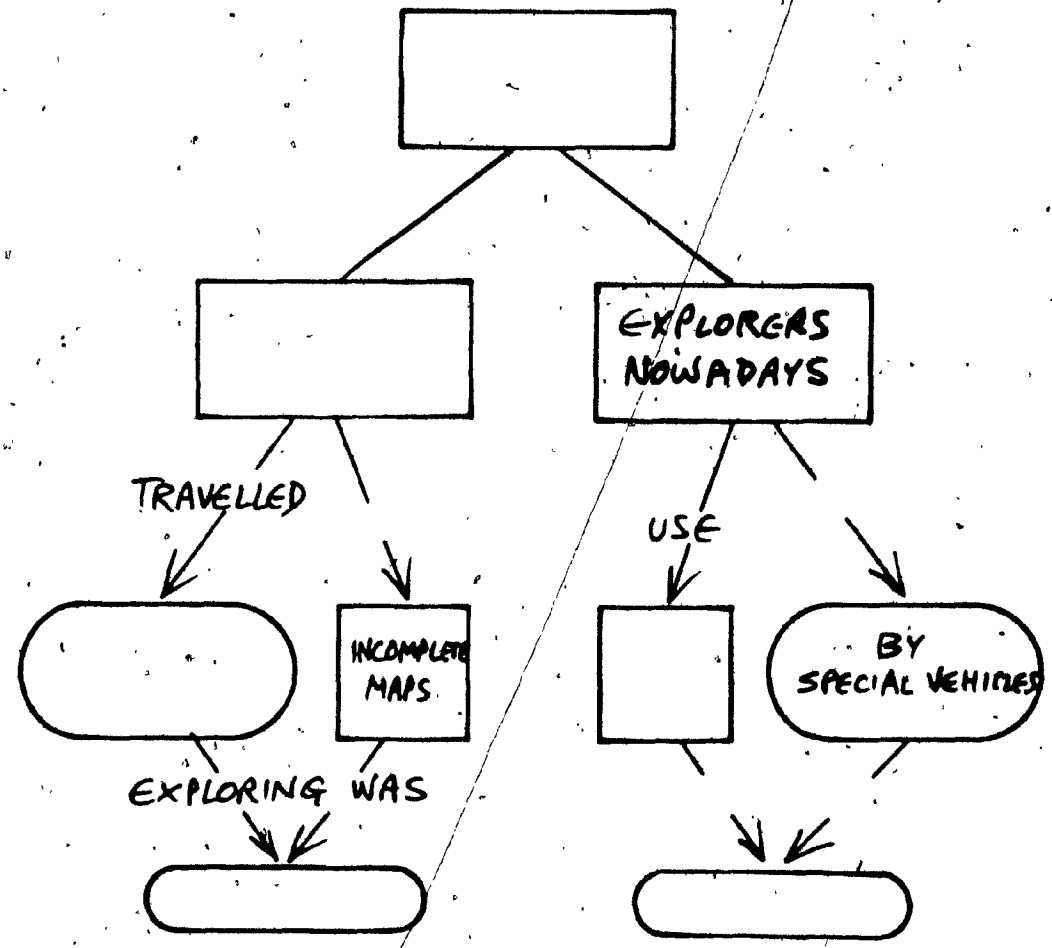
APPENDIX C

Week Three

Exploration now is much easier than it was 100 years ago. Travellers from Europe or North America used to get lost in parts of Africa, for instance, because it was impossible to make good maps of areas which had not yet been fully explored.

Today's explorers use accurate maps, not like those incomplete maps of the 1880's. Back in those days, explorers travelled slowly, by boat, by animal (on horseback, or on a mule, camel or elephant), or else they simply walked! Sometimes it took days to cover just a few kilometers.

Now it is much easier for us to satisfy our curiosity about strange, faraway places. There are specialised vehicles to take people deep down in the ocean or way out into space.



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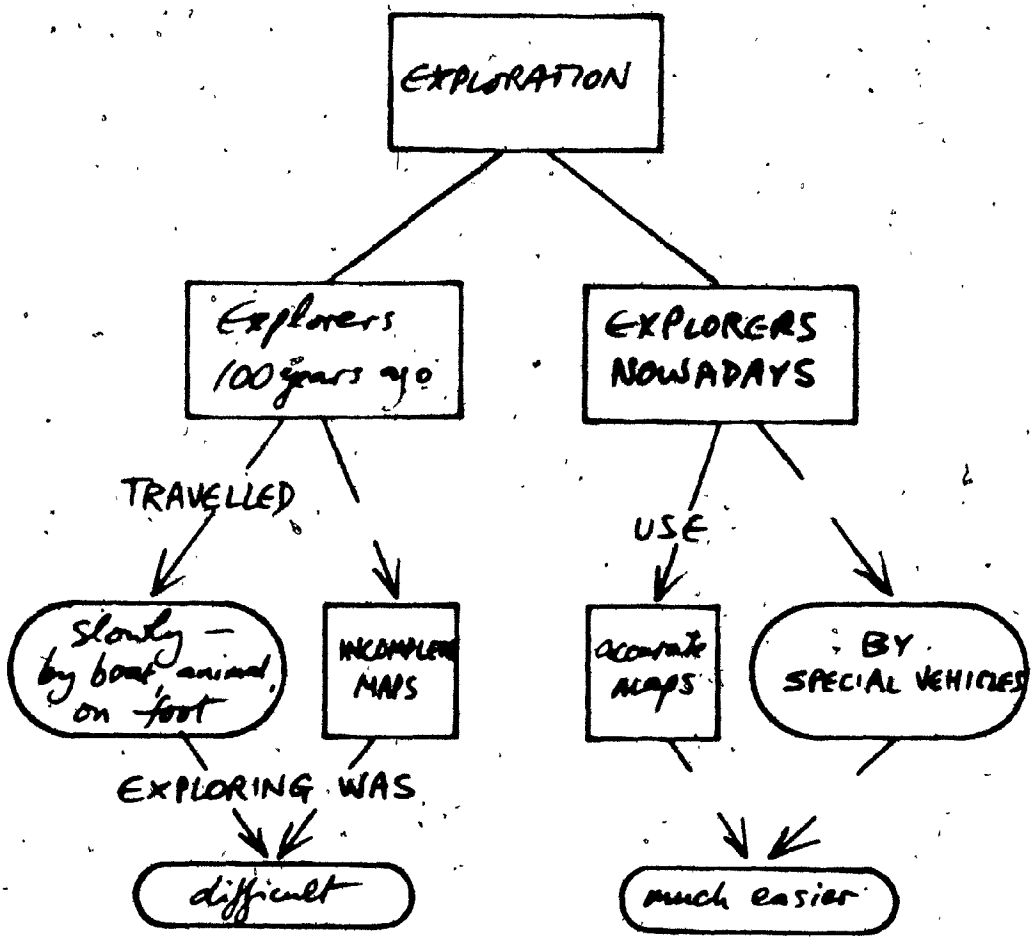


first name : _____ family name : _____

Pick A, B, C, or D to complete each of the 5 sentences below. Please put your answers in the boxes provided right HERE!

1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [ ]

1. The best title for the passage would be...

A "Maps"
B "Oceans"
C "Exploration"
D "Europe"

2. Travel in Africa used to be...

A confusing
B impossible
C very easy
D fast and comfortable

3. The author of this passage compares exploration nowadays with exploration...

A a few years ago
B 1 880 years ago
C 100 years ago
D in the future

4. Maps nowadays are usually

A incomplete
B strange
C impossible to make
D accurate

5. In the 1880's explorers did not travel...

A in specialised vehicles
B by boat
C on foot
D on horseback

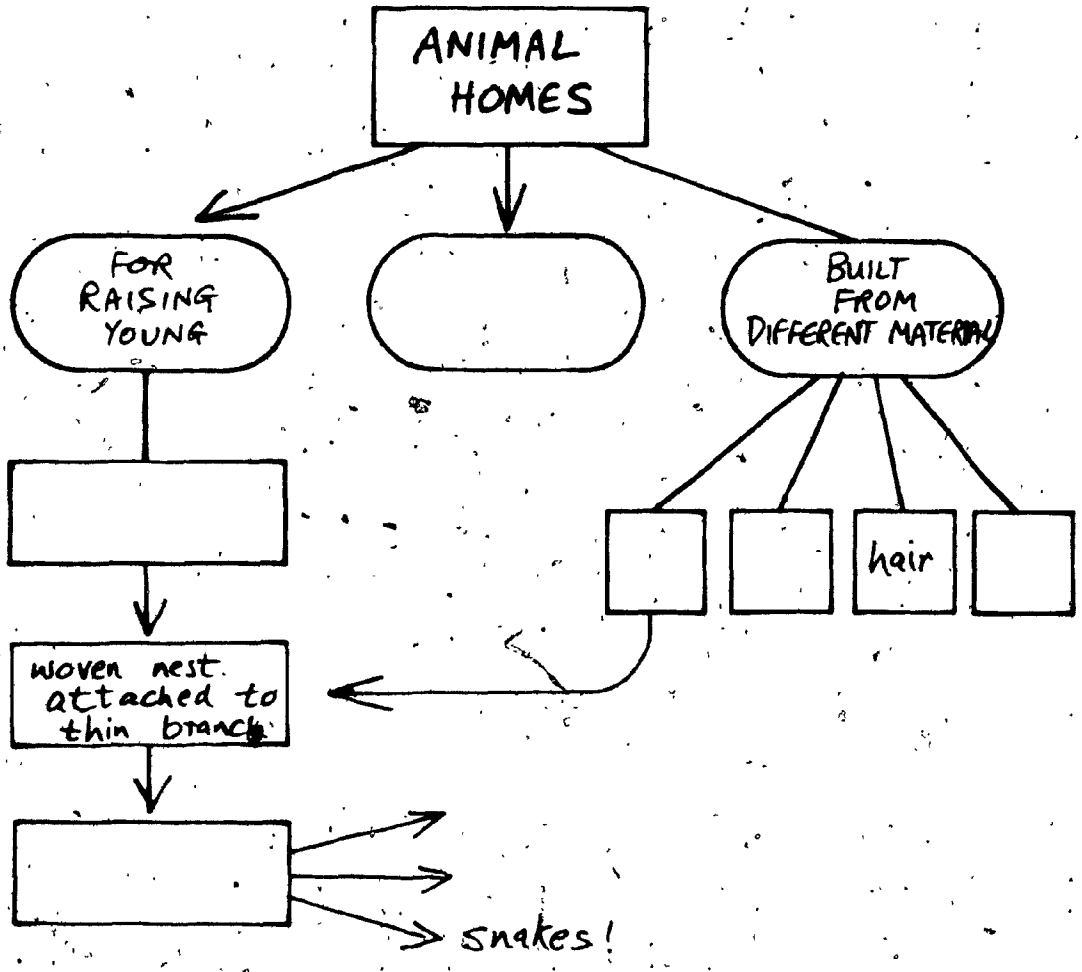
APPENDIX D

Week Four

Many wild creatures work hard building homes. Some build homes mainly as places in which to raise their young, while others build homes to live in.

All sorts of materials are used in home construction. Birds generally use materials found around them. Some prefer string, others look for animal hairs. Many birds will make use of whatever grasses and leaves are plentiful during the nesting season.

The weaver birds of Africa are faced with an unusual problem. They have to protect their young from tree-climbing snakes. To do this, they choose a very thin branch which can not support the weight of a snake. Then they weave long blades of grass together into a nesting ball attached to the twig. The tiny home is out of bounds to snakes and it protects weavers from sun and rain.



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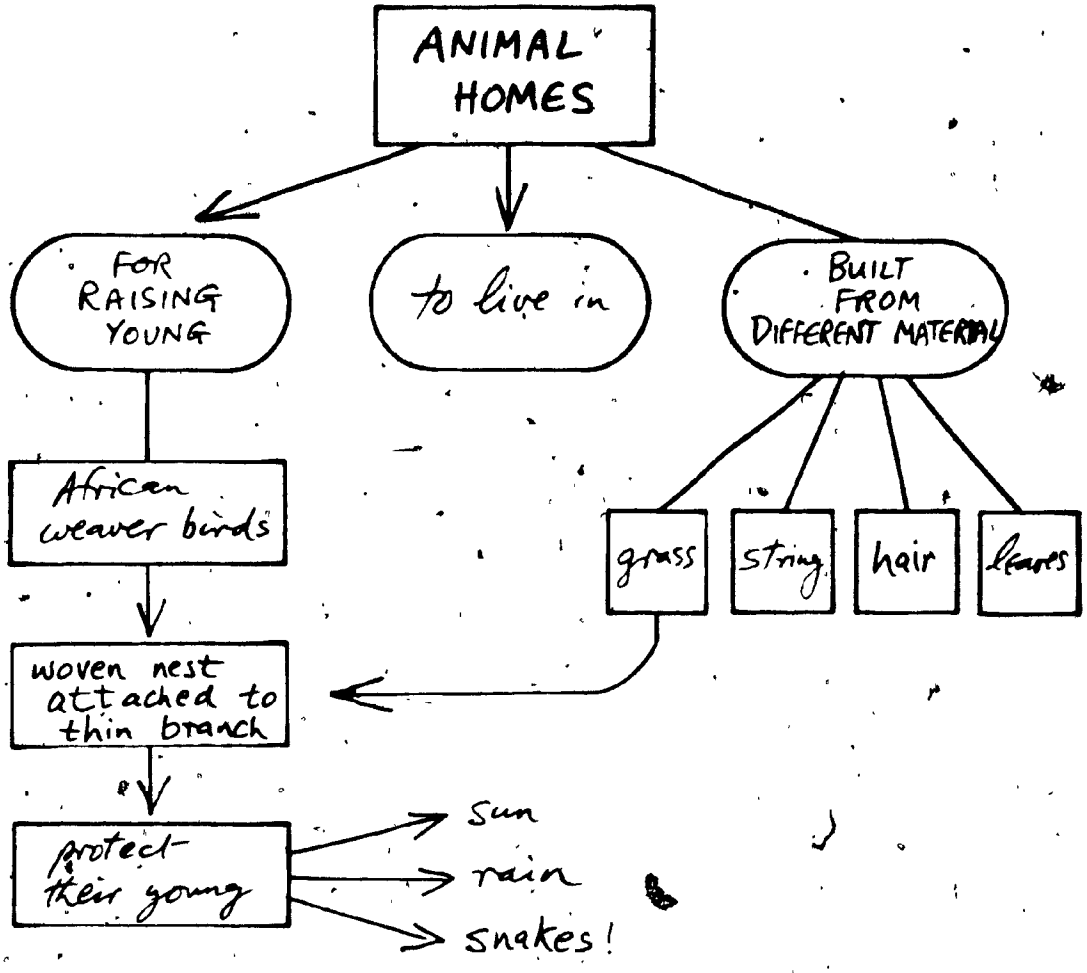


first name : _____ family name : _____

TRUE OR FALSE?

Directions: Read each sentence. Write a T in the box if the sentence is TRUE. Write F if the sentence is FALSE.

[ ] Most wild creatures are too lazy to make a home.

[ ] Animal hair is suitable for building some homes.

[ ] Africa has problems with tree-climbing birds.

[ ] Weaver birds build on thick, strong branches.

[ ] A nest can be made entirely out of grass.

FILL IN THE MISSING WORDS...

Directions: Read each sentence and fill in the blank with the best answer.

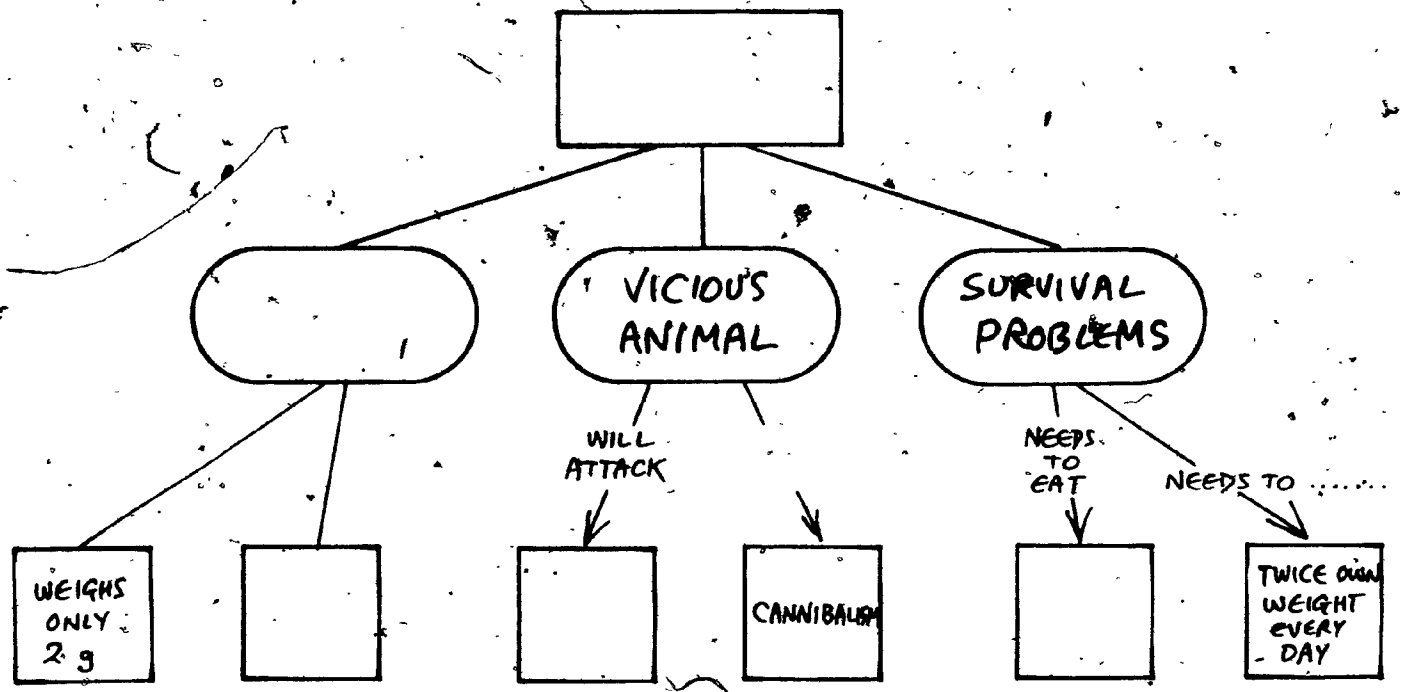
1. Some wild creatures build homes in which they will raise their _____.

2. To build a home, many birds use whatever is abundant during their _____ season:

3. Weaver birds of Africa have to _____ their homes from snakes.

4. A weaver nest shelters the family from _____ and _____.

Luckily for us, the most vicious animal in the world is very small! The shrew measures only 5 cm and weighs only 2 g. But what it lacks in size, it certainly makes up for in courage! It will attack anything that moves and will even resort to cannibalism when no other food is around. This nasty little fellow doesn't kill just for fun, though. It will starve to death if it doesn't eat at least once every two hours. It needs to consume twice its own weight in food every day. To help in its never-ending hunt for prey, the shrew stores poison in its salivary glands. There is enough poison in one of its glands to kill 200 mice!



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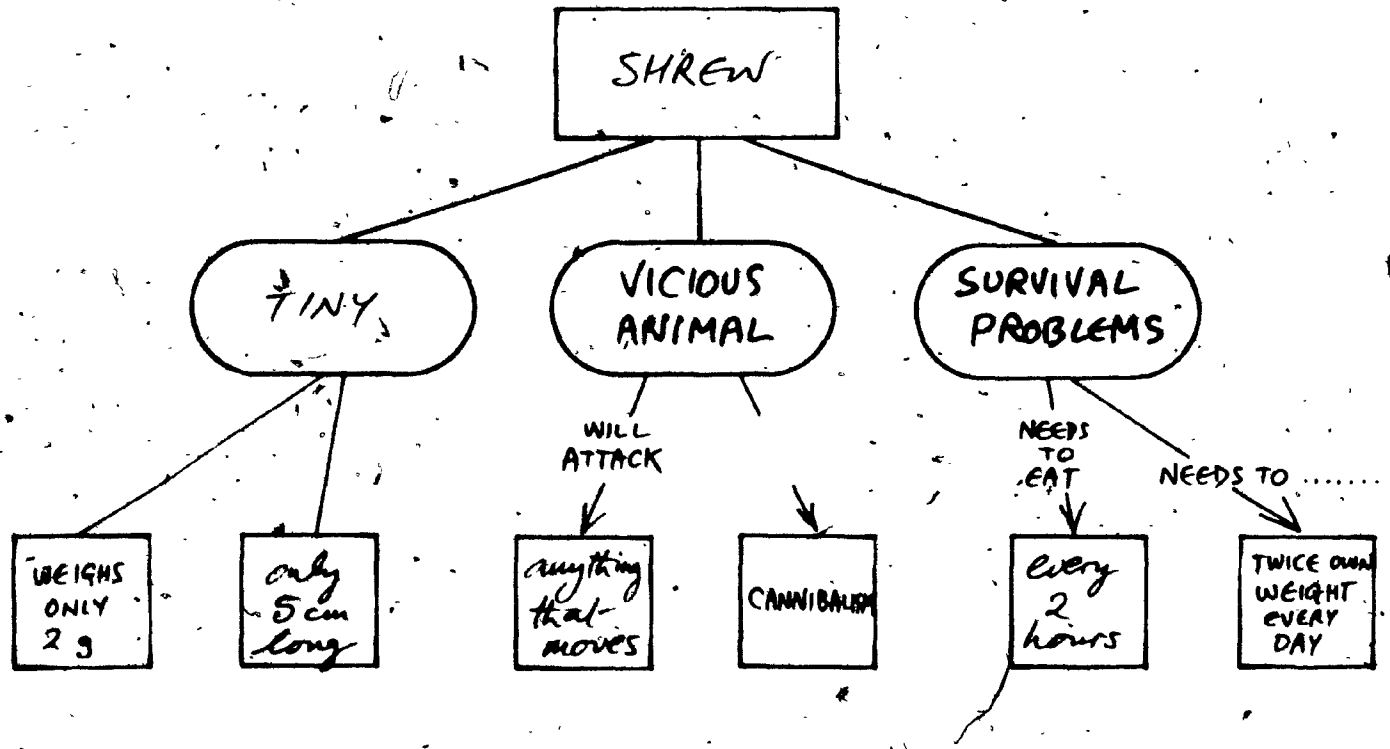
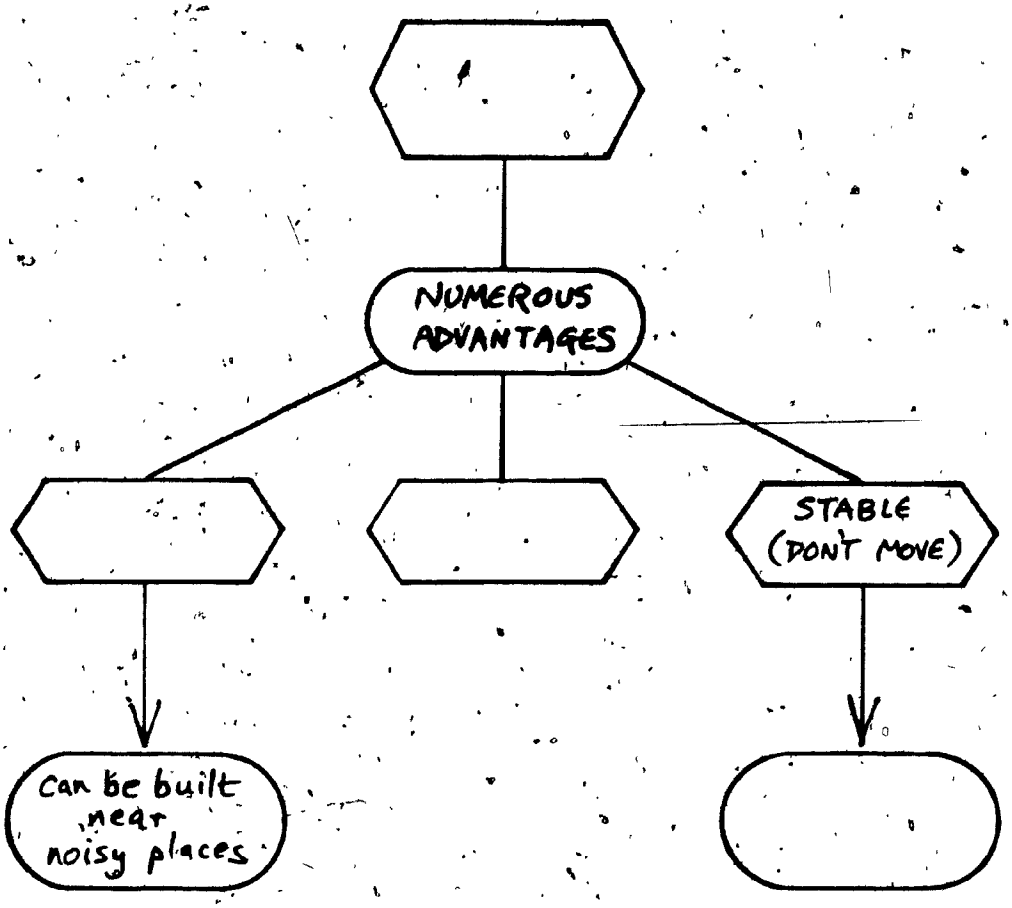


APPENDIX E

Week Five

Underground buildings have numerous advantages aside from being energy efficient. They are extraordinarily quiet and stable, so much so that factories producing sensitive instruments in Kansas City and Montreal have been built below ground to avoid stray vibrations. The quiet of underground homes means they can be built near highways and airports and other noisy places.



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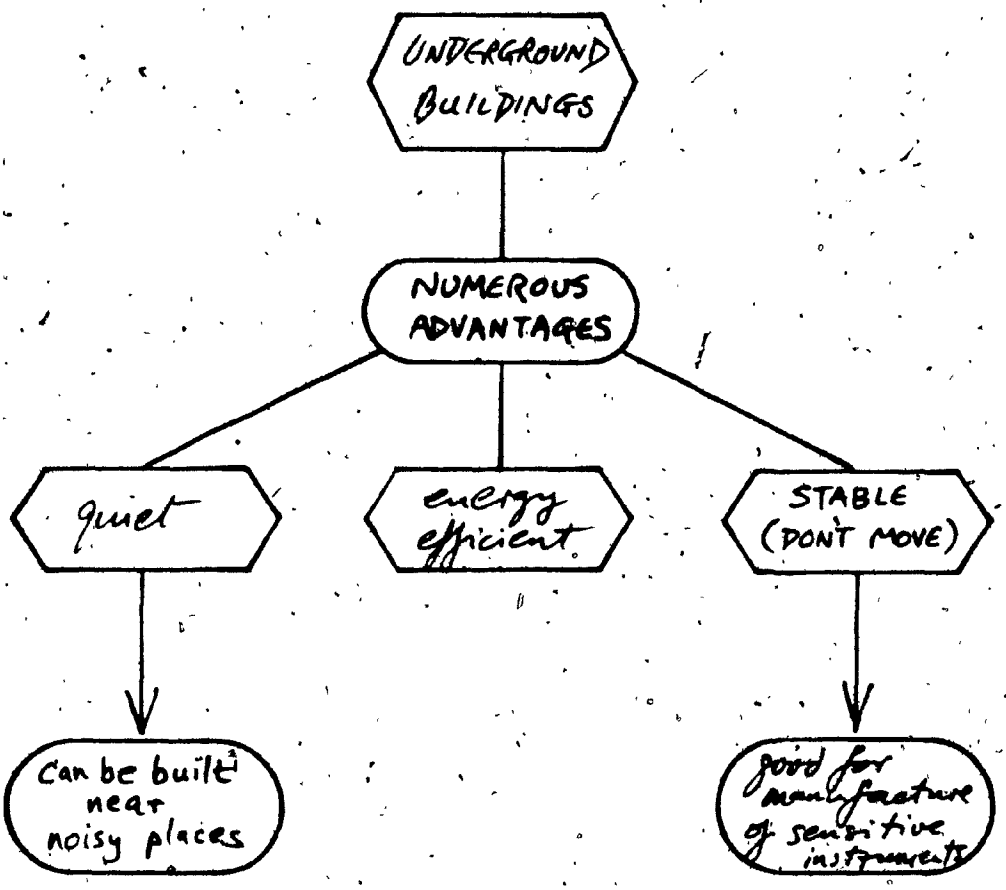
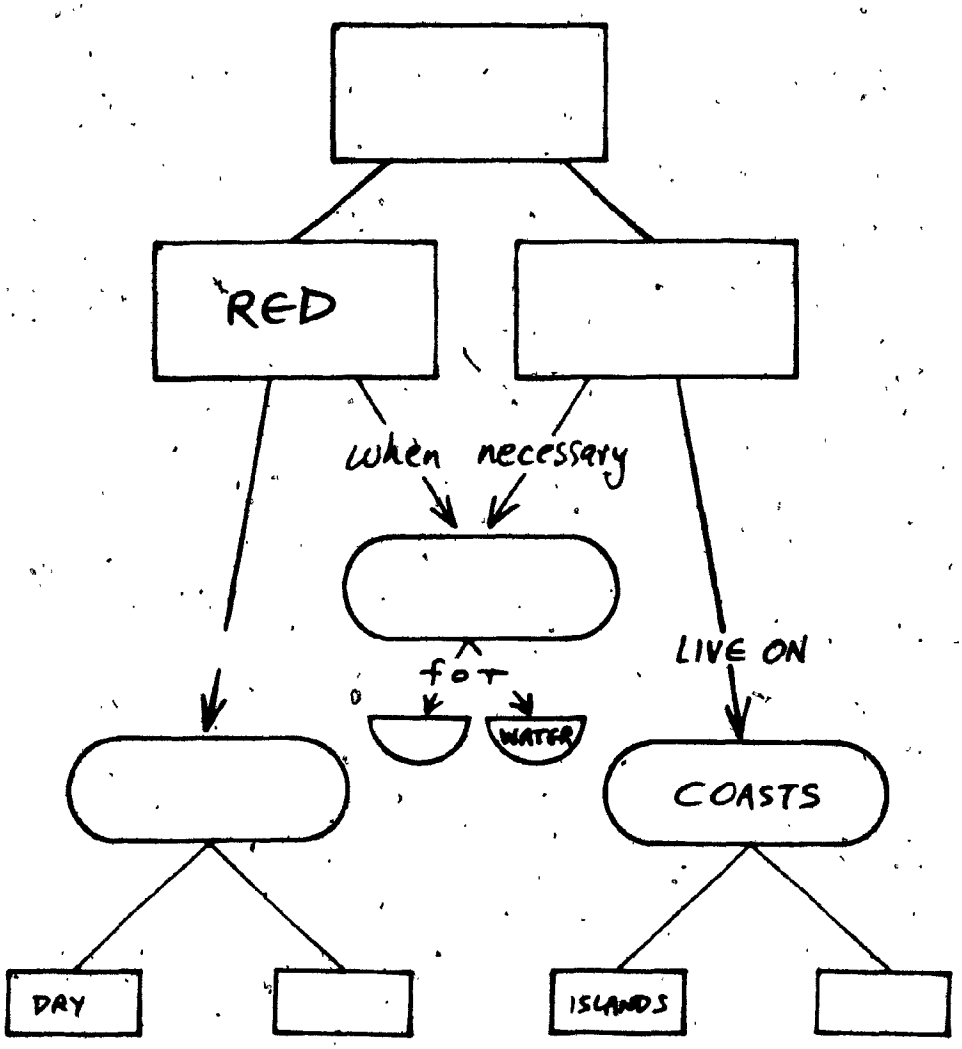


Red kangaroos roam the dry, grassy plains of Australia. Grays live in forests along the coasts of Australia and on some nearby islands. When necessary, these animals travel great distances in search of food and water.



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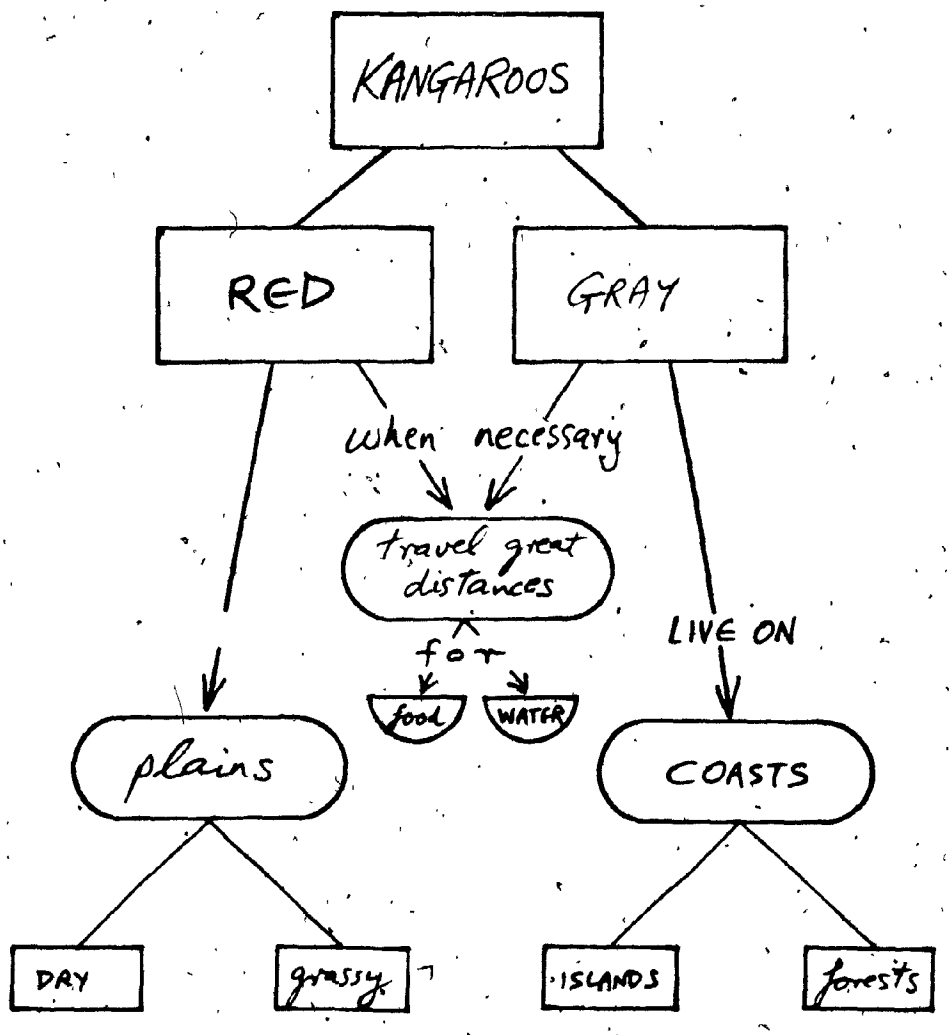


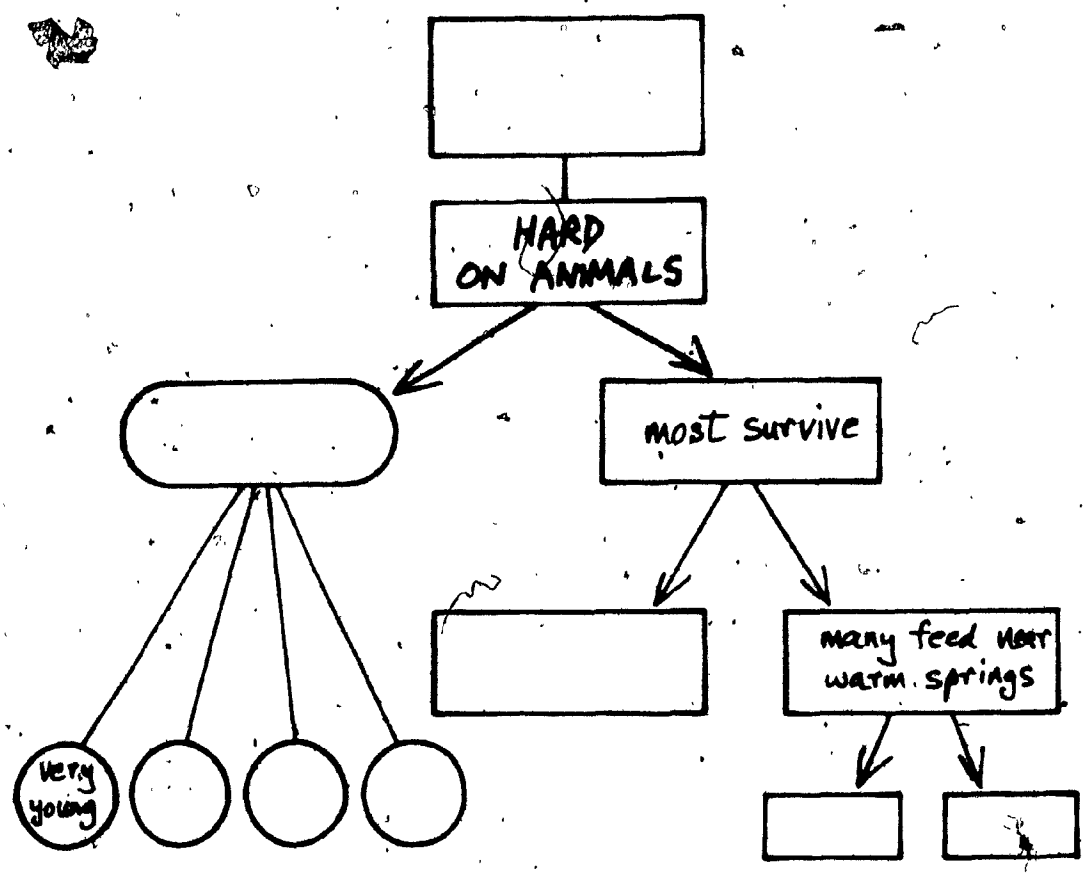
APPENDIX F

Week Six

Winter lasts a long time in Yellowstone National Park. For six months deep snow covers the ground and temperatures fall as low as -40 degrees Celsius. That's hard on the animals of Yellowstone. Animals that are sick, weak, old or very young die during those long cold months. But most of the Park's bison, bears, moose and mountain lions survive.

Bison make their way through deep snow by swinging their huge heads from side to side. This action pushes the snow out of their way, just as a snow-plough would. As they go, they uncover grass which they can eat.

Many animals survive the winter because of the warm springs found in Yellowstone Park. Moss and grass can be found all through the winter in places where the ground is warmed by the springs.



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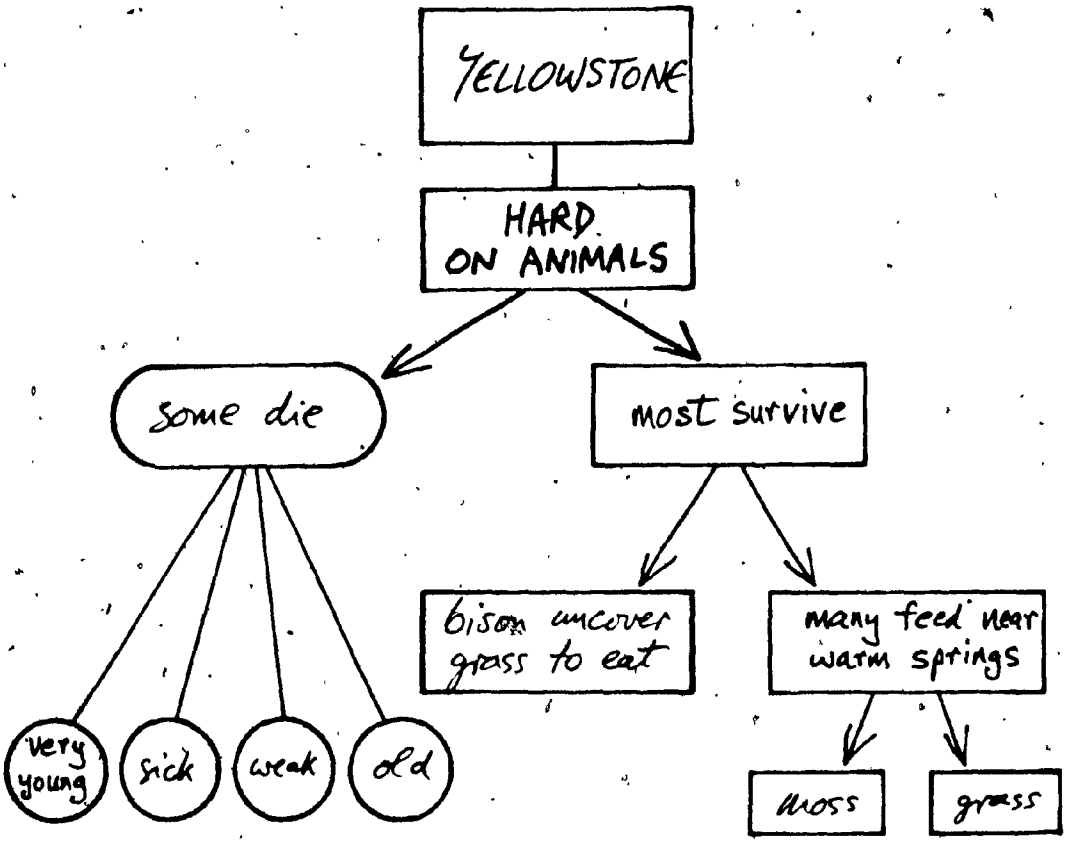
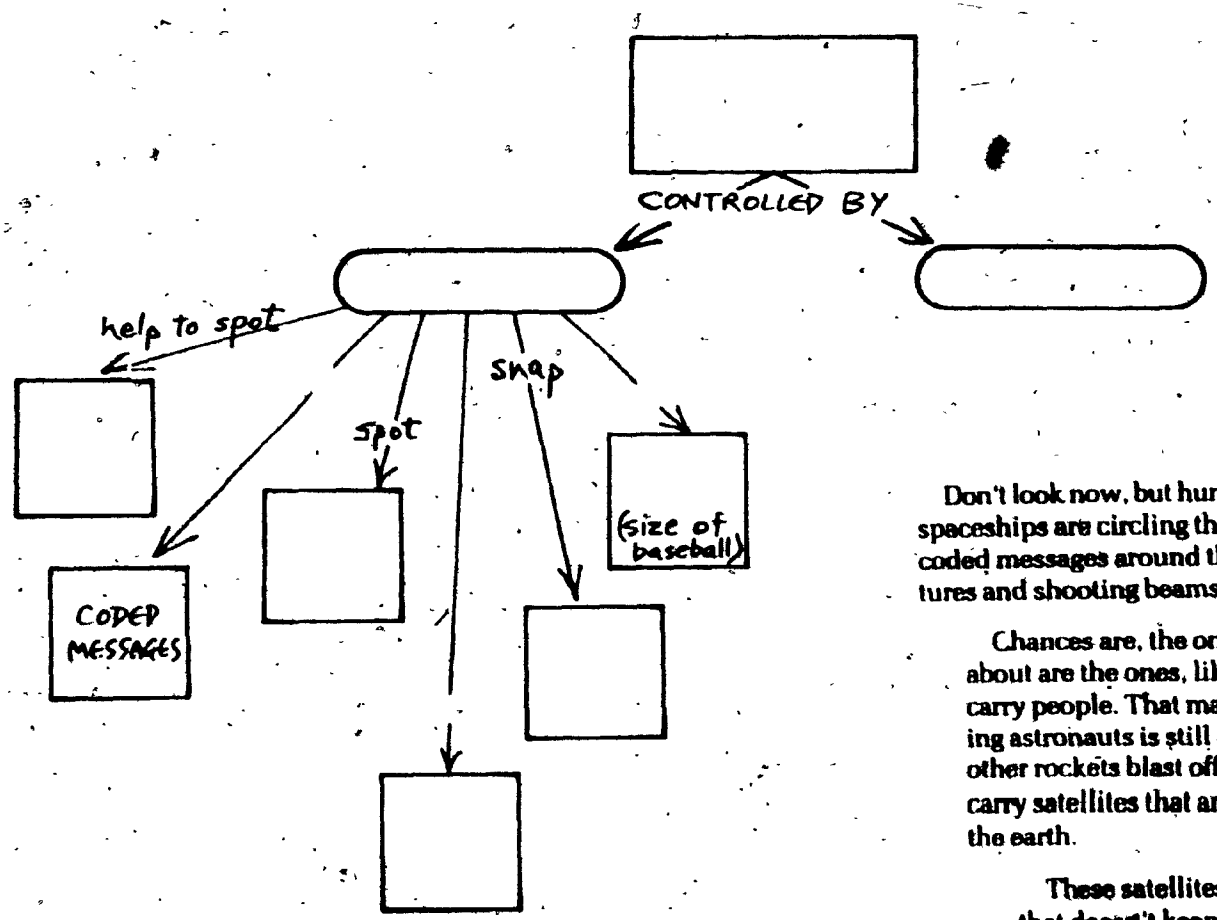
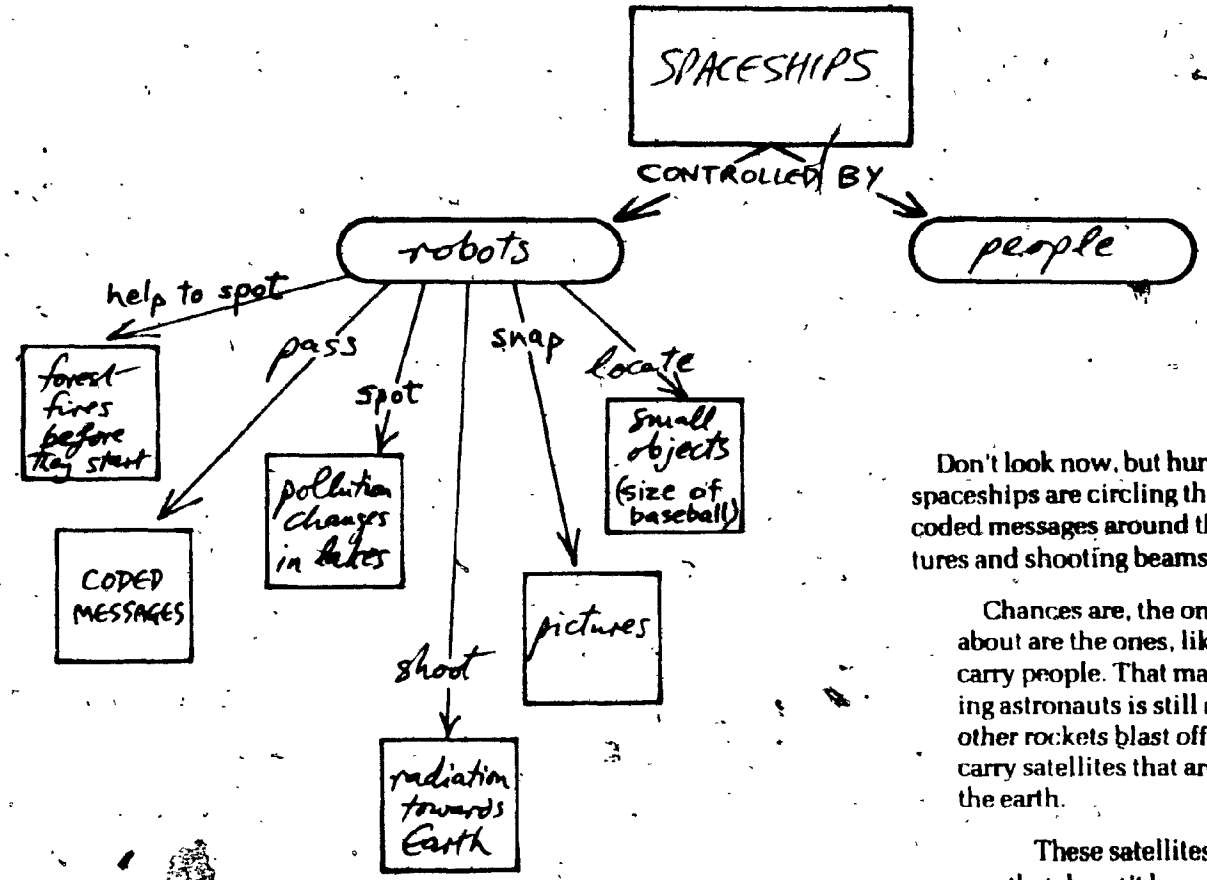




Don't look now, but hundreds of robot-controlled spaceships are circling the earth. They are passing coded messages around the planet, snapping pictures and shooting beams of radiation at the earth.

Chances are, the only spaceships you ever hear about are the ones, like the space shuttle, that carry people. That makes sense but spacecraft carrying astronauts is still a rare event. Dozens of other rockets blast off into space every year. They carry satellites that are placed in orbit around the earth.

These satellites have no people on board. But that doesn't keep them from doing some amazing and important things. Some satellites help spot forest fires *before* they happen. Others can spot pollution changes in the middle of lakes. Still others can locate objects as small as a baseball!



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first name : _____ family name : _____

Pick A, B, C, or D to complete each of the 5 sentences below. Please put your answers in the boxes provided right HERE!

1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [ ]

1. Satellites are described here as being...

A controlled by astronauts on board
B uncontrollable
C controlled by robots
D uncontrolled

2. The space shuttle is special because it...

A sends radiation beams down to Earth
B has no-one on board
C prevents forest fires
D carries people

3. Satellites are capable of...

A finding lost baseballs
B noticing damage caused by pollution
C placing astronauts in orbit
D starting forest fires

4. Photographs of our planet can be taken by...

A a satellite or someone in the space shuttle
B satellites only
C space shuttle astronauts only
D snapping turtles

5. Orbiting around Earth, there are...

A dozens of space shuttles
B hundreds of spaceships manned by people
C about a dozen satellites
D hundreds of unmanned satellites

APPENDIX G

Test Package

DIRECTIONS

Read the following paragraphs. Fill in the best answers for the empty boxes of the graphic organizer. Don't worry about spelling.

GOING OUT FOR A BREATH OF GROSS AIR ?

Air pollution is a growing problem. Since man learned to make fire, he has polluted the air. This did not matter for thousands of years. But as man's numbers have started to expand, so has the waste he pours into the air. If a country becomes industrialized, the problem grows rapidly worse. Let's look at three causes of air pollution and their effects.

One example is the burning of fossil fuels. Most air pollution comes from burning fossil fuels such as coal and fuel oil. Sulphur dioxide is created if these are burned. It harms people's health, it poisons plants, it stunts the growth of trees, and it hastens the decay of buildings.

Automobile traffic is another example. 60 per cent of air pollution is estimated to come from automobiles. Most of the pollution is carbon monoxide (a dangerous gas). Congested traffic between high buildings can make the situation dangerous. Some cities, such as Tokyo, have fresh-air machines. These are needed by police on traffic duty, and by other people in places where pollution is heavy. In large amounts, carbon monoxide can kill. In smaller amounts, it may cause severe headaches.

The automobile has other drawbacks. It has been designed to use gasoline containing lead. Many countries have controlled the amount of lead in gasoline. They would like to ban it altogether. Cars are great wasters of oxygen. On a 600-kilometer journey, a car uses as much oxygen as a person needs in a year.

Some weather conditions make pollution much worse. In the lower layers of the atmosphere the temperature usually falls as you go up. Warm dirty smoke rises and disperses. But sometimes the air at ground level is cold, with a warm blanket of air above. Smoke is trapped because it cannot rise through the warm blanket. The result of this is called smog. It is a major problem in cities surrounded by hills. Smog can cause breathing problems, and it can reduce visibility in traffic.

GOING OUT FOR A BREATH OF GROSS AIR

Air Pollution... a Growing Problem

Since man learned to make fire, he has polluted the air. This did not matter for thousands of years. But as man's numbers have started to grow, so has the waste he pours into the air. If a country becomes "industrialized", the problem grows rapidly worse.

Air Pollution... 3 Causes and their Effects

1. BURNING FOSSIL FUELS

Most air pollution comes from burning "fossil fuels", such as coal and fuel oil. Sulphur dioxide is created if these are burned.

>>> Effects of Sulphur Dioxide:

- it harms people's health
- it poisons plants
- it stunts the growth of trees
- it hastens the decay of buildings

2. AUTOMOBILE TRAFFIC

60 per cent of air pollution is estimated to come from automobiles. Most of the pollution is carbon monoxide (a dangerous gas). Congested traffic between high buildings can make a dangerous situation. Some cities, such as Tokyo, have "fresh-air machines". These are needed by police on traffic duty, and by other people in places where pollution is heavy.

The automobile has other drawbacks. It has been designed to use gasoline containing lead. Many countries have controlled the amount of lead in gasoline. They would like to ban it altogether. Cars are great wasters of oxygen. On a 600-kilometer journey, a car uses as much oxygen as a person needs in a year.

>>> Effects of Carbon Monoxide:

- in large amounts, it can kill
- in smaller amounts, it may cause severe headaches

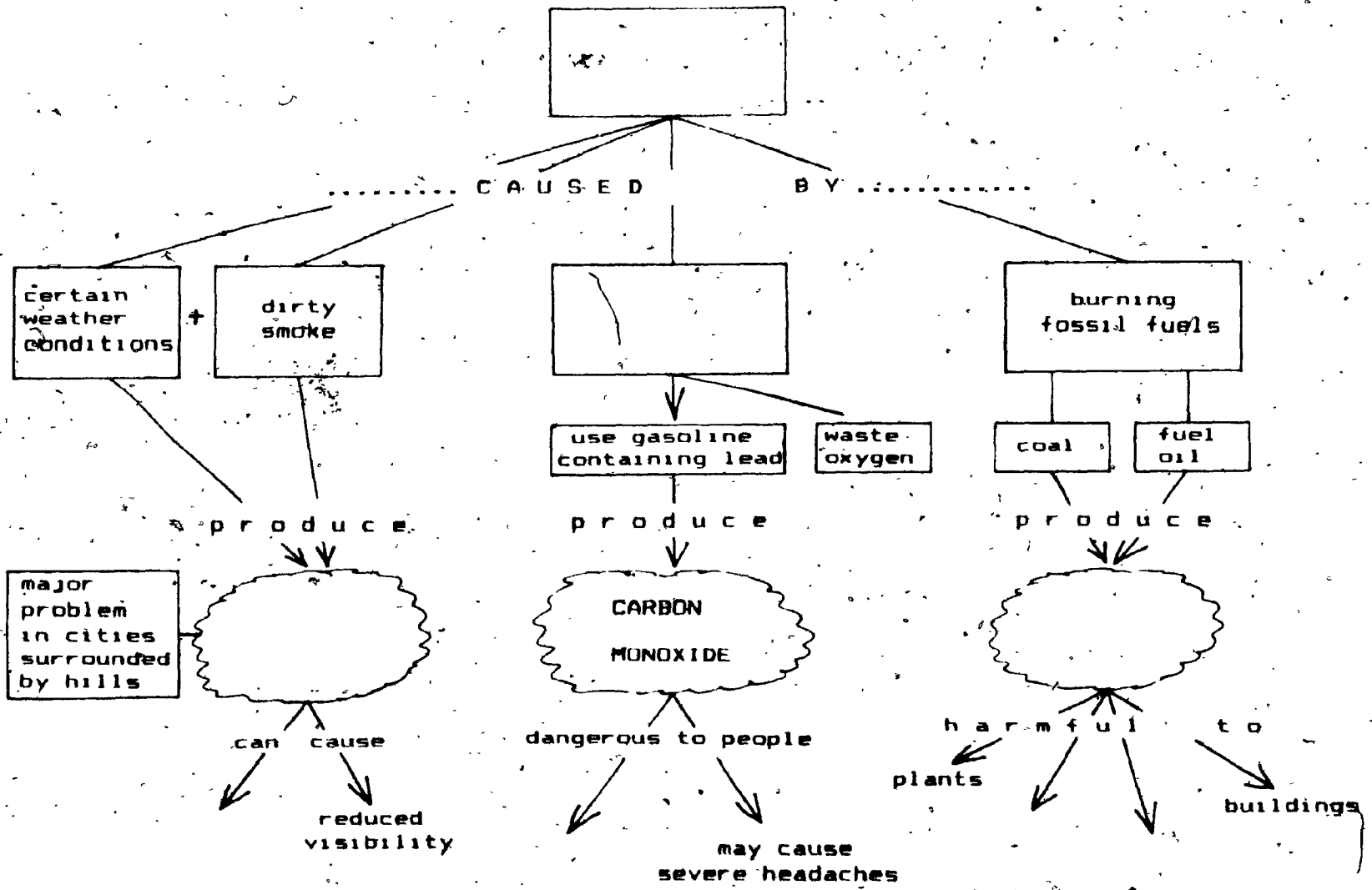
3. WEATHER CONDITIONS

Some weather conditions make pollution much worse. In the lower layers of the atmosphere the temperature usually falls as you go up. Warm, dirty smoke rises and disperses. But sometimes the air at ground level is cold, with a warm blanket of air above. Smoke is trapped because it cannot rise through the warm blanket. The result of this is called smog. It is a major problem in cities surrounded by hills.

>>> Effects of Smog:

- it can cause breathing problems
- it can reduce visibility in traffic

Note: This is a reduction of the original size.


CAUSED BY
certain weather conditions
+
dirty smoke
use gasoline containing lead
waste oxygen
burning fossil fuels
coal
fuel oil
produce
produce
produce
major problem in cities surrounded by hills
CARBON MONOXIDE
can cause
reduced visibility
dangerous to people
may cause severe headaches
harmful to
plants
buildings

First name:_____ Family name:_____

DIRECTIONS : Read each question. Pick the best answer. Circle the letter in front of your answer.

Here's an example: The page I have just read is about...

A sports
(B) pollution
C racing cars
D the weather

O.K.? Now start the test...

1. Some things which cause air pollution are:...

A fish, birds, reptiles
B streams, rivers, lakes
C buildings, cities, towns
D industries, fossil fuels, car fumes

2. The burning of fossil fuels creates...

A sand
B sulphur dioxide
C rain
D carbon monoxide

3. Increased air pollution may result in...

A fewer plants and animals
B smaller factories
C all children born with deformities
D no police in Japan

4. Sulphur dioxide can harm people's health, but it is even more harmful to...

A plants
B animals
C trains
D pets

5. To reduce automobile pollution, people may have to control...

A the use of fresh-air machines
B the production of sulphur dioxide
C the use of cars
D the number of traffic lights

6. Everyone can help reduce the problem of air pollution by...

A driving larger cars
B walking or cycling whenever possible
C burning more fossil fuels
D buying a fresh-air machine

7. To prevent automobile pollution, humans may have to control...

A the use of cars
B the production of sulphur dioxide
C the size of parking spaces
D the use of fresh-air machines

DIRECTIONS : Read each sentence. Write a T in the box if the sentence is TRUE. Write F if it is FALSE.

Example : [F] Pollution is healthy.

8. [ ] Dirty air can damage buildings.

9. [ ] The worst polluters of air are factories.

10. [ ] Exhaust fumes from cars are poisonous.

11. [ ] Lighting a fire makes pollution.

12. [ ] Many countries control the amount of lead in gasoline.

DIRECTIONS : Read each sentence and fill in the blank with the best answer.

13. _____ is formed when the air at ground level is cold and smoke becomes trapped under a layer of warm air.

14. As industrialization grows, _____ also increases.

15. Sixty per cent of air pollution is caused by _____.

16. In Tokyo, police on traffic duty use _____ machines to protect themselves from air pollution.

17. Automobiles contribute to air pollution problems because they waste _____.

18. The growth of _____ has been affected by sulphur dioxide.

19. The problem of smog is most common in cities surrounded by _____.

First name:_____ Family name:_____

DIRECTIONS : Read each question. Pick the best answer. Circle the letter in front of your answer.

Here's an example: The best title for this reading is...

A Monkeys
(B) Pollution
C Cars
D Weather

O.K.? Now start the test...

1. What is created when fossil fuels are burned?

A carbon monoxide
B rain
C sulphur dioxide
D ashes

2. Air pollution is caused by the following things:

A industries, fossil fuels, car fumes
B atmosphere, forests, rivers
C buildings, cities, towns
D fish, insects, rodents

3. Sulphur dioxide harms people's health, but it is more dangerous to...

A animals
B plants
C cars
D pets

4. Continued pollution may lead to...

A no police in Japan
B larger factories
C fewer plants and animals
D all children born with deformities

5. Air pollution could become dangerous to you if...

A your car uses a lot of gasoline
B you're driving too fast through a forest
C you're driving too slowly on a highway
D you're in a traffic jam with tall buildings all around

6. Air pollution might be a danger to you if...

A you're driving too fast in the country
B you're in a traffic jam with tall buildings all around
C your car uses a lot of gasoline
D you're driving too slowly on the highway

7. Air pollution can be reduced by...

A burning more fossil fuels
B talking less on the phone
C walking or cycling whenever possible
D driving bigger automobiles

DIRECTIONS: Read each sentence. Write a T in the box if the sentence is TRUE. Write F if it is FALSE.

Example: [F] Air pollution is good.

8. [ ] The worst polluters of air are industries.

9. [ ] Lighting a fire makes pollution.

10. [ ] Many countries limit the amount of lead in gasoline.

11. [ ] Polluted air may damage houses.

12. [ ] Exhaust fumes from automobiles are poisonous.

DIRECTIONS: Read each sentence and fill in the blank with the best answer.

13. When the air at ground level is cold and smoke becomes trapped under a layer of warm air, _____ is formed.

14. _____ causes sixty per cent of air pollution.

15. Sulphur dioxide has affected the growth of _____.

16. By wasting _____, automobiles contribute to air pollution problems.

17. The problem of smog is found more often in cities surrounded by _____.

18. As industrialization increases, the problem of _____ also increases.

19. _____ machines are used by Tokyo traffic police to protect them from air pollution.

APPENDIX H

List of Idea Units

- Going out for a (breath of (gross air)))
- ((air pollution) is (a growing problem))
- ((since man learned to make (fire) (he has polluted the air))
- ((Pollution did not matter) for thousands of years)
- (As (man's numbers have started to expand) (so has air pollution))
- ((If a country becomes (industrialized) (the problem grows worse))
- ((3 causes of air pollution) and (their effects))
- ((burning) (fossil fuels))
- (most air pollution comes from burning fossil fuels)
- ((coal) and (fuel) are examples of fossil fuels)
- ((sulphur dioxide) is created if fossil fuels are burned)
- sulphur dioxide harms (people's health), (poisons plants), (stunts tree growth), (hastens building decay))
- (automobile traffic) causes air pollution)
- ((60% of air pollution) comes from automobiles)
- ((carbon monoxide) is a dangerous gas)
- ((congested traffic) between (high buildings) makes (air pollution a dangerous situation))
- (fresh air machines are (needed by police (on traffic duty)) (and by people in polluted areas))
- ((In large amounts), (carbon monoxide can kill))
- ((In smaller amounts), (carbon monoxide causes headaches))
- (The (automobile) has drawbacks)

- (cars have been designed to use ((gasoline) containing (lead)))
- (Many countries have (controlled the amount of lead in gasoline))
- (Many countries would like to ban leaded gasoline)
- (Cars are great wasters of (oxygen))
- (On a (600-kilometer journey), (a car uses as much oxygen as a person needs in a year))
- (Some weather conditions) make pollution much worse)
- (In the lower levels of the (atmosphere)) the (temperature) usually falls as you go up))
- (((Warm, dirty smoke) rises) and disperses)
- ((Sometimes the ((air at ground level is cold) (with a warm blanket of air above)))
- ((Smoke gets trapped) because it cannot rise through the warm blanket) and (smog) results)
- ((Smog is a major problem) (in (cities)) surrounded by hills))
- (Smog can cause (breathing problems))
- (Smog can reduce (visibility in traffic))

APPENDIX I

Raw Scores

Subject	Reading	Cueing		Recognition						Free-Recall	
		Yes	No	imm.			del.			imm.	del.
				*MC	T/F	FB	MC	T/F	FB		
Trained											
01	46		x	5	2	3	3	1	3	30	09
02	52	x		5	3	3	5	3	3	11	06
03	58	x		6	4	6	6	1	5	37	16
04	46		x	5	1	7	5	2	6	27	14
05	54	x		6	4	5	5	3	4	22	24
06	63		x	6	4	6		2	5	31	13
07	57		x	6	5	3	5	4	5	52	63
08	52		x	4	3	6	5	3	6	60	19
09	20	x		2	3	0	1	1	0	12	00
10	50		x	6	4	6	7	3	3	22	20
11	47	x		4	2	6	5	1	5	41	24
12	55		x	4	4	6	6	3	5	52	27

*MC = multiple-choice
imm. = immediate

T/F = true or false
del. = delay

FB = fill-in-the-blank

Subject	Reading	Cueing		Recognition						Free-Recall	
		Yes	No	imm.			del.			imm.	del.
				*MC	T/F	FB	MC	T/F	FB		
13	47		x	3	3	2	4	2	2	15	04
14	60	x		4	4	6	4	3	5	31	20
15	39		x	4	2	1	4	2	3	24	17
16	29	x		6	4	1	2	4	2	20	12
17	51		x	5	3	5				37	
18	42	x		5	3	4	3	3	4	33	13
19	40		x	3	3	5	5	4	5	16	04
20	31	x		5	2						
21	16		x	5	2	0				11	
22	35	x		3	2	1	4	2	1	08	08
23	33	x		2	3	0	2	3	0	06	02
24	52		x	5	4	4	5	4	6	19	09
25	41		x	4	3	2	3	2	2	18	00
26	53	x		6	2	2	6	2	5	38	20

Subject	Reading	Cueing		Recognition						Free-Recall	
		Yes	No	imm.			del.			imm.	del.
				*MC	T/F	FB	MC	T/F	FB		
27	51	x		5	4	5	6	4	5	44	26
28	49	x		7	3	5	7	4	4	20	26
29	59		x	5	3	4	6	3	6	44	40
30	30	x		4	2	2	6	2	3	30	10
31	39		x	7	3	5	5	3	4	34	12
32	27	x		4	2	4	3	3	3	18	13
33	49		x	4	4	5	3	3	4	23	13
34	30	x		6	3	5	7	2	3	14	16
35	43	x		4	3	5				26	
36	37		x	5	3	4	4	1	0	25	06
37	53	x		4	4	7				12	
38	58		x	5	3	5	6	4	6	37	33
39	55		x	4	4	6	1	5	6	48	44
40	30	x		3	1	3	5	1	2	09	03

Subject	Reading	Cueing		Recognition						Free-Recall	
		Yes	No	imm.			del.			imm.	del.
				*MC	T/F	FB	MC	T/F	FB		
41	41		x	5	3	4	6	3	4	14	14
42	40		x	4	1	3	2	3	2	17	06
43	53		x	7	5	5	7	4	7	44	33
44	45	x		6	4	4	6	2	4	24	11
45	22		x	4	3	6	4	2	5	54	13
46	34	x		9	9	9	9	9	9	99	99
47	62		x	9	9	9	9	9	9	99	99
48	56	x		6	2	6	6	3	5	23	18
49	42	x		2	4	4	5	2	3	17	16
50	34		x	5	1	3	2	4	3	35	17
51	26	x		5	4	4				33	
52	33		x	6	4	3	7	2	4	31	26
53	53	x		4	4	5	6	3	4	21	33
54	56		x	1	2	6	6	3	6	34	14

Subject	Reading	Cueing		Recognition						Free-Recall	
		Yes	No	imm.			del.			imm.	del.
				*MC	T/F	FB	MC	T/F	FB		
55	61	x		7	1	5	7	4	6	34	22
Without training											
56	51		x	6	5	7	7	4	5	25	30
57	34	x		3	1	4	6	2	2	11	08
58	55	x		7	3	7	6	3	6	14	07
59	52		x	4	3	6				22	23
60	37	x		6	3	3	4	4	5	16	09
61	08		x	3	3	2	2	3	1	19	00
62	55		x	6	2	4	5	3	6	10	12
63	52		x	6	2	5	5	3	4	16	14
64	41		x	4	4	7	5	3	6	21	15
65	29		x	3	3	0	3	5	5	07	14
66	34	x		3	4	5				22	
67	54	x		6	5	4	7	3	5	27	15

Subject	Reading	Cueing		Recognition						Free-Recall	
		Yes	No	imm.				del.		imm.	del.
				*MC	T/F	FB	MC	T/F	FB		
68	62		x	6	2	6	5	3	6	34	24
69	59		x	6	2	4	6	2	5	13	17
70	35	x		6	2	4	6	2	4	21	15
71	31	x		4	2	2	4	3	5	06	13
72	41	x		3	1	3	5	2	3	15	06
73	61	x		4	2	6	5	2	6	20	16
74	27		x	3	1	0	3	2	0	12	08
75	37	x		4	2	2	2	2	3	21	06
76	41	x		5	2	1	4	1	2	11	05
77	42	x		5	3	5	5	3	4	17	01
78	35		x	6	5	4	4	4	2	31	21
79	59		x	6	4	7	7	3	6	38	34
80	38	x		5	3	6	4	2	4	05	10
81	29	x		2	2	0	4	3	1	06	11

Subject	Reading	Cueing		Recognition						Free-Recall	
		Yes	No	imm.			del.			imm.	del.
				*MC	T/F	FB	MC	T/F	FB		
82	49	x		9	9	9	9	9	9	99	99
83	43		x	2	3	2	1	4	2	08	02
84	49		x	6	3	4	7	1	3	10	10
85	54	x		4	4	6	5	4	4	22	03
86	41	x		6	3	5	6	2	6	04	01
87	37		x	2	2	0	4	3	1	05	06
88	54		x	4	5	6	5	4	6	44	24
89	59	x		4	4	5	7	2	5	11	09
90	40		x	5	3	4	6	2	4	14	08
91	61		x	6	4	6	5	4	5	29	26