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CANADIAN THESES ON MICROFICHE / ***THÈSES CANADIENNES SUR MICROFICHE***

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TITLE OF THESIS/*TITRE DE LA THÈSE* Operationalizing Cognitive Processing During the Study of Categorized Information

UNIVERSITY/*UNIVERSITÉ* Simon Fraser University

DEGREE FOR WHICH THESIS WAS PRESENTED/*GRADE POUR LEQUEL CETTE THÈSE FUT PRÉSENTÉE* Master of Arts (Education)

YEAR THIS DEGREE CONFERRED/*ANNÉE D'OBTENTION DE CE DEGRÉ* 1981

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OPERATIONALIZING COGNITIVE PROCESSING DURING THE STUDY OF CATEGORIZED INFORMATION

by

Dawn C. Howard

C.C.W., St. Lawrence College, 1975

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF

THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS (EDUCATION)

in the Faculty

of

Education

SIMON FRASER UNIVERSITY

April 1981

APPROVAL

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Degree: Master of Arts (Education)

Title of Thesis: Operationalizing Cognitive Processing During the Study of Categorized Information

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OPERATIONALIZING COGNITIVE PROCESSING DURING THE STUDY OF CATEGORIZED INFORMATION

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ABSTRACT

Past research on human learning commonly has failed to operationalize learners' cognitive processes so that valid conclusions may be drawn about the effects of these processes on acquisition and retention. Previous research on the effects of presenting learners with new or repeated information following a categorized word list was extended in this study by training learners to use hypothetical processes researchers have invoked to explain the findings of earlier studies.

In Experiment I, 41 undergraduates experienced either a standard list with seven words in each of seven categories, or one followed by either repeated items, repeated category labels, or new items logically belonging to the categories. Following a recall test on the information presented, the learners were trained to respond to the respective list structures by using a specified cognitive strategy. The posttraining recall task was the same as the one given before training. Experiment II, which involved 71 undergraduates, extended the training procedures of Experiment I to include more practice in the instructed strategy. Several conditions also were added to the design to test hypotheses based on the results of Experiment I. These included two additional training conditions and a 9-word per category control condition that controlled for extra information presented in the list structure that provided new category items.

Results of Experiment I replicated the findings of an earlier study. Presenting new information maximized acquisition, but no statistically reliable differences between groups viewing differently structured lists were found following training. Experiment II did not replicate the effects of different list structures. As in Experiment I, extended training produced no statistically reliable effects on recall. Participants' reports of the

cognitive processes they engaged during the acquisition tasks indicated that most of them did not follow explicit instructions to use only the instructed strategy. Also, many participants who learned the strategy well enough to describe it indicated difficulty in applying it as instructed.

The generalizability of the effects of the different list structures on acquisition and retrieval was rendered suspect due to one failure to replicate it. The facts that training university students in simple cognitive strategies did not reliably affect recall, and that many students did not use the strategies as instructed has important implications for future research. Studies concerning the effects of practice on learners' application of trained cognitive strategies are needed to verify this method of operationalizing cognitive process. Also, more research on metacognitive variables is required to validate current explanations offered for most findings from research on human information processing.

ACKNOWLEDGEMENTS

Many thanks to Phil Winne and Ron Marx for their patience, encouragement, and expert advice throughout this endeavor. With their assistance the achievement that this paper represents is one of personal as well as intellectual growth. A very special thank you also goes to Pat for superb typing, meeting deadlines, kind words when needed, and all the other extra effort she put out to help me through the project. Finally, I wish to thank all of the friends and colleagues who have offered their support and encouragement when it was needed most. In particular, thank you to Joan for coming to my rescue when I needed a break, and to Charlie for always being there with a smile, a word of encouragement, or a shoulder.

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CHAPTER I

REVIEW OF THE LITERATURE

Introduction

Few would dispute that to acquire knowledge as efficiently and as effectively as possible is advantageous to learners. To assist learners in this endeavor can be seen as a reasonable goal for education. Identifying and developing teaching methods that will serve this goal, that is, to communicate effectively more information to students in less time, thus can be an important objective of educational research.

One step toward meeting this objective is to identify and examine variables defining the structure of information presented to learners since these variables may, in part, determine the effectiveness and efficiency with which that information can be acquired. For example, research on variables (which I will refer to as "structural" variables) such as the categorization of similar bits of information into a larger, distinct whole (Mandler, 1967), and the use of instructional objectives (Kurtz, 1974), has shown that they generally increase the effectiveness of learning.

The study of these structural variables could lead to the improvement of teaching practices in at least two ways. First, their manipulation as independent variables in research on human learning can illuminate the cause-and-effect relationships between the ways in which content is structured during instruction and the efficiency of learning. Second, once techniques of presentation and structures of content are identified which lead to effective and efficient instruction, they can be incorporated into classroom lessons directly and relatively easily.

While some advances have been made in this direction, as demonstrated by the results of research on teaching to date (Winne, 1980a), the current

picture of the effects of instruction on student learning is incomplete in at least one essential area. That is, until recently, researchers have failed to consider the role played by the cognitive processes in which learners engage in response to instruction. The need to attend to this aspect of the teaching-learning process has been demonstrated in studies such as that by Anderson and his associates, who found that variations in cognitive schema used by students to interpret and learn from text influence comprehension (Anderson, Spiro, & Anderson, 1978). As noted by Winne and Marx (1979), it is extremely rare for studies to test formally the cognitive processes engaged in by students as they deal with learning tasks before proposing theoretical links between these presumed processes and learning measured by tests administered following instruction. The theoretical advancement of instructional psychology thus has been impeded by the failure to verify hypotheses used to explain learning outcomes in terms of students' cognitive responses to instruction.

The value of identifying structural variables which influence the effectiveness and efficiency of learning was pointed out earlier. One such variable, which has been shown to improve learning, and which is widely used in classroom teaching, is that of repetition (Waugh, 1963). In a study designed to test the effects of three types of repetition on the acquisition and retention of categorized information, Winne (1972), found that presenting new information belonging to previously presented categories significantly improved recall compared to repeating either labels for the categories or information previously included in the categories. (Winne's 1972 study was an unpublished Master's thesis which was published as an article in the Journal of Educational Psychology by Winne, Hauck, & Moore, in 1975. Since some parts of the discussion and conclusions in the two papers differed,

there are instances here where one paper or the other is cited, and not both.) In light of this rather surprising finding, Winne hypothesized that presenting new category information induced learners to store this information by actively restructuring cognitive associations made while acquiring the previously studied categorized information. More recent research, related to a "levels-of-processing" model of human memory (Cermak & Craik, 1979), has produced some empirical support for explanations such as Winne's.

The present investigation was undertaken for two purposes. First, an attempt was made to replicate Winne's (1972; see also Winne, Hauck, & Moore, 1975) findings with regard to the effects of implicit versus explicit repetition of information on recall. In addition, subjects were trained to use a specific cognitive strategy for rehearsal during the presentation of new or repeated information, in order to test the hypotheses set forth by Winne to explain his findings. Through this attempt to control the nature and extent to which learners actually engaged in the cognitive restructuring that Winne hypothesized, it was believed that more substantial statements could be made concerning the causal links among the structure of information presented, cognitive processes used in acquisition, and subsequently measured learning.

Related Research

Research involving the recall of categorized verbal information has yielded a number of findings relevant to the issue of maximizing acquisition and retention. For instance, numerous studies have established that recall is significantly improved when information to be remembered is grouped into meaningful categories or chunks, and that learners will impose such organization on seemingly unrelated information presented to them (e.g., Bousfield, 1953; Frase, 1969; Miller, 1956). Moreover, while it has been shown that

there are limits to the acquisition and storage of information in immediate memory (Mandler, 1967; Miller, 1956; Johnson, 1970), it is evident that the capacity of immediate memory can be expressed in terms of chunk units, which contain individual items of information, thereby increasing the total amount of information that can be acquired in a given amount of time (Bower, 1969; Johnson, 1970; Mandler, 1968; Tulving, 1962). Tulving and Pearlstone (1966) obtained further support for this hypothesis, which they refer to as the "chunk recall hypothesis", when they found that recall of individual items within a chunk is improved when the chunk label is given as a retrieval cue during the recall trial. An additional finding is that, once the concept of a category has been recalled, as evidenced by the recall of one or more category members, the proportion of the total number of items recalled from the category is relatively stable across categories of varying sizes, as well as across lists of varying lengths (Cohen, 1966).

It appears then, that the recall of verbal material can be increased by presenting the information in a chunked or categorized format, and by increasing the probability that the concept of a particular category will be recalled, such as by cueing the learner. Other investigations have indicated that learning is further improved when information is repeated during the study trial (Miller, 1958; Waugh, 1963). The results of Winne's (1972; see also Winne, Hauck, & Moore, 1975) study conflicted with this latter assertion, in that no facilitative effects were obtained by repeating either individual items of information from a categorized word list, or by repeating category labels. As noted earlier, what Winne found was that learning was facilitated when new category members were presented following presentation of the original list, as an "implicit category repetition" treatment. In addition, Winne aptly pointed out that the repetition of category labels or of two

items from each category increased the probability that the repeated information would be recalled, even though no effect on total recall was evident.

To explain his results, Winne hypothesized that presenting new information belonging to a category induced learners to store this information by actively restructuring cognitive associations made while acquiring the previously presented word list. Likewise, he proposed that repetition of category labels or category members from the original list produced no improvement in recall over a no repetition control condition because "the repeated information does not demand a restructuring of information already stored in an intra-category associational network" (Winne, Hauck, & Moore, 1975, p. 774).

Such an explanation is quite similar to the depth-of-processing model of human memory (Craik & Lockhart, 1972; Cermak & Craik, 1979), which has accrued increasing empirical support in recent years (see Glass, Holyoak, & Santa, 1979; Wickelgren, 1977). This model is distinguished from the earlier "multistore" theories, such as those involving separate and distinct short-term and long-term memory "stores," (Atkinson & Shiffrin, 1968) by its conceptualization of varying degrees of cognitive analysis during encoding, resulting in relatively stronger or weaker memory traces. According to this model, the more active cognitive processing that is engaged in during acquisition, such as that which occurs during semantic elaboration, the stronger and less susceptible to interference will be the memory trace, resulting in greater recall (Craik & Lockhart, 1972). As part of this theoretical framework, acquisition is hypothesized to involve one of two distinctly different types of rehearsal. Type I or maintenance rehearsal is that which maintains the item at a superficial memory level, and supposedly

would not improve recall if rehearsal time was increased. Type II or elaborative rehearsal, on the other hand, involves a "deeper" analysis of the item which creates more meaningful associations, or a greater number of them, resulting in a stronger, more durable trace. Later formulations of the same theory expanded the notion of depth of processing in several ways. One extention is that of the distinctiveness with which an item is encoded as a determinant of its retention, which suggests that variations occur in the quality of processing at each level, rather than in quantity only, as implied by the notion of elaboration (Jacoby & Craik, 1979).

Distinctiveness is described by these authors as relating to the contrastive value of information in the particular context in which it is embedded (Jacoby & Craik, 1979, pp. 2-5). This conceptualization has relevance to the present investigation in that it includes the notion that the more difficult it is to encode an item, the more complete a "description" is formed of it, in order to discriminate it from other stimuli. This is said to result in a more distinctive and easily retrieved memory trace (Battig, 1979; Jacoby & Craik, 1979). Retrieval is seen as mirroring initial encoding processes, and thus is described in terms of variations in depth, elaboration, and distinctiveness. As stated by Jacoby and Craik (1979): "Thus retrieval operations vary in their extensiveness; habitual encodings are evoked spontaneously and automatically by the stimulus [cue], whereas further elaborate processing is evoked if directed by task demands or by feelings of partial recognition" (p. 8).

To interpret Winne's (1972) findings according to this model, the retrieval of a category concept, when cued by repetition of category labels or previously seen items, is relatively easy, and thus fails to demand any further processing of that category concept or network of inter-item associations.

In contrast, the retrieval of the category concept would be somewhat more difficult and demand further processing when new items were presented as cues during the study trial. In this way the function of the different types of "repetition" may be conceptualized as that of evoking a retrieval process, while at the same time the repeated or new items themselves are being encoded. In both cases, the new information is likely to produce a more distinctive trace for the category concept. It is unfortunate that the number of categories recalled was not used as an additional dependent variable in Winne's (1972) investigation, rather than simply using "total amount of information recalled," as this might have added some weight to his proposed explanation.

Operational definitions of cognitive processes. A considerable amount of research in the last 15 years has focused on the effects of rehearsal on human memory performance, especially in efforts to examine the properties of short-term versus long-term memory storage (Atkinson, & Shiffrin, 1968; Jacoby & Bartz, 1972; Rundus, 1971; Rundus & Atkinson, 1970; Woodward, Bjork, & Jongeward, 1973), and to test various aspects of the depth of processing model (i.e., Craik, 1970; Craik & Watkins, 1972; Dark & Loftus, 1976; Evans, 1977; Glenberg, Smith, & Green, 1976; Jacoby & Bartz, 1972). The findings of Rundus and Atkinson, which indicated that retention varies directly with amount of rehearsal, have since been shown to occur only under certain circumstances. Some of the experimental conditions under which conflicting results have been obtained are examined next in order to illuminate a major flaw in current theories about cognitive processing. The problem is that of a failure to operationally define the cognitive processes which researchers often try to manipulate as independent variables in studies of learning and memory.

Results of studies showing that increases in study time, which are assumed to increase amount of rehearsal, affected immediate recall but not delayed recall (Craik & Watkins, 1972; Glenberg et al., 1977; Modigliani & Seamon, 1974; Jacoby & Bartz, 1972; Woodward, Bjork, & Jongeward, 1973), were offered as evidence of the existence of two different types of rehearsal, such as those described by Craik & Lockhart (1972). However, evidence to the contrary has also been gathered (e.g., Dark & Loftus, 1976; Evans, 1977; Darley & Glass, 1975), and thus researchers seem to be increasingly concerned with the unique conditions under which the different results have been obtained (see Dark & Loftus, 1976; Evans, 1977; Glenberg et al., 1977).

Evans found that slowing the rate of presentation improved final recall regardless of whether subjects were instructed to engage in rote rehearsal or imagery during the interval between items. In contrast, an 8-second delay following presentation of each of a series of 12 four-word lists increased recall over a no-delay condition only when subjects were instructed to engage in imagery, as opposed to rote rehearsal, during the delay. However, the fact that, in this study, an immediate recall test followed the presentation of each four-word list may have confounded the final recall measures. Dark & Loftus (1976) explained how the processing, required by initial recall tests, may influence delayed-test performance, and obscure the effects of processing during study intervals:

> This is because the effect of some initial processing variable (e.g., number of rehearsals) on a delayed test may be composed of two things. First, the variable may have a direct effect on delayed performance. Second, the variable may have an indirect effect in that it may influence short-term recall which in turn may influence long-term recall. (p. 481)

A major reason why past research has failed to establish the existence of a Type I, or maintenance rehearsal process may be due to confusion associated with defining the process. Dark and Loftus (1976) distinguished between classifying rehearsal according to experimental procedure and according to delayed-test effects. Their concern was that rote repetition not be equated with maintenance rehearsal, since the former procedure can produce either maintenance rehearsal effects or elaborative rehearsal effects (Dark & Loftus, 1976, p. 489).

The circularity in defining Type I rehearsal, as it is described within the depth-of-processing framework, was also pointed out by Glenberg et al. (1977). Working from the specification that increases in amount of Type I rehearsal should not affect delayed memory performance, these authors proposed the following three criteria for any paradigm that is used to elicit it. First, there must be control of the processing used by the subject, which ensures that s/he is trying only to maintain the information for a brief time period, and that no attempt is made to form associations among the to-be-remembered items, or to increase the depth of analysis during the processing interval. Second, the subject must be actively maintaining the information in memory throughout the processing interval under study. The final criterion is that delayed recall must not be affected by the amount of Type I rehearsal engaged in by the subject (Glenberg et al., 1977, p. 340).

While the criteria just described were met in their study, even though delayed recall was not affected, they found that delayed recognition was reliably improved when the amount of Type I rehearsal was increased. This result, together with a similar finding by Woodward et al. (1973), led to the conclusion that, "Type I rehearsal modifies the internal representation of an item by the addition of frequency or context tags which increase the

amount of processing" (Glenberg et al., 1977, p. 351). Thus, while Type I rehearsal is said to serve only to maintain information in short-term memory, and to involve no further analysis when engaged in for increasing amounts of time, research has not produced reliable evidence of its existence. Reports in the literature confuse the issue by defining Type I rehearsal as a cognitive process, an experimental procedure, and/or in terms of measured recall or recognition.

The validity of the depth of processing model of human memory has been challenged directly by several researchers. For instance, Nelson (1977) criticized studies which concluded that the amount of rote repetition does not affect final free recall, cued recall or recognition on the basis of several factors. In addition to the problems discussed above, he pointed out that many studies may have lacked statistical power and/or exhibited possible floor effects. These features could have resulted in an inability to detect differences in recall resulting from variations in amount of repetition (Nelson, 1977).

Another major citicism of studies involving depth of processing variables is that of incongruity between the encoding processes elicited during acquisition and the tests used to measure acquisition. Specifically, several studies have shown that when the criterion test is appropriate to the acquisition process used to encode the material, semantic encoding does not appear to produce a more durable trace than non-semantic processing (Morris, Bransford, & Franks, 1977; Postman, 1978; Stein, 1978). For example, Morris et al. (1977) found that semantic processing did not produce superior memory performance compared to processing which focused on the rhyming of words when the criterion test in the latter case was one of recognizing words that rhymed with the target items. Stein (1978) found similar results with

semantic encoding versus that where the focus was on physical features of the words (upper case or lower case letters).

These and other researchers (Postman, Thompkins, & Gray, 1978; Tulving & Thomson, 1973) tend to support an encoding specificity framework in which task demands, information presented, the skills and prior knowledge of learners, and the type of criterion test combine to cause variations in performance on verbal learning tasks.

Careful examination of the literature produces another problem regarding definitions of cognitive processes. That is, that the same type of problem in definition exists in relation to rehearsal per se as was found with type I and type II rehearsal. It seems that there is no commonly accepted operational definition of rehearsal. It is simply believed to occur as some sort of process whereby attention is focused on an item for a given length of time in an effort to store or retain that item in memory. It seems that the difficulty involved in testing directly the hypothesized cognitive processing which occurs during a study interval often has led researchers to describe rehearsal in terms of measured effects on recall or recognition, while the process itself remains undefined. It is unclear whether the term is intended to mean repetition, or whether in fact the same cognitive process occurs during overt repetition and covert repetition. It is not known whether the cognitive processing engaged in during intervals between items (encoding processes) are the same as those engaged in during a delay following presentation of a list of items (storage processes), or whether both of these can be considered rehearsal. Research has led to conceptualizations of rehearsal as involving contextual or temporal tagging, creating associations among items or portions of information presented, or relating information presented to existing memories.

Another issue that remains unclear in the literature on human information processing is the distinction between recall and recognition. Whether, and to what extent, the same cognitive processes are involved in the two types of memory tasks is a topic of considerable debate. While it appears to be generally accepted that the two tasks require some of the same kinds of processing, the distinction between them can be viewed either qualitatively or quantitively. The studies by Glenberg et al. (1977) and Woodward et al. (1973), in which it was found that carefully controlled "rote, nonassociative" rehearsal produced substantial improvement in recognition performance, but had no effect on recall, supported a "tagging" hypothesis. This hypothesis states that context or frequency tags are used for retrieval during a recognition task, but that semantic associations are required for recall tasks (Glenberg et al., 1977). While this suggests a qualitative difference in the processes entailed in recognition and recall, Wickelgren proposed that the same retrieval processes can be used to tap differing kinds of associations (episodic or semantic) (1977, p. 414). To further complicate matters, there is evidence to support the notion that the recognition process itself can operate in two different ways, either as automatic, direct matching, or by way of a search and decision process, depending on task requirements (Bahrick, 1979; Glass et al., 1979; Jacoby & Craik, 1979). Wickelgren's (1977) contention that both recall and recognition involve direct access processes is questionable in light of the increases in decision latencies that occur over longer lists in a recognition task (Sternberg, 1966), which suggest the existence of a search process.

It may be concluded from the literature cited so far, that while past research on human memory has demonstrated that recall improves under certain experimental conditions involving the manipulation of study time, current

theories are inadequate for identifying the mechanisms underlying the observed effects. Similarly, distinctions between recall and recognition processes must be expressed in terms of the effects of variations in learning tasks, observed in subsequent test scores, while explanations concerning the two kinds of processing are necessarily limited to inferences based on presumed links between stimulus conditions and observed effects rather than direct control of those links per se.

Similar inadequacies have been pointed out in relation to research on instructional effects, where conclusions about the causal links between instructional treatments, cognitive processes used during acquisition, and subsequently measured learning are rendered suspect due to the "black box" problem (Winne, 1980b; Winne & Marx, 1979). Specifically, while researchers control the stimuli presented to learners in an experiment, the cognitive processes engaged by the learners in response to those stimuli generally are left to vary freely. Although any observed effects are directly caused by that processing rather than by the stimuli that are manipulated by the experimenter, any conclusions about what has taken place cognitively are a matter of inference. It appears that our definitions of cognitive events will remain circular, and our explanations of them will remain speculative until they can be operationalized.

Control of cognitive processes. Several methods might be used to operationalize or control the cognitive processing of subjects as they engage in learning tasks. One of these is the use of incidental orienting instructions, where the specific cognitive process being studied is controlled by nature of the information given to the learner about the purpose of the task (Dark & Loftus, 1976; Evans, 1977; Glenberg et al., 1977; Lockhart, 1979; Woodward et al., 1973). The difficulty that has been found with this

method is that the experimenter can seldom guarantee that only the process of interest is being activated by the orienting task, that is, that other kinds of processing are not occurring at the same time (Nelson, 1979). Nelson cited a number of studies in which sensory and semantic interference were both found to occur regardless of which of the two kinds of attributes were focused on during encoding. He concluded:

> Sensory and semantic interference effects persist even though pairs [of words] are imaginatively encoded. Semantic interference is obtained even though instructions emphasize sensory attributes. Thus, although instructional set may determine what types of features are focal to the task, other types of features are apparently independently activated (1979, p. 56).

In the context of research on instructional effects, a method for controlling the cognitive processing of learners was proposed by Winne (1980b) in which students are trained to use specific cognitive strategies in response to particular kinds of instructional stimuli. He defined "instructional stimuli" as stimuli other than the content to be learned (that is, items of information) which are presented to learners during instruction for the purpose of facilitating the acquisition of the content. The use of concrete exemplars of a concept, adjunct questions in text materials, retrieval cues, or repetition are illustrative instructional stimuli.

In his paper, Winne identified four different types of training which may be needed to produce valid evidence of the existence of specific cognitive responses on the part of learners: (1) training learners to discriminate the occurrence of an instructional stimulus from content and other instructional stimuli; (2) training to standardize the message that learners should receive upon encountering the instructional stimulus (that is, what it communicates

about how to operate on content); (3) reinforced practice to build learners' motivation to engage in the cognitive process; and (4) direct training in the components of the cognitive processing. Thus, as Winne states, by training learners in this manner to process instructional stimuli in accordance with a theoretically favoured process, rather than an unknown naturalistic one, and by designing studies so that observable output of the trained process is required of learners, the "black box" may be penetrated.

While theoretically sound and potentially useful for the advancement of theories about instructional effects, several problems have yet to be solved before the full benefits of Winne's procedure can be reaped. The few studies to date in which attempts were made to train learners in specific cognitive strategies have yielded inconsistent results. In studies by Dansereau and associates (1979), Larkin and Rief (1976), and Wicker, Weinstein, Yelich and Brooks (1978), university students were trained in specific cognitive learning and study strategies. All three studies showed reliable gains in learning for trained students. Bassett and Kibler (1975), and Kurtz (1974), found statistically reliable differences in learning outcomes in favour of students trained to use behavioral objectives prior to receiving text materials. These findings are encouraging, but studies where training proved less effective demonstrate several possible problems with which researchers must be concerned. For instance, a recent study by Winne & Marx (1980) showed that, while university students could be successfully trained to perceive the lecturer's intentions behind distinctive instructional stimuli and to operationalize responses to those stimuli, most students actively rejected the trained strategy during lectures. Those who did not reject the trained strategy differed from the others in two respects. First, they were trained in a strategy which was relatively similar to that which they used naturally,

as described in their own self-reports. Secondly, they were given extended practice in the use of the strategy within the context in which it was to be employed, i.e., in actual lectures. These factors, as well as the lack of training generalization found with fifth-to-seventh graders in a later study by Winne (1980a), point to two issues of concern. The first is related to the motivational aspect of Winne's training paradigm. Specifically, it appears that rather extensive training may be required in order to lessen the cognitive expense for students being asked to use a new strategy, which opposes, at least in some respects, that which has become habitual with years of previous learning practice. While Winne (1980b) did not ignore the issue, related research is too scant at this point to estimate how extensive such training needs to be in order to secure the kind of effects that will lead to valid conclusions.

Another area of concern is that of training the learner to isolate the cognitive process that s/he is expected to engage and, as is the case with incidental orienting tasks, of limiting processing to that strategy only. In order to do this, the learner's metacognitive skills must be fairly well developed, and even then some cognitive processes probably remain beyond awareness (Neisser, 1977). Apt examples of this problem can be found throughout the literature on verbal learning and memory, where the control of cognitive processing during acquisition and storage remains a challenge for researchers (Wickelgren, 1977). Thus, penetrations of the "black box" may be limited to situations in which the learners themselves are able to identify and control what they do cognitively during learning.

Finally, is the difficulty that may be involved in securing evidence that the trained strategy and only that strategy was used during the learning task. This point is demonstrated clearly by the Dark and Loftus (1976) study

described earlier, wherein the overt rote repetition engaged by learners could not be taken as evidence that some other kinds of processes, such as semantic elaboration, were not being executed at the same time.

An obvious and tempting way of obtaining evidence about learners' use of a cognitive strategy is self-reports. The validity of this method is the topic of much debate in current literature, however. Specifically, the ability to determine its validity under varying conditions seems limited, given the present methodological state of affairs (Ericsson & Simon, 1980; Nisbett & Wilson, 1977; White, 1980). In their review of the evidence, Nisbett and Wilson suggested that, while learners are generally unaware of or unable to recall accurately their cognitive processing, their self-reports are sometimes accurate due to their ability to make sound judgements about what process logically would produce the observed response. However, the papers by Ericsson and Simon (1980) and by White (1980) criticized this conclusion on the basis of methodological issues such as the type of probe used to solicit reports from subjects, and delays between task and self-report which make recall of the process more difficult. Specifically, Ericsson and Simon noted that some of the studies reported by Nisbett and Wilson involved questions which provided enough information for learners to deduce logically the process that "should" have been used. In other instances the information asked for could not have been in the learner's memory in the first place. In the former case, it may be predicated that learners may often rely on logically deducing the answer to the probe, rather than on their memory of the cognitive process, since this is the more efficient choice (Ericsson & Simon, 1980).

Overall, it may be concluded that valid self-report data concerning cognitive processing can be obtained, but that it is often not complete

(i.e., some steps in the process may be omitted due to their being "automatic" or "unconscious"), and that when and how self-reports are asked for can be important.

Summary

The following conclusions can be drawn from the research reviewed:

1. The recall of verbal material can be increased by presenting the information in a chunked or categorized format, and by increasing the probability that a particular category concept will be recalled.

2. Once a category concept is recalled, the amount of information recalled from that category is relatively stable across variations in list length or category size.

3. Repetition of verbal information during the study trial increases the probability that the repeated information will be recalled.

4. Initial recall of an item affects its subsequent recallability.

5. Increasing amounts of rote non-associative repetition following list presentation appears to aid recognition, but not recall, of verbal material.

6. Increases in decision latencies for longer lists in recognition tasks support a "search-decision" model as opposed to a "direct access" model, though the two processes both may operate under different task requirements.

Existing evidence shows that recall is affected by variations in amount of study time during and after presentation of verbal material, but that these effects are conditional upon varying task requirements, list structure, study instructions, and the types and ordering of recall measures used. That research to date has not led to valid conclusions regarding the cognitive processing that occurs during learning is the result of several theoretical and methodological inadequacies which seem to pervade the literature. These

include the lack of operational definitions for terms such as rehearsal which then are used as independent variables in studies of recall and recognition, and the drawing of conclusions about cognitive processing on the basis of its effects, without controlling or operationalizing the processing itself. Recent efforts to develop methodologies to deal with the latter of these problems have included the use of incidental orienting tasks and training to induce subjects to engage in specific cognitive strategies. In addition, research on the accuracy of self-reports of cognitive processing engaged in during learning tasks has shown that this may be an additional source of information from which to augment understanding of the processes underlying learning outcomes.

Implications for the Current Investigation

This study was designed to answer a number of questions regarding the cognitive processes used by learners when they encounter repeated or new information which is intended to serve as a retrieval cue during a study trial. In two separate experiments, initially designed as attempts to replicate Winne's (1972; see also Winne, Hauck, & Moore, 1975) findings, a training component was added to operationalize cognitive responses to the new or repeated items which followed the presentation of a categorized word list. In both experiments participants also were asked a number of questions about the cognitive strategies they used during the recall task immediately after their completion of the task.

CHAPTER II

EXPERIMENT I

Winne (1972, see also Winne et al., 1975) found that presenting new information during the study trial which logically belonged to previously presented categories reliably improved recall compared to repeating either labels for categories or information included in the categories. These researchers hypothesized that presenting new information belonging to the category induced learners to store this information by actively restructuring cognitive associations made while acquiring the previously studied categorized information. They further hypothesized that this restructuring was accompanied by a review of each category concept to locate the new members in their respective categories.

Experiment I attempted to replicate Winne et al.'s (1975) findings. It also tested their hypotheses by training subjects to use a specific cognitive strategy when they encountered new or repeated information following presentation of the categorized word list. Specifically, three treatment groups were presented with the same categorized word list, immediately followed either by repetition of the category labels (category cue), by repetition of two members of each category (item cue), or by two new words logically belonging to each category (new item cue). A no cue control group was presented only with the categorized list. Following an interpolated task, all subjects were given a free recall test. The scores on this test were used as the dependent variable. Participants then were asked to describe, in writing, the cognitive strategy they had used to try to memorize the list.

Two days later, the item cue and new item cue groups were instructed to respond to each cue-word by scanning mentally all previously seen category labels to find the one to which the cue-word belonged, and then reviewing

mentally all the members of that category as they added the item or new item to their stored information. The category cue group was instructed to review all the members of the appropriate category each time a repeated category label was shown. The control group was instructed simply to follow the cognitive strategy for learning the words which they had described on the first day of the experiment.

Immediately after training, all participants were shown a list of words and given a recall test like that on the first day, but the list was comprised of different words.

Hypotheses

According to Winne et al.'s (1975) hypotheses, the trained strategy should match the one which was used naturally by members of the new item cue group. Thus, if training was effective and was used by participants, the mean recall score for this group should remain unchanged after training.

On the other hand, they hypothesized that this strategy would not have been induced naturally by the presentation of repeated category labels or category members. It was therefore predicted that effective training and actual use of the described strategy would produce an increase in the mean recall scores for these groups, since they too would now be engaging in some restructuring or further analysis of the previously presented information. The means for these groups were not expected to reach the level of the new item cue group however, since the latter was presented with a greater total number of words, and thus was provided with a greater number of possible associations, that is, a "richer" inter-item association network. Finally, it was predicted that the means for the control group would not be reliably different on the two days' tasks.

An additional point must be made here. It could be argued that higher

mean recall scores for the item cue and category cue groups after training would be a result of the effects of the initial recall attempts made while viewing the cue words, rather than a result of any cognitive restructuring of inter-item associations. Alternatively, it could be argued that the effects of previously recalling information upon final recall performance, which have been found to occur in past research (see Dark & Loftus, 1976), actually were products of such cognitive restructuring. The state of the art of research on cognitive processing does not provide a resolution to this debate.

In order to determine the extent to which the training in the three treatment groups had been effective and used by participants, they were asked to answer several written questions immediately following the recall test on the second day. First, they were asked to describe the cognitive strategy they had been instructed to use when viewing the cue-words. They then were asked to rate on a 5-point scale the extent to which they had used the trained strategy, the extent to which they had used another strategy of their own, and the extent to which they felt the training had helped them to recall more words, if at all.

The specific experimental hypotheses that were tested in Experiment I are shown below. The first two predicted that Winne's (1972) findings would be replicated. The others are based on the interpretation that Winne proposed to explain his findings.

1. The repetition treatments, category cue and item cue, will not reliably improve recall compared to the no cue control condition.

2. The new item cue treatment, in which new category members are presented as retrieval cues during the study trial, will reliably improve recall compared to the other treatments and control condition.

3. The training given in the category cue and item cue conditions will reliably increase recall for those groups.

4. The training given in the new item cue condition will not reliably change the amount of information recalled in that group.

5. The improvement in recall due to training for the category cue and item cue treatments will yield mean total recall scores which remain reliably lower than those in the new item cue treatment condition.

All statistical hypotheses used to test experimental hypotheses assumed the null form of no reliable differences among the population means under consideration.

Methods

Participants. The sample for the first experiment was comprised of 41 volunteer undergraduate university students. The participation of these students was solicited during lectures and tutorials, where the author presented brief oral and written descriptions of the experimental tasks and explained the general purpose of the study. Each participant was randomly assigned to one of four treatment groups in a repeated measures design.

Treatment and design. On each of two separate days participants viewed a unique categorized list comprised of 49 words in seven categories, and experienced one of four types of cue conditions. The four cue conditions were: no cue, item cue, category cue, and new item cue. On the second day, training was introduced in which participants in each group were instructed to follow a specific cognitive strategy while viewing the cue words.

Materials and procedures. The two lists of words were presented in categorized format. Each category consisted of the category label underlined and followed immediately by its seven members. Categories were drawn randomly from those presented in the revised Connecticut Category Norms

(Battig & Montague, 1969). To control for highly probable or highly improbable association effects, the category members were selected randomly from the sixth to the twenty-fifth most frequent associations to each category label. Categories were randomly assigned to one of two separate lists and were randomly arranged within lists. Words within each category also were randomly ordered. All cue words followed the original word list in a separate section. For the category cue group, category labels were randomly arranged so that they did not appear in the serial order of the categories in the "standard" list. (The term "standard list" refers to that portion of the material presented which excludes the cue words.) Under the item cue condition, two randomly chosen words from each category appeared in the sequence presented in the standard list category, but each pair of repeated category members was then arranged randomly. For the new item cue group, two new words which logically belonged to each category were arranged as were the repeated words under the item cue condition. The no cue condition viewed only the standard list. The word lists are presented in Appendix A.

All instructions and materials were presented by an examiner who followed a verbatim script to control for effects caused by differences in presentation. These instructions are presented in Appendix B. Participants in a given treatment or control group were given the experimental task together as a group. Each word was presented for three seconds and a three second blank separated the last word of a category from the next category label. The lists were shown on an overhead projector, which was partially covered so that only one word was in view at any time. While presenting the list the examiner listened to an audiotape through an earphone, which timed the word presentation by way of a tone sounding at 3-second intervals.

Prior to the presentation of the list, participants were informed of the number and format of the words, including the type of cue words which would follow the standard list, if any. They were then instructed to observe the words as they were presented and to try to remember as many of them as possible. All participants had been informed prior to their signing up for the experiment that they would be asked to memorize a list of words, and, afterwards, to write down as many of the words as they could remember. When the standard list had been presented, the examiner noted verbally that the cue words were about to be shown.

Immediately after the presentation of all words, participants were given a pre-recorded audiotaped version of the Stanford-Binet digit span test to control for any recency effect. They then were asked to write as many of the words as they could remember from the list, including category labels and cue words. They were told that they could write the words in any order they wished without time limit. Once all participants had recalled as many words as they could, they were asked to write a brief description of the cognitive strategy they had used to try to memorize the list. This completed the task for the first day.

On the second day (48 hours later), all participants except those in the control group were given instructions regarding how they should respond cognitively to the cue words following the standard list. The instructions for the item cue and new cue groups were to first mentally scan all the category labels each time a cue word appeared and decide the category to which it belonged. Then they were to review mentally all the words they could remember from that category, including the cue word being shown. The strategy was demonstrated for them on the blackboard using common boys' and girls' names as sample words. The delivery of these instructions took approximately five

minutes. In lieu of training, participants in the control group were given the descriptions of the cognitive strategy they had used to memorize the words that they had written on the first day. They were instructed to follow as closely as possible the same strategy again during the second day's task.

After the instructions were given, all participants were presented with a different list of words of the same length and in the same format as on the first day. The lists were presented in exactly the same manner as on the first day, and were again followed by the interpolated digit span task, and recall test. The digits in the interpolated task were presented in the reverse order to that of the previous day to avoid any practice effects. After they were finished writing all the words they could recall from the list, all participants except those in the control group were asked to describe in writing the strategy they had been trained to use while viewing the cue words. They then were given three questions which they were to answer by checking the appropriate choice on a five-point rating scale. These questions concerned the extent to which participants had actively used the trained strategy, the extent to which they had used their own strategy, as described on the previous day, and the extent to which they felt the instructions helped them in remembering the words from the list.

As soon as this task was completed, all participants were given an opportunity to ask questions regarding the design and procedures of the study.

Scoring system. In this investigation, as in the Winne (1972) study, it was considered desirable to obtain not only a measure of whether a category was recalled, but also of the degree to which each category's contents were recalled. However, because recall of the category label alone provides no evidence that the information within the category, that is, the words to

be learned, can be recalled, a score of zero was given for recall of category labels. The recall of each word appearing in the list as a category item was given a score of +1, and a score of zero was given to intrusions, that is any words within a category that were not list items. The latter procedure differs from Winne's (1972), where a score of +2 was given for correct recall list items, and a score of +1 was given for intrusions (i.e., words not appearing in the list, but considered by independent judges as logically belonging to the presented category). The rationale for this departure from Winne's methodology is that the addition of scores for intrusions is seen as an inaccurate representation of what was actually learned, even though verbatim recall may not always be necessary or even desirable in classroom learning situations. In addition, it is possible that the addition of scores for intrusions may have inflated the mean differences in the total amount of information recalled among the different treatment conditions. For example, if, for some reason, the presentation of two new words for each category following the original list resulted in a greater number of intrusions being produced by Winne's (1972) "Implicit Category Repetition" group (here referred to as new item cue group), the higher mean recall score for this group compared to the other repetition conditions would have been at least partially due to this factor.

A total recall score reflecting the sum of the scores for items recalled from the list served as a dependent variable. In addition, participants' descriptions of the strategy they were trained to use were given a score of 0, 1, 2, or 3, according to their relative adequacy. The criteria upon which each of these scores was based are shown in Table 1.

Table 1

Minimum Criteria for Scores Representing Adequacy of Descriptions of Trained Cognitive Strategy in Experiment I

Score	Must Include
3	a. Scanning of category labels b. Selection of category that cue word belongs to c. Review of all words in selected category d. Inclusion of cue word in review process
2	b. as above c.
1	b. as above, plus major error c. OR b. or c. (above, but not both)
0	No response, OR no correct information

Results and Discussion

Six out of the 41 participants in the original sample were omitted from the analyses because they did not participate in the second session of the experiment. The means and standard deviations of pretraining and posttraining recall scores for the remaining sample of 35 are shown in Table 2.

Table 2

Means and Standard Deviations of Pretraining and Posttraining Recall Scores in Experiment I

Group	Pretraining		Posttraining		
	M	sd	M	sd	N
Item cue	21.25	6.08	18.83	7.72	12
Category cue	19.83	7.88	15.83	9.11	6
New item cue	31.22	6.30	23.66	8.63	9
Control	23.75	6.32	22.75	4.17	8

Scores on the pretraining recall measure were analyzed using a oneway analysis of variance, ($F_{3,31} = 5.22$, $p < .01$). A priori contrasts were performed comparing each of the three treatment groups to the control group. These showed reliably higher recall scores for the new item cue group, but not for the item cue or category cue groups. These statistics are shown in Table 3. Tests for homogeneity of variance among the four groups showed that this assumption for analysis of variance was met.

Table 3

t-values and Error Terms for Treatment Groups, Compared to Control Group on Pretraining Recall Scores in Experiment I, Using Pooled Variance Estimates

Group	df	t-value	st. error	p
Item cue	31	- .84	2.97	.40
Category cue	31	-1.11	3.52	.27
New item cue	31	2.36	3.16	.025

Scheffé post hoc contrasts showed reliably higher recall scores for the new item cue group compared to the item cue and category cue groups ($p \leq .05$), supporting hypothesis 2.

Effect sizes were also calculated for the new item cue condition, using the item cue and category cue groups as standards for comparison, where the means for the item cue and category cue groups were assumed to correspond to the 50th percentile. Increases to the 89th percentile from the category cue group and the 95th percentile from the item cue group were found to result from the new item cue condition.

While not predicted directly in this study, it was considered of interest to examine the average proportion of words recalled per category, once a category was recalled, in the control group, to compare this to the 63% which Cohen (1963) showed with categories of up to five words each. The average proportions on pretraining and posttraining recall measures for this group were 57% and 52%, respectively. One-sample t-tests comparing these proportions to the 63% predicted from Cohen's (1963) work showed that the proportion obtained on the pretraining measure was not reliably different from 63%

($t = -1.3$, $df = 6$), while that obtained on the posttraining measure was reliably different from 63% ($t = -5.0$, $p \leq .01$, $df = 6$).

Since the effects of training were of primary interest in this experiment, only those participants who were able to describe the trained strategy and who said that they had used it to some extent were entered into the analyses of recall scores for the second day's task. In order to meet these criteria participants must have obtained a score of 2 or above on their descriptions of the trained strategy, and must have indicated that they had used the trained strategy at least "a little bit." This eliminated seven participants, four from the item cue and three from the category cue group. A oneway analysis of variance yielded an omnibus F-statistic ($df = 3,27$) of less than one.

Results of the analyses performed on the pretraining recall scores confirmed hypotheses 1 and 2, thus replicating Winne's (1972; Winne et al., 1975) findings with regard to the lack of facilitative effects due to category label or item repetition, and with regard to the superior performance of the new item cue group. It is important that the mean recall scores for the new item cue group exceeded those of the repetition groups to the extent they did, particularly in light of the traditional beliefs about and use of repetition in instruction. Specifically, the new item cue condition produced 47% more recalled words than the explicit repetition of information from within categories, that is, the item cue condition.

This is noteworthy because the increase in acquisition was obtained by presenting more information to be learned in the same amount of time available to the item cue group, who saw repeated information.

In examining the results concerning the posttraining recall scores, the absence of effects associated with training participants to use the cognitive

strategy described earlier is particularly important. Specifically, since no effect due to training was predicted for the new item cue group, hypothesis 5 was confirmed. However, hypothesis 4, which stated that the recall performance of the item cue and category cue groups should improve due to training was not supported since the mean scores were lower following training.

There are two possible interpretations of this outcome. One is to conclude that the cognitive strategy of reviewing all the items in a category whenever that category is cued is the naturally preferred strategy of learners, regardless of whether the cue is new or repeated information. In other words, if participants are trained to use a strategy that is the same as the one they normally use, no training effects would be expected to occur. Unfortunately, while the participants in this experiment were asked to describe their cognitive strategy for memorizing the standard list in the pre-training task, they were not specifically asked to report the strategy they used while viewing the cue words.

Another possible interpretation of the lack of training effects is that it resulted from inadequate training in a cognitive strategy which differed from that in which learners naturally engage. Although most participants were able to describe adequately the trained strategy and reported that they used it to some extent during the learning task, the fact that 20% of them (7 people) did not meet these criteria makes such an explanation plausible. Moreover, meeting these criteria does not guarantee that the training was sufficient for participants to apply it effectively during the learning task. Thus, even though participants are able to describe what they were to do cognitively in response to certain stimuli, and reported having done so at least "a little bit," they may have stopped short of applying the strategy fully enough to produce any effects. The lack of training generalization

found in prior attempts to train students in a specified cognitive strategy (Winne, 1980a; Winne & Marx, 1980) lends support to such an interpretation. In addition, that many participants had difficulty applying the trained strategy was indicated by their low ratings of its helpfulness in remembering more words, and by additional comments made by some participants. Specifically, several comments indicated that some participants found there was not enough time to employ the strategy within the three-second intervals between cue words.

Finally, some specific inadequacies in the training procedures were evident from both the formal and informal comments made by participants, and so it may be concluded that this, at least partially, was the reason for the absence of any effects. For example, it was evident from their written responses to questions concerning the use of the trained strategy that many participants had thought that they were supposed to use it somehow while studying the standard list of words, as opposed to only applying it when they saw the new or repeated information following the list.

In order to examine some of the questions which arose from this experiment, and to attempt to rectify some of the methodological problems that were found, Experiment II was undertaken. In addition to extending the amount of training given to subjects under the different treatment conditions, a number of extra conditions were added to the design. Those are described in the following chapter.

CHAPTER III

EXPERIMENT II

It was proposed in the previous chapter that the lack of training effects found in Experiment I could have been due either to problems with the training procedures used, which rendered the trained strategy ineffective, or to the fact that the strategy was one which participants in all treatment groups used naturally, without training. Experiment II sought to test these hypotheses in several ways.

First training procedures were extended to include several opportunities for participants to practice, overtly and covertly, the cognitive strategy they were being taught to use. In order to do this it was necessary to give the training on the first day of the experiment, so that the items used for practice trials would not interfere with learning of the word list on the posttraining recall task. As a result, the experiment proceded as follows. On the first day, all participants viewed a categorized list of words and were given a recall task identical to that used in Experiment I. Then, participants who were in a strategy training group were trained during the same session, using a portion of the list they had just been tested on as practice material. The posttraining recall task took place one week later, and was preceded by a brief review of the trained strategy. This retention interval was lengthened from that in Experiment I to reduce further the likelihood of proactive interference from studying the list during training.

Secondly, in Experiment II the self-report data collected differed from that collected in Experiment I in some important ways. On the first day subjects were asked to describe the strategy they used to memorize the standard list, and then to describe what they had done mentally when they saw the new or repeated information that followed the list. The requests for this

description differed from those in Experiment I in that they specified clearly whether the description pertained to the standard list or to the new or repeated words. Also, they explicitly asked whether participants changed their strategy for learning the standard list after receiving training, and if so, why they had done this.

A third way in which Experiment II attempted to test the hypotheses generated from the results of Experiment I was the addition of several treatments. One of these involved training a subset of participants in each of the three original cue conditions (that is, item cue, category cue, and new item cue) to use a strategy whereby they covertly repeated each cue word as many times as they could until the next cue word was presented. This condition was called cue repetition. The intention behind this type of training was to test the effects on recall of using this strategy in response to the various types of cues, and thus the possibility that this procedure is one that learners naturally use in response to such cues.

Another treatment, called recognition, also was added. It did not involve training, but included a different set of instructions prior to the second day's recall task. This treatment also was applied to all three cue conditions, and the same stimulus lists were used. Here, subjects were told that they would be shown some "extra" words following the standard list. They were to memorize the standard list as well as they could because their task would be to decide whether each extra word had been included in the standard list. Although these subjects were informed that they would be asked to recall the list afterwards, it was emphasized that this recognition task was the only cognitive process they were to engage as they viewed each extra word. To prohibit any further processing, they were instructed to count backwards covertly as soon as they had made each recognition decision until the next extra word appeared.

The recognition condition was designed to explore two questions. One question is whether learners' natural way of responding to repeated or new information following a list of words is simply to perform a recognition check. If this is the case for one or more cue conditions, or if cue repetition is the naturally preferred strategy of learners in one or more cue conditions, the following patterns in mean recall scores would be expected. In the former case, that is, if a recognition check is naturally performed by learners in a given cue condition, the recognition groups' means for the two days' tasks should not be reliably different, but those in the same cue condition who were given cue repetition training should differ reliably over the two days. In the latter case, that is, if cue repetition is naturally preferred by learners in a particular cue condition, their means should not differ reliably over the two days' tasks, while those in the same cue condition who followed recognition instructions ought to show a reliable change on the second day.

The other question to be explored by the inclusion of the recognition condition is that of whether the process of making a recognition decision involves a search of previously presented items, already stored in memory, in order to generate a "match" with the stimulus word. A positive answer to this question would indicate support for a search-decision model of recognition, as opposed to direct access. Mean recall scores on the post-training task for all three recognition groups which do not reliably differ from those of participants in the same cue condition, but who were trained in complete set repetition, would supply some evidence for a search-decision model.

Finally, one more condition was added to the design for Experiment II. According to the chunk recall hypothesis (Cohen, 1966; Tulving & Pearlstone,

1966), it could be postulated that the superior recall of participants in the new item cue condition in Experiment I was due simply to the fact that each category presented to that group contained nine words rather than seven. Specifically, 9-word categories may provide the opportunity for a greater number of inter-item associations to be formed, resulting in a richer associational network for each category. Once the concept of a category is recalled, the number of items recalled within the category may be a similar proportion of the total number presented as results when 7-word categories are shown. Cohen's (1963) claim in this regard was made on the basis of studies using categories of five words each, or less. However, this result was obtained with 7-word categories in one instance in Experiment I, and thus was considered a reasonable hypothesis in this case. To test the possibility that this could explain the higher recall produced in the new item cue condition, a 9-word control condition was included in this experiment. This involved presenting exactly the same information as was shown in the new item cue condition, but in standard list format; that is, all nine items were presented immediately following their category label.

Hypotheses

The hypotheses which concern the effects of training in a cognitive strategy were based on the assumption that the respective strategies were learned and were used by participants. Self-report data were used to determine the extent to which the assumption was met.

Prior research does not provide sufficient evidence to warrant predicting whether posttraining recall scores for the groups trained in complete set repetition will equal those of the groups in the recognition condition. Similar scores in the respective cue conditions, when given the two different types of instructions, would indicate support for a search-decision model of recognition, while reliably different scores would not.

The first two hypotheses predicted that the results obtained in Experiment I will be replicated. Hypothesis 3 was based on the interpretation of the results of Experiment I, that training was inadequate, but that adequate training would produce results in support of Winne's (1972) hypotheses concerning the restructuring of inter-item associations. Hypotheses 4 and 5 are based on the chunk recall hypothesis as an alternative explanation of the results in Experiment I, and of Winne's (1972) findings.

There does not appear to be sufficient evidence upon which to base predictions about whether learners naturally engage in cue repetition or recognition checks when they encounter certain types of cue words following a categorized word list. While the patterns of results obtained in the cue repetition and recognition conditions would be analyzed according to the description above, no specific hypotheses were posed for these treatments.

The specific experimental hypotheses tested in Experiment II were as follows:

1. The repetition treatments, item cue and category cue will not reliably improve recall compared to the 7-word control condition.

2. The new item cue treatment will reliably improve recall compared to the item cue, category cue, and control conditions.

3. Training participants in complete set repetition will reliably improve recall for participants in the item cue and category cue conditions, but not for those in the new item cue condition.

4. The 9-word control condition will produce mean recall scores that are reliably higher than those of the 7-word control, item cue, and category cue conditions.

5. For those categories recalled by the participants in the 9-word control group, the average proportion of words per category recalled will

be approximately 63%.

Methods

Participants. The sample for the second experiment was comprised of 71 volunteer undergraduate university students, none of whom particpated in Experiment I. Participants each were assigned to one of eleven treatment groups in semi-random fashion, constrained by times when they were available to participate. This assignment was effected by conditionally randomizing the time blocks during which individual or small groups of participants were available so that approximately equal cell sizes would be obtained where possible.

Treatment and design. On the first day of the experiment participants in the respective treatment groups were shown the same categorized word lists as were used in Experiment I, with one exception. The exception was a standard list for the 9-word control group which was created for this experiment.

All participants in the complete set repetition and cue repetition groups were trained to follow the cognitive strategy designated for them, while viewing the cue words which followed the standard list. This training took place immediately after the recall measure was taken on the first day. One week later these participants and those in the two control groups were given a posttraining recall task similar to that given in Experiment I. Subjects in the three recognition groups were not trained, but were given a different set of instructions for the task on the second day. Participants worked either individually or in small groups of up to six people. Experiment II consisted of nine treatment groups arranged in a 3 x 3 factorial design, plus two control conditions. The two factors in the factorial design were cue condition and type of instruction.

Materials and procedures. The word lists for this experiment were the same as those in Experiment I, except for the one presented to the 9-word category control group. The latter consisted of the same words as were presented in the new item cue condition, but in the standard list format, that is, all nine items belonging to each category were presented immediately after their category label, and no cue-wrods followed the list.

Several small but significant changes were made in the instructions for the recall task in Experiment II. One of these was that, prior to the first day's task, participants were told explicitly the rate at which the words would be presented. This was done because it was considered important for them to be prepared as adequately as possible for the first trial, so that their expectations would not differ from those of the second day's trial. In addition, at the end of training for all participants, two things were stressed by the trainer. Firstly, they were told that, in this study, it was the effect of the particular strategy they had been taught which was of interest, and thus, that they should do their best following the instructions they had been given, even if they felt another strategy would be more helpful for memorizing the list. Secondly, they were asked not to discuss the procedures of the experiment with other students until after all participants had completed the second day's task.

The second day's instructions for those participants who were trained included a brief review of the cognitive strategy in which they were instructed on the first day plus a reminder of the format of the list and rate of word presentation. This was seen as important since the two sessions were one week apart, a long enough interval for some forgetting to occur. Otherwise, the procedures for the second day's task for these participants was identical to that which was given prior to training on the first day.

The training for the complete set repetition groups included a demonstration on the blackboard by the trainer, similar to that included in Experiment I. However, in this case participants in the item cue and new item cue conditions were not instructed to scan all category labels upon presentation of a new or repeated word, but rather, simply to decide which category the word belonged to. This change was made for two reasons. First, due to the difficulty in applying the trained strategy within each 3-second interval between cue words reported by participants in Experiment I, it was considered advantageous to simplify their task. A second and perhaps more important reason was that the scanning of all categories is a separate cognitive process from reviewing the items in a single category, and to include both in the training might add unwanted variance to any resulting effects. Thus, to adequately test one hypothesis concerning participants' restructuring of inter-item associations within categories, it was necessary to discard any questions about the review of all category concepts for the purposes of the present investigation.

Following the trainer's modeling of the strategy, participants in the category cue condition were shown three complete categories (21 words) from the standard list which was used for the same day's recall trial, while those in the item cue and new item cue conditions were shown two complete categories (14 words) from this list. This was done so that each group saw enough list material for three related cue words to be used for practice. Then, one cue word, belonging to one of the categories just shown, was presented. Participants were asked to write on the backs of their answer sheets the category label to which the cue word belonged, and all of the words they could recall from that category including the cue word just presented. They were given about one minute to engage in this exercise.

They were then reminded of the total number of words belonging to the category in the standard list, and told that they should assess their performance on this basis. The next practice trial involved a different cue word and instructions to go through the exercise mentally only. The same amount of time was given for this trial, and then a participant was randomly called on to recite the words recalled from the category to ensure that the directions were being followed correctly. The third trial was done in the same manner as the second except that only about 10 seconds was allowed for the review of the category members. In order to obtain a rough measure of how well participants were able to carry out the strategy, they were asked to write down all the words which they had recalled during the ten-second time allotment. They were instructed explicitly not to write any words which came to mind after the 10-second period. After the training was complete participants were reminded that the instructions applied only to the cue words, and that they should use whatever strategy they normally used while studying the standard list in the following week's session. The training for these groups took approximately 20 minutes.

The training for the cue repetition strategy proceded as follows. The trainer gave an oral demonstration, using an example on the blackboard identical to that used for the complete set repetition training. Then, just before the participants were shown the first cue word from the day's recall trail list, the trainer verbally recreated the scenario for the recall trial, by saying, "You do whatever you normally do while studying the regular list, and then when you see the first repeated word, (or, in the case of the new item cue group: new word), say it to yourself as many times as you can before the next repeated word (or: new word) appears. Do it out loud this time--here's your repeated word (or: new word . . .) . . ." One more cue word

was used for an overt practice trial. Then two more trials were given, each with about three seconds allotted for covert repetition of the cue word. This training took approximately 10 minutes.

Participants included in the three recognition treatments were given the same recall tasks on the first day as the other groups, but no training followed. On the second day these groups were told that their task would be different from that of the week before. The orientation to the task involved a description of the cue words as "extra words, which may or may not have been included in the original (standard) list." Their instructions were to memorize the standard list as well as possible because they would be asked to decide, upon presentation of each "extra" word, whether it was part of the standard list. Participants in the new item cue condition were instructed to place a check mark (✓) on the front of their answer booklets each time they saw a word that had been shown in the standard list. Those in the item cue and category cue conditions were told to do this for each word that had not been shown in the standard list. These instructions were strictly for the purpose of ensuring that participants would engage in the recognition decision process. Finally, all three of these groups were instructed to begin counting backwards from 10 as soon as they had made each recognition decision, and to do this until the next "extra" word appeared. This was intended to prevent further attention to or processing of the cue word or list items.

The procedures used with the control groups on both days of Experiment II paralleled directly those in Experiment I. At the end of the experiment all participants were given the opportunity to discuss or ask questions about the study and the procedures used.

Scoring system. The method for deriving total recall scores was the same as that used in Experiment I. Scores of 0, 1, 2, or 3 were given to

participants' descriptions of the training or instructions they had been given. The criteria upon which the latter scores were based appear in Table 4.

Table 4

Minimum Criteria for Scores Representing Adequacy of Descriptions of Trained Cognitive Strategies in Experiment II

Score	Must Include
	Complete Set Repetition
3	a. Identification of category to which cue word belongs (N/A for category cue condition) b. Review of all words in the appropriate category while each cue word is being shown c. Inclusion of cue word in review process
2	b. As above
1	b. As above, plus major error
0	No response OR no correct information
	Cue Repetition
3	a. Repetition of cue word as fast as possible OR b. Repetition of cue word as many times as possible c. . . . until next cue word is shown
2	a. Repetition of cue word over and over
1	a. Repetition of word plus major error
0	No response OR no correct information
	Recognition
3	a. Decision about whether cue word was seen in standard list b. Making check mark (√) on answer booklet if cue word was not seen before (item cue and category cue conditions only) OR Making check mark (√) on answer booklet if cue word was seen before (new item cue condition only) c. Counting backwards until next word appears

Table 4 (continued)

	Recognition (continued)	
2	a. or b. c.	As above
1	a. or b. c. OR a. or b. (c. missing) OR c. (a. and b. missing)	As above, plus major error
0	No response OR no correct information	

Results and Discussion

Six of the original 77 participants in the sample for Experiment II were lost due to attrition, leaving a total of 71. Due to the nature of the randomizing procedures used, where time blocks for which participants had volunteered were randomly assigned to treatment conditions, it was possible to maintain proportional group sizes. This was accomplished by dropping two participants from each of the three groups trained in cue repetition. One case was dropped from the group in the category cue condition who received training in complete set repetition. This was done because this person's scores on the digit span test and recall measure were so low that they could not be considered representative of the population. Specifically, these scores were zero on all parts of the digit span test, and a total of 6 and 5 words recalled out of a possible 49, on pretraining and posttraining recall tests, respectively.

Effects of cue conditions. The means and standard deviations of pretraining and posttraining recall scores for the eleven groups in the experiment are shown in Table 5. The three groups in each cue condition (item cue, category cue, and new item cue) were pooled across training conditions for the analyses on pretraining recall scores since they had identical tasks on the first day. Means and standard deviations for the pooled cue conditions also are shown in Table 5.

A priori contrasts comparing the three cue conditions to the 7-word control condition and the new item cue condition to the 9-word control condition were performed. These contrasts showed no reliable differences among the groups' means of the pretraining recall scores. A oneway analysis of variance performed on the pretraining recall scores for the three different cue conditions and the two control groups yielded a non-significant

omnibus F-statistic of 1.04 (df = 4,65). In addition, a t-test comparing the pretraining recall scores of the 7-word and 9-word control groups showed no reliable difference between the means for these groups (t = 1.21, df = 12).

Table 5

Means and Standard Deviations of Pretraining and Posttraining Recall Scores for All Groups, and of Pretraining Recall Scores for Pooled Cue Groups

		Pretraining		Posttraining		
Training	Cue Condition	M	sd	M	sd	N
Complete Set	Item cue	31.6	9.3	25.1	10.7	7
Repetition	Category cue	22.3	3.4	21.3	8.3	6
	New item cue	29.6	9.7	24.4	7.2	7
Cue Repetition	Item cue	29.0	6.0	24.2	5.5	5
	Category cue	29.4	5.9	22.2	7.6	5
	New item cue	23.0	7.4	19.4	4.6	5
Recognition	Item cue	31.7	7.6	25.0	6.4	7
	Category cue	29.0	4.9	23.6	4.5	7
	New item cue	31.1	10.6	28.7	12.8	7
7-word control		29.7	7.7	29.9	4.7	7
9-word control		25.3	6.0	22.1	7.3	7

	Pooled cue group	M	sd	N
	Item cue	30.9	7.6	19
	Category cue	26.2	5.6	18
	New item cue	28.4	9.6	19

The scores on the pretraining recall measure for the different cue conditions clearly did not replicate the findings of Winne (1972; Winne et al., 1975) or those of Experiment I. Tests for training effects in this experiment thus were irrelevant for the purpose of explaining pretraining differences attributed to cue conditions. Nevertheless, some analyses were performed on posttraining recall scores to determine what effects due to training were present, if any. These tests may have implications for interpreting Winne's earlier study, and the results of Experiment I.

Training effects. Ten cases were eliminated for the analyses of posttraining recall scores because they did not meet the minimum criteria established for demonstrating that they had learned and used the trained strategy. For the groups trained in complete set repetition and cue repetition, these criteria were the same as those used in Experiment I; that is, the participants must have obtained a score of 2 or above on the descriptions of the trained strategy, and must have indicated that the trained strategy had been used at least "a little bit." The criteria used for identifying participants who used the trained strategy in the recognition condition differed from the foregoing in the following way. Some participants received a score of one on their descriptions of the trained strategy because they did not mention the instructions to count backwards from ten. If, however, the participants who received this score indicated that they did not attend to the cue word or list words once they had made a recognition decision, their data were included in the analyses. Otherwise the criteria for these groups were identical to those who received the other types of instructions. Of the ten cases eliminated from the analyses, one was omitted from each of the three groups trained in complete set repetition, three were omitted from the item cue condition where recognition instructions were given,

and two were omitted from each of the other two groups given recognition instructions.

To estimate rater reliability for scoring of participants' descriptions of the strategies they were instructed to use, 44 of the 71 descriptions in the complete sample were rescored. This procedure resulted in changes in only 4 cases, or approximately 9% of the descriptions that were rescored. Since the percentage agreement was 91%, the scoring criteria used to determine the adequacy of participants' descriptions was judged to be consistent.

Table 6 shows the means and standard deviations of posttraining recall scores with these 10 participants deleted. Hypothesis 3 predicted a positive effect of training in complete set repetition for the item cue and category cue conditions. This hypothesis was tested by obtaining mean gain scores, which were derived by subtracting pretraining recall scores from posttraining recall scores. These gain scores showed that recall scores after training were lower for both groups. Thus, further tests of the predictions made in this hypothesis for the item cue and category cue conditions are not appropriate. The same hypothesis predicted the absence of a statistically reliable gain for the new item cue condition after training in complete set repetition. A t-test on gain scores for this group showed no reliable difference ($t = 1.13$, $df = 5$). By itself, however, this statistical test cannot be considered sufficient evidence that these participants naturally use the trained strategy, especially since no differences among cue conditions were found in pretraining scores. Without changes in posttraining recall scores in the other two cue conditions, which would represent the predicted pattern of results due to training in complete set repetition, a conclusion is not justified that complete set repetition is a natural strategy learners use in response to any of the three cues to repeat information. A t-test comparing

the posttraining recall scores for the 7-word and 9-word control groups showed reliably higher mean recall for the 7-word control group ($t = 2.34$ $p = .04$, $df = 12$). Also, separate a priori contrasts comparing means of pretraining recall scores for the 9-word control condition versus those for the pooled groups in the item cue ($t = -1.68$) and category cue conditions ($t = -.47$) on pretraining recall scores showed no reliable differences. Thus, hypothesis 4 was not accepted.

Table 6

Means and Standard Deviations of Posttraining Recall Scores, Excluding 10 Cases Which did not Meet Criteria for Having Learned and Used Training

Training Condition	Cue Condition	M	Sd	N
Complete Set	Item cue	25.7	11.6	6
Repetition	Category cue	19.0	6.7	5
	New item cue	25.7	7.0	6
Cue Repetition	Item cue	24.2	5.5	5
	Category cue	22.2	7.6	5
	New item cue	19.4	4.6	5
Recognition	Item cue	24.5	7.7	4
	Category cue	22.4	4.6	5
	New item cue	29.4	6.4	5

The 9-word control group remembered an average of 43% of the words in each category that was recalled. A one-sample t-test comparing this proportion to the predicted 64% showed a statistically reliable difference ($t = -9.13$, $p < .01$, $df = 5$). Thus, hypothesis 5 was not supported.

Characteristics of the data. The assumptions of homogeneity of variance among groups and of homogeneity of covariance across occasions were both violated in Experiment II. As a result, repeated measures analysis of variance procedures were rejected as a method of testing the effects of training and cue condition on posttraining recall scores. In fact, the extreme differences in variance that occurred across the eleven groups in this experiment (maximum variance = 135.07, minimum variance = 20.8) suggests the possibility that the lack of effects from cue or training conditions may have been due to sampling variability. Alternatively, it could be hypothesized that treatments accentuated individual differences, thereby increasing variance, while having no impact on group means.

Another peculiarity in the data from Experiment II was that pretraining and posttraining recall scores for participants in eight of the nine treatment groups were moderately to strongly correlated, while those of the two control groups were nearly zero (see Table 7). Although many of these correlations did not reach traditional levels of statistical significance, they may be important, especially since the small cell sizes and an attendant lack of statistical power makes it difficult to reject the null hypothesis of $\rho = 0$.

Table 7

Pearson's Correlations Between Pretraining and Posttraining Recall Scores for All Groups in Experiment II, Excluding 10 Cases Where Training Criteria Were Not Met

Training Condition	Group	r	p	N
Complete Set Repetition	Item cue	.85	.02	6
	Category cue	.61	.14	5
	New item cue	.63	.14	6
Cue Repetition	Item cue	.90	.02	5
	Category cue	.70	.09	5
	New item cue	.55	.17	5
Recognition	Item cue	.42	.24	4
	Category cue	.17	.40	5
	New item cue	.63	.13	5
7-word control		.03	.47	7
9-word control		-.08	.43	7

The written descriptions of the cognitive strategies used by participants in the control groups to learn the words on both days of the experiment were examined for reasons why this phenomenon occurred. In particular, it was thought that perhaps participants in the control groups had changed their strategies for learning the words over the two days' tasks. If so, it is plausible that such a change might have a positive effect on recall for some participants and a negative effect for others. This would result in the absence of a correlation between the pretraining and posttraining scores.

Their descriptions showed that four of seven people in the 7-word group and three of six people in the 9-word group claimed to change their cognitive strategies on the second day's task. (One participant in the 9-word group did not respond.) Responses from participants in the other nine groups indicated that many of them misread the question concerning whether they had changed their strategy for studying the standard list. Hence, the data from this question could not be used to make comparisons between participants in the various training and cue conditions groups.

It is possible that the instructions given to the nine treatment groups, while having no differential effects on mean recall, had similar effects on whether, or to what extent, people changed their strategies for studying the standard list. This would result in positive correlations between pretraining and posttraining recall scores. For instance, if participants commonly believed that the instructed strategy would aid their recall on the second day, they might have relaxed their initial encoding strategies to a similar degree. On the other hand, it is possible that they were all somewhat distracted from their studying because they were preparing for the presentation of the cue words, at which point they were expected to follow a specific strategy. This also would result in positive correlations between pretraining and posttraining scores. The self-report data concerning the cognitive processing of participants during the tasks, which are discussed next, may help to shed some light on this issue.

Self-report data. Participants' self-reports of their cognitive processing during this experiment were examined to determine whether they could provide any explanations of the observed pattern of results. Before discussing these data however, it is important to consider the extent to which

participants' responses can be considered valid indicators of the cognitive processing which occurred. The possibility must be accepted that participants may have been unable to judge accurately the extent to which they engaged in the strategy they were instructed to use, or to which other types of processing were being engaged in during the task (Dark & Loftus, 1976; Neisser, 1977). Also, a possible threat to the validity of this type of self-report measure is that of social desirability biases in responses. That is, reports may not have been veridical to the extent that participants believed the experimenter would like or expect a particular response.

While these two issues cannot be eliminated completely, it is important that measures be taken where possible to minimize their effects on conclusions drawn from the data. For instance, in examining responses concerning the extent to which participants used the strategy they were instructed to use versus using other strategies, social desirability biases may be minimized by focusing on the responses which indicate that the instructed strategy was not used exclusively. This is especially important in this study since participants were explicitly instructed to use only the instructed strategy and no other, even if they believed another strategy would be more effective.

The issue of whether participants could judge accurately the extent to which they followed these instructions is more problematic. It could be argued that it is most parsimonious to draw conclusions on the basis of responses which indicate that other strategies besides that instructed were used, rather than on responses indicating that the trained strategy was used exclusively, because in the latter cases participants may have engaged alternative strategies unknowingly. However, proponents of the viewpoint

held by Nisbett & Wilson (1977) might argue that participants who said they had engaged other strategies than the ones which were instructed may have based their responses on assumptions about the probable outcome of using only the instructed strategy. In other words, if they believed that they would remember more words by using only the trained strategy and this did not occur, participants may have assumed that they must have engaged in some other kinds of processing and that this interfered with their ability to recall the words. While this issue cannot be resolved at present, it must be taken into consideration, and thus conclusions stemming from responses concerning the use of the trained strategy versus the use of other strategies must be made with caution.

In examining the questionnaire data, some facts were observed which have some important implications for research involving the use of training to control cognitive processing. One particularly relevant observation is that, even when participants were instructed explicitly to engage in only the instructed strategy while viewing the cue words, 27 of the 62 people who could describe the strategy reported that they had engaged in other types of cognitive processing during this portion of the task. This must be taken as a conservative estimate of the extent to which other strategies were used, since only 24 of the remaining 35 participants indicated that they had used only the instructed strategy. It seems reasonable to conclude that some of the 35 participants who did not indicate that they used only the instructed strategy engaged in other kinds of processing, even if they did not state this explicitly.

Clearly, most participants in this experiment did not follow the instructions they were given. At least two possible reasons might explain why this occurred. First, participants may not have been motivated to

engage in the instructed strategy because it required more effort than their natural strategies. Second, although a learner may have been able to describe the strategy they were to use, this is not a guarantee that they could operationalize it well enough to apply it effectively during the task. Prior research has found results in favour of the former cause (Winne & Marx, 1980). Nevertheless, it cannot be assumed that enough practice was provided here to rule out the latter possibility. In fact, one participant in this experiment who was able to describe the trained strategy made the same complaint as was made by participants in Experiment I, that is, that there was not sufficient time between cue words in which to carry out the strategy.

The questionnaire data also showed that ten participants were trained in a strategy similar to the one they described on the first day of the experiment. Of these, five indicated that they had followed the instructions completely on the second day, while five indicated that they did not. Thus, similarity of the trained strategy to that naturally preferred by learners, which might have the effect of lessening the cognitive expense of engaging it for those people, appears to have had little or no effect on the extent to which the instructions were followed.

This observation tends to support the notion that participants did not learn the strategy of interest well enough to carry it out effectively during the learning task, and that perhaps a certain amount of overlearning may be required.

Another noteworthy piece of evidence that was obtained from self-report data was that only 10 out of the 62 participants who could describe the instructed strategy said that it was at least "somewhat" helpful for remembering the words. Of these, only 3 produced higher recall scores on the second day of the experiment than they did on the first day. Since there

were 32 participants of the 62 who said that they used the trained strategy "mostly" or "all the time" while viewing the cue words, it seems reasonable to conclude that, even when the respective strategies were learned and used, they were not helpful for most people. Here also, one can only speculate about whether the strategies were not helpful because of insufficient practice in using them or because of the nature of the strategies themselves.

An important conclusion that can be drawn from these questionnaire responses is that studies which are designed to test the effects of varying amounts of practice on learners' use of trained cognitive strategies are needed in order to verify the usefulness of training paradigms such as that suggested by Winne (1980b). Even then, while his proposed technique is appealing, the control of cognitive processing by learners, and the collection of valid evidence that this has occurred, appears more complex and more difficult than Winne (1980b) suggests. It may be postulated that once learners are given enough practice in a particular cognitive strategy that it becomes automatic, the difficulty then might be in their ability to isolate and describe the process as it occurred, rather than as it should have occurred, according to the instructions (Nisbett & Wilson, 1977).

CHAPTER IV

CONCLUSIONS

The preceding two experiments were aimed at replicating the findings of Winne and his associates (1972; 1975) with regard to the effects on recall of presenting learners with new or repeated information following a categorized word list. Specifically, Winne et al. found that learners presented with new information following the list remembered more words than did those who were presented with repeated information or no information following the same list. They hypothesized that this finding occurred because learners were induced to restructure the cognitive associations they had made while studying the list in order to incorporate new items into the categories, and that this restructuring was not induced by repeating list items.

To test this hypothesis in the second study, learners were trained to respond cognitively to the new or repeated information in ways which were hypothesized to either induce or inhibit cognitive restructuring of the previously presented information. This attempt to control the cognitive processing of learners also was aimed at testing whether a particular cognitive strategy was naturally preferred by learners under one or more of the different cue conditions being investigated. Thus, by comparing recall scores of participants trained in different cognitive strategies to each other and to the recall scores obtained without instruction, it was believed that direct statements might be made about the causal links among the structure of information presented, cognitive processes used during acquisition, and subsequently measured learning.

A number of conclusions can be drawn from the present findings. First, while Winne's (1972; Winne et al., 1975) results were replicated in the first experiment, they were not in Experiment II. It is possible that the latter

results were a product of sampling variability, that is, variations resulting from the use of this sample as opposed to another. Nevertheless, it seems reasonable to conclude that the phenomenon found by Winne and his associates (1972; 1975) is not particularly robust, if it is a phenomenon as such. In view of the distributional characteristics of the data collected in Experiment II, judgements should be postponed until more evidence is available regarding the reasons why effects on recall due to different cue conditions were not found.

The conclusions that can be drawn concerning the training component of this investigation are particularly important because of their implications for the use of training by researchers to operationalize learners' cognitive processes, and for training paradigms such as that proposed by Winne (1980b). Specifically, this study showed that training learners in specified cognitive strategies, which they were to use in response to different types of instructional stimuli, had no effect on their recall performance compared to that which they produced without instructions.

The most obvious conclusion here is that the cognitive strategies in which these learners were trained are not effective ones in terms of changing recall performance. However, this conclusion must be considered with caution for several reasons. First, the lack of statistical power which was noted by Nelson (1977) as a possible cause for type II errors in past research is potentially relevant in the current data. It is possible that differential effects due to training were not detected due to the small sample size. Second, it is plausible that the free recall criterion measure used in these two experiments were not compatible with the instructions given to learners prior to acquisition (see Morris et al., 1977; Stein, 1978; Postman, 1978).

This is a particularly strong possibility in the case of the recognition condition, where learners were instructed to study list items for the purpose of later recognition, but were subsequently given a free recall test. However, it is also possible that effects of training in other groups went unnoticed because of an incompatibility between encoding instructions and the retrieval operations used at the time of test (Winne, 1981). In other words, even if a free recall test was an appropriate criterion measure, the control of encoding operations without also controlling the retrieval processes of learners may have confounded these results. For example, if learners were instructed to review all the items in each category while viewing each cue word, then perhaps they should also have been instructed to retrieve the information in this fashion in order to produce an accurate measure of the strategy's usefulness.

Another important result here is the fact that, when university students were instructed in quite simple cognitive strategies and even when they were given several opportunities to practice those strategies with the same type of stimulus material as was used for the recall task, they did not follow explicitly stated instructions to engage in the trained strategy and no other.

This can be related to two aspects of Winne's (1980b) proposed training paradigm. The self-report data collected in Experiment II showed that participants either were not motivated to replace their naturally preferred strategies with the one they were instructed to use, or were unable to apply the instructed strategy effectively when they were supposed to. Both of these problems indicate that more extensive practice was required for the training to generalize to the subsequent learning task. Thus, it has yet to be demonstrated how much of the reinforced practice and direct training in components of cognitive processes that was recommended by Winne (1980a) is

needed in order for those processes to be applied as intended.

It was suggested earlier that a certain amount of overlearning may be required in order for learners to apply trained strategies effectively during subsequent learning tasks. In examining the data from these two experiments it appears that cogntiive processing may need to be automatic in order for it to be effective for the learner. The fact that any observed changes in mean recall over the two days' tasks were in a negative direction may be seen in relation to this possibility. In particular, the means for two out of the three control conditions in this study decreased on the second day, albeit not statistically reliably. While it is possible that this occurred due to the relative difficulty of the two lists, there is no reason to believe that this was the case, since the words and categories were chosen randomly. Another possible explanation for the decrease in these groups' means is that their processing on the second day was no longer automatic because they had described their cognitive strategies on the first day and thus became conscious of them. The awareness of the processing they engaged in could have shifted the learners' attention from the task at hand to the components of the cognitive strategies they were using to memorize. This interpretation also might explain why learners in this study appeared to have difficulty applying the strategies they were taught. La Berge and Samuels (1974) proposed a similar view of the cognitive processing involved in reading:

> During the execution of a complex skill, it is necessary to coordinate many component processes within a very short period of time. If each component process requires attention, performance of the complex skill will be impossible, because the capacity of attention will be exceeded. But if enough of the components and their coordinations can be processed automatically, then the load on attention will be within tolerable limits and the skill can be successfully performed. (p. 548)

Implications for Future Research

The present findings indicate a need for further research in several areas. First, other attempts should be made at producing the results found on two occasions regarding the effects of different cue conditions on recall of categorized word lists. The fact that these effects were not found in the second experiment of this investigation renders suspect the generalizability of the phenomenon.

Second, studies are needed to determine the extent to which learners must be trained in various types of cognitive processing before they can apply them effectively in the learning task for which they are intended. Through manipulating as an independent variable the amount of practice that is provided, the relative cost in terms of time spent by researchers of using training paradigms such as Winne's (1980b) can be gauged. Also, if particular processing skills must be automatic in order to be applied effectively, it will be necessary to determine how much practice is required to make those skills automatic. It is clear that studies designed to examine cognitive processing variables through training to engage in specified strategies should be postponed until an effective training methodology has been developed and validated. In addition, the use of training by researchers for this purpose will also require research on metacognitive variables. Studies are needed to discover how well, and under what conditions, learners can isolate, control, and describe their cognitive processing. Finally, future research should test the validity of self-report data as evidence that particular types of cognitive processes have occured. Until more is known about the strengths and limitations in our metacogntiive ability, it is impossible to prove the validity of current approaches to research on human information processing.

REFERENCES

Anderson, R. C., Spiro, R. J., & Anderson, M. C. Schemata as scaffolding for the representation of information in connected discourse. American Educational Research Journal, 1978, 15, 433-440.

Atkinson, R. C., & Shiffrin, R. M. Human Memory: A proposed system and its control processes. In K. W. Spence & J. T. Spence (Eds.), The psychology of learning and motivation, Vol. 2. New York: Academic Press, 1968.

Bahrick, H. P. Broader methods and narrower theories for memory research: Comments on the papers by Eysenck and Cermak. In L. S. Cermak & F. I. M. Craik (Eds.), Levels of processing in human memory. Hillsdale, N.J.: Erlbaum, 1979.

Bassett, R. E., & Kibler, R. J. Effect of training in the use of behavioral objectives on student achievement. Journal of Experimental Education, 1975, 44(2), 12-16.

Battig, W. F., & Montague, W. E. Category norms for verbal items in 56 categories: A replication and extention of the Connecticut category norms. Journal of Experimental Psychology Monograph, 1969, 80(3), pt.2.

Battig, W. F. The flexibility of human memory. In L. S. Cermak & F. I. M. Craik (Eds.), Levels of processing in human memory. Hillsdale, N.J.: Erlbaum, 1979.

Bousfield, W. A. The occurrence of clustering in the recall of randomly arranged associates. Journal of General Psychology, 1953, 49, 229-240.

Bower, G. H. Chunks as interference units in free recall. Journal of Verbal Learning and Verbal Behavior, 1969, 8, 610-613.

Cermak, L. S., & Craik, F. I. M. (Eds.), Levels of processing and human memory. Hillsdale, N.J.: Erlbaum, 1979.

Cohen, B. H. Some-or-none characteristics of coding behavior. Journal of Verbal Learning and Verbal Behavior, 1966, 5, 182-187.

Craik, F. I. M. The fate of primary items in free recall. Journal of Verbal Learning and Verbal Behavior, 1970, 9, 143-148.

Craik, R. I. M., & Lockhart, R. S. Levels of processing: A framework for memory research. Journal of Verbal Learning and Verbal Behavior, 1972, 11, 671-684.

Craik, R. I. M., & Watkins, M. J. The role of rehearsal in short-term memory. Journal of Verbal Learning and Verbal Behavior, 1973, 12, 599-607.

Cronbach, L. J., & Snow, R. E. Aptitudes and instructional effects. New York: Irving, 1977.

Dansereau, D. F., Collins, K. W., McDonald, B. A., Holley, C. D., Garland, J., Diekhoff, G., & Evans, S. H. Development and evaluation of a learning strategy training program. Journal of Educational Psychology, 1979, 79(1), 64-73.

Dark, V. J., & Loftus, G. R. The role of rehearsal in long-term memory performance. Journal of Verbal Learning and Verbal Behavior, 1976, 15, 479-490.

Darley, C. F., & Glass, A. L. Effects of rehearsal and serial list position on recall. Journal of Experimental Psychology: Human Learning and Memory, 1975, 104, 453-458.

Ericsson, K. A., & Simon, H. A. Verbal reports as data. Psychological Review, 1980, 87(3), 215-251.

Evans, J. D. On the inconstant effects of study instruction. American Journal of Psychology, 1977, 90, 511-516.

Frase, L. T. Paragraph organization of written materials: The influence of conceptual clustering upon the level and organization of recall. Journal of Educational Psychology, 1969, 60, 394-401.

Glass, A. L., Holyoak, K. J., & Santa, J. L. Cognition. Reading, Mass.: Addison-Wesley, 1979.

Glenberg, A., Smith, S. M., & Green, C. Type I rehearsal: Maintenance and more. Journal of Verbal Learning and Verbal Behavior, 1977, 16, 339-352.

Jacoby, L. L., & Bartz, W. H. Rehearsal and transfer to long-term memory. Journal of Verbal Learning and Verbal Behavior, 1972, 11, 561-565.

Jacoby, L. L., & Craik, F. I. M. Effects of elaboration of processing at encoding and retrieval: Trace distinctiveness and recovery of initial context. In L. S. Cermak & F. I. M. Craik (Eds.), Levels of processing in human memory. Hillsdale, N.J.: Erlbaum, 1979.

Johnson, N. F. The role of chunking and organization in the process of recall. In G. H. Bower (Ed.), The psychology of learning and motivation, Vol. 4. New York: Academic Press, 1970, 171-247.

Kurtz, P. D. The effect of instructional objectives on student learning. The Alberta Journal of Educational Research, 1974, 20(4), 327-333.

LaBerge, D., & Samuels, S. J. Toward a theory of automatic information processing in reading. Cognitive Psychology, 1974, 6, 293-323.

Larkin, J. H., & Reif, F. Analysis and teaching of a general skill for studying scientific text. Journal of Educational Psychology, 1976, 68 431-440.

Lockhart, R. S. Remembering events: Discussion of papers by Jacoby and Craik, Battig, and Nelson. In L. S. Cermak & F. I. M. Craik (Eds.), Levels of processing in human memory. Hillsdale, N.J.: Erlbaum, 1979.

Mandler, G. Organization and memory. In K. W. Spence & J. T. Spence (Eds.), The psychology of learning and motivation. New York: Academic Press, 1967, 328-372.

Mandler, G. Organized recall: Individual functions. Psychonomic Science, 1968, 13, 235-236.

Miller, G. A. The magical number seven, plus or minus two: Some limits on our capacity for processing information. Psychological Review, 1956, 63, 81-97.

Miller, G. A. Free recall of redundant letter strings. Journal of Experimental Psychology, 1958, 56, 485-491.

Modigliani, V., & Seamon, J. G. Transfer of information from short- to long-term memory. Journal of Experimental Psychology, 1974, 102, 768-772.

Morris, C. D., Bransford, J. D., & Franks, J. J. Levels of processing versus transfer appropriate processing. Journal of Verbal Learning and Verbal Behavior, 1977, 16, 519-533.

Neisser, V. Cognition and reality: Principles and implications of cognitive psychology. San Francisco: W. H. Freeman, 1976.

Nelson, D. L. Remembering pictures and words: Appearance, significance, and name. In L. S. Cermak & F. I. M. Craik (Eds.), Levels of processing in human memory. Hillsdale, N.J.: Erlbaum, 1979.

Nelson, T. O. Repetition and depth of processing. Journal of Verbal Learning and Verbal Behavior, 1977, 16, 151-171.

Nisbett, R. E., & Wilson, T. D. Telling more than we can know: Verbal reports on mental processes. Psychological Review, 1977, 84, 231-259.

Postman, L., Thompkins, B. A., & Gray, W. D. The interpretation of encoding effects in retention. Journal of Verbal Learning and Verbal Behavior, 1978, 17, 681-705.

Rundus, D. Analysis of rehearsal processes in free recall. Journal of Experimental Psychology, 1971, 89, 63-77.

Rundus, D., & Atkinson, R. C. Rehearsal processes in free recall: A procedure for direct observation. Journal of Verbal Learning and Verbal Behavior, 1970, 9, 99-105.

Stein, B. S. Depth of processing re-examined: The effects of the precision of encoding and test appropriateness (semantic vs. case). Journal of Verbal Learning and Verbal Behavior, 1978, 17, 165-174.

Sternberg, S. High speed scanning in human memory. Science, 1966, 153, 652-654.

Tulving, E. Subjective organization in free recall of unrelated words. Psychological Review, 1962, 69, 344-354.

Tulving, E., & Pearlstone, Z. Availability versus accessibility of information in memory for words. Journal of Verbal Learning and Verbal Behavior, 1966, 5, 381-391.

Tulving, E., & Thomson, D. M. Encoding specificity and retrieval processes in episodic memory. Psychological Review, 1973, 80, 352-373.

Waugh, N. C. Immediate memory as a function of repetition. Journal of Verbal Learning and Verbal Behavior, 1963, 2, 107-112.

White, P. Limitations on verbal reports of internal events: A refutation of Nisbett and Wilson and of Bem. Psychological Review, 1980, 87, 105-112.

Wickelgren, W. A., Learning & Memory. Englewood Cliffs, N.J.: Prentice-Hall, 1977.

Wicker, F. W., Weinstein, C. E., Yelich, C. A., & Brooks, J. D. Problem-reformulation training and visualization training with insight problems. Journal of Educational Psychology, 1978, 70(3), 372-377.

Winne, P. H. The effects of three types of repetition and the amount of chunked information on the acquisition and retention of structured information. Unpublished Master's Thesis, Bucknell University, 1972.

Winne, P. H. Matching students' cognitive processing to text with instructional objectives or inserted questions (Research Report No. 80-02). Burnaby, B.C.: Instructional Psychology Research Group, Simon Fraser University, 1980a.

Winne, P. H. Minimizing the black box problem to enhance validity of theories about instructional effects (Occasional Paper No. 80-02). Burnaby, B.C.: Instructional Psychology Research Group, Simon Fraser University, 1980b.

Winne, P. H. Treatment Design for Research on Teaching. In L. Corno (Chair), Students' cognitive processing during teaching. Symposium presented at the annual meeting of the American Educational Research Association, Los Angeles, 1981.

Winne, P. H., & Marx, R. W. Matching students' cognitive processes and teacher skills to enhance learning from teaching. Proposal funded by National Institute of Education, submitted 1979.

Winne, P. H., & Marx, R. W. Matching students' cognitive responses to teaching skills. Journal of Educational Psychology, 1980, 72, 257-264.

Winne, P. H., Hauck, W. E., & Moore, J. W. The efficiency of implicit repetition and cognitive restructuring. Journal of Educational Psychology, 1975, 67, 770-775.

Woodward, A. E., Bjork, R. A., & Jongeward, R. H. Jr. Recall and recognition as a function of primary rehearsal. Journal of Verbal Learning and Verbal Behavior, 1973, 12, 608-617.

APPENDIX A

Word Lists

This appendix shows the word lists used for both experiments. It includes a standard list plus three sets of cue words corresponding to the item cue, category cue, and new item cue conditions, for each day of the experiment. The cue words are presented separately in Table A. Included in the standard lists for each day are two words in parentheses which were added to the lists in order to form the lists for the 9-word control group for Experiment II.

Standard List - Day One

Boats	Fruit
freighter	prune
sloop	strawberry
tug	cherry
clipper	apricot
canoe	cantaloupe
yacht	plum
schooner	lemon
(tanker)	(mango)
(barge)	(lime)

Clothing	Toys
skirt	jacks
jacket	wagon
hat	rattle
sweater	dollhouse
gloves	top
scarf	balloon
belt	soldiers
(shorts)	(block)
(suit)	(train)

Musical Instruments	Body Parts
banjo	finger
harp	liver
organ	elbow
trombone	hair
cello	mouth
tuba	neck
oboe	heart
(guitar)	(stomach)
(cymbals)	(tooth)

Sports
softball
hockey
golf
boxing
track
bowling
soccer
(fishing)
(archery)

Note: Words in parentheses were added for the 9-word control group in Experiment II.

Standard List - Day Two

Fuels	Fish
steam	guppy
butane	flounder
alcohol	mackeral
kerosene	perch
electricity	cod
propane	pike
deisel	tuna
(uranium)	(minnow)
(water)	(carp)

Fabrics	Carpenter's Tools
velvet	wrench
linen	file
mohair	crowbar
orlon	pliers
corduroy	chisel
flannel	drill
satin	lathe
(tweed)	(awl)
(muslin)	(square)

Human Dwellings	Occupations
castle	farmer
tepee	scientist
motel	merchant
houseboat	fireman
cabin	plumber
mansion	nurse
trailer	salesman
(cottage)	(banker)
(bungalow)	(labourer)

Trees
redwood
spruce
willow
palm
walnut
beech
cedar
(peach)
(dogwood)

Note: Words in parentheses were added for the 9-word control group in Experiment II.

Table A

Cue Words Following Standard List for Item Cue,

Category Cue, and New Item Cue Conditions

Item Cue	Category Cue	New Item Cue
	Day One	
soccer	sports	lime
golf	clothing	mango
belt	toys	cymbals
sweater	boats	guitar
rattle	body parts	blocks
balloon	musical instruments	train
tug	fruit	tooth
clipper		stomach
hair		shorts
elbow		suit
tuba		tanker
organ		barge
apricot		archery
plum		fishing
	Day Two	
perch	fish	carp
tuna	human dwellings	minnow
motel	occupations	bungalow
castle	fuels	cottage
fireman	trees	banker
plumber	fabrics	labourer
butane	carpenter's tools	uranium
steam		water
walnut		dogwood
palm		peach
mohair		tweed
linen		muslin
pliers		awl
file		square

Appendix B

Instructions and Scripts

The materials included in Appendix B are the instructions and scripts used by the trainers in Experiment II.

The materials used in Experiment I were altered in several ways to create those used for the control and complete set repetition groups in Experiment II. These changes are described in Chapter III. Since there were more materials used for Experiment II than Experiment I, only those used in Experiment II are included here. The italicized portions of the materials presented are instructions that the trainers followed. The portions appearing in standard type are scripts, which were read to the participants verbatim during data collection. These materials were used as follows:

Basic Task

The recall task varied slightly for the different cue conditions. The common instructions are presented here. They are augmented by special instructions corresponding to each cue condition. The special instructions for each group are signalled as follows: "a" for control, "b" for item cue, "c" for category cue, and "d" for new item cue. One set of special instructions also are included which correspond to all groups under the recognition condition. These were used only for Day Two of the experiment, and are signalled by "e".

Introduction - Day One

The introduction which preceded the recall task on Day One also varied slightly for the different cue conditions. The common introduction is presented here. It is augmented by special instructions for each cue condition. The special instructions corresponding to each group are again signalled by "a", "b", "c", or "d", for the control group, item cue, category cue, and new item cue, respectively.

Introduction A, B, and C

Three different introductions were given prior to the recall task on Day Two of the experiment. Each of these three introductions varied slightly for different cue conditions. The common introductions are presented here. Each is augmented with special instructions for each cue condition. The special instructions for each group are signalled in exactly the same way as those in the Basic Task and the common introduction for Day One. Introduction A was given to the 7-word control group, the 9-word control group, and the groups who were trained under the complete set repetition condition. Introduction B was given to the groups who were trained under the cue repetition condition. Introduction C was given to the groups who participated under the recognition condition.

Training

A different set of instructions was used for each treatment group that was trained. For the complete set repetition condition, Training A was used for the item cue group, Training B was used for the category cue group, and Training C was used for the new item cue group. For the cue repetition condition, Training D was used for the item cue group, Training E was used for the category cue group, and Training F was used for the new item cue group.

Table B shows the sequence in which these materials were used for the different experimental groups in Experiment II.

Table B

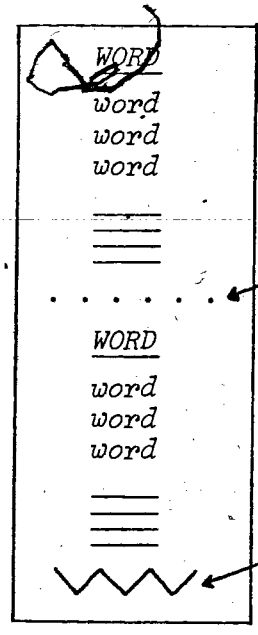
Sequence of Use of Instructional Materials in Experiment II

Day One	Day Two
Complete Set Repetition	
1. Introduction	1. Introduction A
2. Basic Task	2. Basic Task
3. One of the following:	
Training A (item cue group)	
Training B (category cue group)	
Training C (new item cue group)	
Cue Repetition	
1. Introdution	1. Introduction B
2. Basic Task	2. Basic Task
3. One of the following:	
Training A (item cue group)	
Training B (category cue group)	
Training C (new item cue group)	
Recognition	
1. Introduction	1. Introduction C
2. Basic Task	2. Basic Task
Control Groups	
1. Introduction	1. Introduction A
2. Basic Task	2. Basic Task

All Groups

Introduction - Day One

Will you please print your names at the top of your answer booklets. The only reason we need your name is to match your answers from today with those you give us next week. I'm now going to show you a list of words, arranged in categories on the screen. There will be seven categories with seven* words in each. You will see the words one at a time, one every three seconds. I'd like you to try and remember as many of them as you can. The underlined words are category labels, and all the words in each category will follow immediately after their category label. I'll show you what it looks like. . . . *Show on blackboard:* . . . *describe list as you do so.*



Then say one of the following:

a. *control* - *nothing*

b. *item cue* - After the end of the list, I will show you two of the words from each category again, to help you remember the list.

**9-word control:* 9 words in each

c. *category cue* - After the end of the list, I will show you each of the category labels again, to help you remember the list.

d. *new item cue* - After the end of the list, I will show you two new words that logically belong to each of the categories, to help you remember the list.

Any questions? Will you please now look at the words and try to remember as many as you can, including the category labels, and the new words at the end. Please do not write anything until told to do so.

Follow instructions for "Basic Task"

Basic Task

Turn on tape recorder and play "BEEPS" tape with earphone, so only you hear it. Show words, holding each word in view until you hear the beep. Hold on each row of dots as if they were a word. Stop at squiggly line, and say ONE of the following:

a. *control* - *nothing*

b. *item cue* - okay, here are the repeated words.

c. *category cue* - okay, hear are the repeated category labels.

d. *new item cue* - okay, here are the new words that belong to the categories.

[*All groups except control: Show these words in same manner as standard list, stopping at the squiggly line.*] *Unplug earphone and change tape, putting Digit Recall Tape into tape recorder. Do not play this tape until you have said the following:* Before you are asked to recall the words, please follow the directions you'll hear on this tape. It will take about three minutes. *Play Digit Recall tape.* You should now be on page two of your answer booklets. Will you please write down all of the words you can remember from the list, including category labels.

Say one of the following:

a. *control* - *nothing*

b. *item cue* - and the repeated words you saw at the end.

c. *category cue* - *nothing*

d. *new item cue* - and the new words you saw at the end.

e. *recognition groups (Day Two only)* - and the "extra" words you saw at the end.

Write them in any order you wish, and there is no time limit. *When they have all finished, say:* Will you now please turn to page three of your booklets

and answer the questions you see there. Please do not go back to page two, once you have turned the page.

Training A

Item Cue - Complete Set Repetition

Next week you'll be shown a list of words similar to today's, but I'd like you to follow the strategy I'm about to teach you when you see the repeated words at the end. Hopefully, it will help you to remember more of the words on the list. I will demonstrate the strategy on the board for you first, then I will ask you to try it yourselves on paper. After that, I'll give you a couple of chances to practice it mentally, since you'll have to do it that way next week. It will seem like a simple task, but since you may not be used to doing it, and you only have three seconds between words, it's important for you to really know it well.

Print on board: (Remember to underline category labels)

Boys

Peter ←
Tom ←
Mark ←
Eddie ←
. . . . .

Girls

Mary
Susan
Janet
Diane

Tom ←
Mark ←

Then say:

Okay. Here's you list of words, but remember, you'll see them one at a time. When you see a repeated word at the end *(point to "Tom")*, first decide which category it belongs to. For example. "Tom" belongs to the category called "Boys" *(point to the category label "Boys")*. Then, try to remember all of the words from that category *(draw arrows to the four names)* before the next

repeated word comes up on the screen *(point to "Mark")*. Don't worry about the order that you recall the words in, unless you find it easier to recall them in a certain order. The important thing is to try to remember all of the words in the category each time you see a repeated word. Are there any questions? Okay. Let's try it with a couple of the categories from the list you saw today. Will you please turn to the very back of your answer booklets, and use this as a practice sheet. I'll show you a portion of the regular word list first. *(Show complete categories: "Sports" and "Fruit", in same manner as before.)* Okay. Now here's your first repeated word. *(Show "soccer".)* Will you please write down the label of the category this word belongs to. *(Wait until finished.)* Next, write down all of the words that you can remember from that category, in any order you like. If you can't remember them all, just write as many as you can recall, and don't worry about the others. Remember to include the repeated word. *(Wait until they are finished.)* Are there any questions about what we've done so far? Remember that each category contains seven words in all, so you should know whether or not you've gotten all of them.

Okay. This time let's try the same exercise with another repeated word, only this time we won't write anything down. *(Show next repeated word: "golf".)* Which category does the word belong to? *(Point to someone if necessary.)* Okay, good. Now, would everyone please mentally rehearse all of the words you can remember from this category. *(Give them a minute or so, then ask someone to say aloud all the words he/she remembers.)* Okay, that's great--are you aware of whether you got them all or not? Okay. Is everyone sure they understand what to do? When you see the repeated words on the list next week, you'll only have three seconds to do this rehearsal process in your heads, so let's just go through one more trial to make sure you are all

experts. Here's the repeated word. *(Show "apricot".)* Which category is this word in? *(Ask group.)* Okay. Now please try to recall all of the words in the category, and include the word "apricot" as you go over them. *(Wait about 10 seconds.)* Has everyone recalled as many as they can? Good. Now would you please write them down--if you recall more of them as you are writing, do not include them. Just write the ones you could remember initially. *(Wait until they are finished.)*

That's all for today, but there are just a couple of things I'd like you to take note of. Firstly, in this study we are interested in how well this study strategy helps people learn a list of words. For this reason, we'd like you to just do your best next week using the method you just learned, even if you feel another method might be better. Secondly, we ask that you don't discuss what you did today with your classmates, until after next week. The other groups in the experiment are learning different study strategies, and if you talk to each other about it, then we can't be sure that our results are valid (accurate). Thank you very much for coming, and we'll see you here, same time, next week.

Training B

Category Cue - Complete Set Repetition

Next week you'll be shown a list of words similar to today's, but I'd like you to follow the strategy I'm about to teach you when you see the repeated category labels at the end. Hopefully, it will help you to remember more of the words on the list. I will demonstrate the strategy on the board for you first, then I will ask you to try it yourselves on paper. After that, I'll give you a couple of chances to practice it mentally, since you'll have to do it that way next week. It will seem like a simple task, but since you may not be used to doing it, and you only have three seconds between words, it's important for you to really know it well.

Print on blackboard: (Remember to underline category labels)

Boys

Peter ←
Tom ←
Mark ←
Eddie ←
. . . . .

Girls

Mary
Susan
Janet
Diane

Boys ←
Girls ←

Than say:

Okay. Here's your list of words, but remember, you'll see them one at a time. When you see a repeated category label at the end *(point to "Boys"--see arrow)*, try to remember all the words that belonged to that category in the list *(draw arrows to the four names)*, before the next repeated category label comes up on the screen *(point to "Girls")*. Don't worry about the order

you recall the words in, unless you find it easier to recall them in a certain order. The important thing is to try to recall all of the words in the category, each time you see a category label repeated. Are there any questions?

Okay. Let's try it with a couple of the categories from the list you saw today. Will you please turn to the very back of your answer booklets, and use this as a practice sheet. I'll show you a portion of the regular word list first. *(Show three complete categories: "Clothing," "Sports," and next one ("Toys") in same manner as before.)* Okay. Now here's your first repeated category label. *(Show "Sports" on screen.)* Will you please write down all the words from this category that you can remember, in any order you wish. If you can't remember them all, just write as many as you can recall, and don't worry about the others. You should be writing the category label itself as well. *(Wait until they are finished.)* Are there any questions about what we've done so far? Remember that each category contains seven words, so you should know whether or not you've gotten all of them.

Okay. This time let's try the same exercise with another repeated category label, only this time we won't write anything down. *(Show next repeated category label: "Clothing," on screen.)* Now, I'd like you to mentally rehearse all the words from this category that you can remember. *(Give them a minute or so, then ask someone to say aloud all the words he/she remembers from the category.)* Okay, that's great--are you aware of whether you got them all or not? Okay. Is everyone sure of what you are to do? When you see the repeated category labels next week, you'll only have three seconds between them, to go through this rehearsal process in your heads, so let's just go through one more trial to make sure you are all experts. Here's the repeated category label. *(Show "Toys.")* Try to recall all the words in this

category, and rehearse the label as well. *(Wait about 10 seconds.)* Has everyone recalled as many as they can? Okay. Now, I'd like you to write them down--if you recall more of the words as you are writing, don't include them. I just want to see how many you were able to remember initially. *(Wait until they have finished.)*

That's all for today, but there are just a couple of things I'd like you to take note of. Firstly, in this study we are interested in how well this strategy helps people to learn a list of words. For this reason, we'd like you to just do your best next week using the method you just learned, even if you feel another study method would work better. Secondly, we ask that you don't discuss what you learned today with your classmates until after next week. The other groups in the experiment are learning different study strategies, and if you talk to each other about it, then we can't be sure that our results are valid (accurate). Thank you very much for coming, and we'll see you here, same time, next Tuesday.

Training C

New Item Cue - Complete Set Repition

Next week you'll be shown a list of words similar to today's but I'd like you to follow the strategy I'm about to teach you when you see the new category members at the end. Hopefully, it will help you to remember more of the words on the list. I will demonstrate the strategy on the board for you first, then I will ask you to try it yourselves on paper. After that, I'll give you a couple of chances to practice it mentally, since that's how you'll have to do it next week. It will seem like a simple task, but since you may not be used to doing it, and you only have 3 seconds between the words, it's important for you to know it really well.

Print on board: (Remember to underline category labels)

Boys

Peter ←
Charles ←
Mark ←
Eddie ←
. . . .

Girls

Mary
Susan
Janet
Diane

Tommy ←
Nick ←

Then say:

Okay. Here's your list of words, but remember, you'll see them one at a time. When you see a new category member at the end, *(point to "Charles")*, first decide which category it belongs to. For example, "Tommy" belongs to the category called "Boys". *Point to "Boys".* Then, try to remember all of the words from that category, *draw arrows to the four names*, before the next

new category member comes up on the screen. *Point to "Nick".* Don't worry about the order that you recall the words in, unless you find it easier to recall them in a certain order. The important thing is to try to recall all of the words in the category each time you see a new category member. Are there any questions? You should include the new category member in your list as you rehearse them.

Okay. Let's try it with a couple of the categories from the list you saw today. Will you please turn to the very back of your answer booklets, and use this as a practice sheet. I'll show you a portion of the regular word list first. *(Show complete categories "Sports" and "Fruit" in same manner as before.)* Okay, now here's your first new category member. *(Show "lime")* Will you please write down the label of the category this word should go in. Next, write down all of the words that you can remember from that category, in any order you like. If you can't remember them all, just write as many as you can recall, and don't worry about the others. Remember to include the new category member you just saw. *(Wait until they are finished.)* Are there any questions about what we've done so far? Remember that each category contains 7 words, plus the new category member, so you should know whether or not you've gotten all of them.

Okay. Would you please turn your booklets over. This time let's try the same exercise with another new category member only this time we won't write anything down. *(Show "mango".)* Which category does this belong to? . . . Okay, good. Now will you please mentally rehearse all the words you can remember from this category. Do not look at your answer booklets. This time is your second time through this cateogry, but make sure you are also rehearsing this new word, and the new category member you saw a moment ago. *(Give them a minute or so, then ask someone to say aloud all the words he/she*

remembers.)

Okay. That's great--are you aware of whether you got them all or not? Did everyone include the new category members? When you see the words next week, you'll only have 3 seconds to do this rehearsal process in your heads, so let's just go through one more trial to make sure you are all experts. Here's the new category member. *(Show "archery".)* Which category does this word belong to? *(Ask group.)* Okay. Now please try to recall all of the words in the category, and include the word "archery" as you go over them. *(Wait about 10 seconds.)* Has everyone recalled as many as they can? Good. Now would you please turn over your answer booklets and write them down. If you recall more while you are writing, do not include them. Just write the ones you could remember initially. *(Wait until they are finished.)* That's all for today, except for a couple of things I'd like you to take note of. Firstly, in this study we are interested in how well this study strategy helps people to learn a list of words. For this reason, we'd like you to just do your best next week using the method you just learned, even if you feel another method might be better. Secondly, we ask that you don't discuss what you learned today with your classmates, until after next week. The other groups in the experiment are learning different study strategies, and if you talk to each other about it we can't be sure our results are valid (accurate). Thank you very much for coming and we'll see you here, same time, next week.

Training D

Cue Repetition - Item Cue

Next week you'll be shown a list of words similar to today's, but I'd like you to follow the strategy I'm about to teach you when you see the repeated words at the end. I'll demonstrate the strategy for you first, then I'll ask you to try it yourselves out loud. After that, I'll give you a couple of chances to practice it mentally, since that's how you'll have to do it next week. It will seem like a simple task, but since you may not be used to doing it, and you only have 3 seconds between words, it's important for you to learn it really well, so you can do it for each word.

Print on board:

Boys

Peter
Charles
Mark
Eddie
. . . . . .

Girls

Mary
Susan
Janet
Diane

Susan
Janet

Then say:

Okay. Here's your list of words, but remember, you'll see them one at a time. When you get to the repeated words at the end, say the following: As each repeated word is shown on the screen, repeat it to yourself mentally as many times as you can before the next repeated word appears. So, you'll see the regular list of words, and then I'll say, "Okay, here are the

repeated words." When you see the first repeated word *(point to "Susan")*, say to yourself, "Susan Susan Susan . . . " as many times as you can before the next word is shown. Then do the same with the next one: *(point to "Janet")*"Janet Janet Janet . . . " Are there any questions? Okay. Let's try it with a couple of the words you saw earlier. Do whatever you normally do while looking at the regular list. Then I'll say, "Okay, here are the repeated words." As I show each one, repeat it to yourself as fast as you can. Do it out loud this time. Ready? *(Show first repeated word, and lead them in repeating it over and over. Do this again with the next word.)* Okay. Are there any questions about what to do? Let's just try it a couple of times without saying it aloud. Do the same thing, but do it in your heads, okay? Here we go. *(Show next two words, 3 seconds apart.)* Okay. That's it. Remember this is all you should do when you see the repeated words at the end. In this experiment I'm interested in how well you can memorize the words, so please follow the instructions I've given you, even if you think another strategy would work better. One more thing: I must ask you to please not discuss what you did today with people outside this group, until after next week's session. The other groups in the experiment are learning different study strategies, and if you talk to each other about it, I can't be sure the results will be valid. Thank you very much for coming and I'll see you at my office, same time next week.

Training E

Cue Repetition - Category Cue

Next week you'll be shown a list of words similar to today's, but I'd like you to follow the strategy I'm about to teach you when you see the repeated category labels at the end. I'll demonstrate the strategy for you first, then I'll ask you to try it yourselves, out loud. After that, I'll give you a couple of chances to practice it mentally, since that's how you'll have to do it next week. It will seem like a simple task, but since you may not be used to doing it, and you only have 3 seconds between each word, it's important for you to learn it really well, so you can do it for each word.

Print on board:

Boys

Peter
Charles
Mark
Eddie
. . . . . .

Girls

Mary
Susan
Janet
Diane

Girls
Boys

Than say:

Okay. Here's your list of words, but remember, you'll see them one at a time. When you get to where the category labels are repeated, do the following: As each repeated category label is shown on the screen, repeat it to yourself mentally as many times as you can before the next category label appears. So, you'll see the regular list of words, and then I'll say, "Okay, here are

the repeated category labels." When you see the first one *(point to "Girls")* say to yourself, "Girls Girls Girls . . . " as many times as you can before the next label is shown. Then, do the same with the next one: *(point to "Boys")*"Boys Boys Boys . . . " Are there any questions? Okay, let's try it with a couple of the words you saw earlier. Do whatever you normally do while looking at the regular list. Then I'll say, "Okay, here are the repeated category labels." As I show each one repeat it to yourself as fast as you can. Do it out loud this time. Ready? *(Show first repeated category label, and lead them in repeating it over and over. Do this again with the next category label.)* Okay. Are there any questions about what to do? Let's just try it a couple of times without saying it aloud. Do the same thing, but do it in your heads, okay? Here we go. *(Show next two category labels, 3 seconds apart.)*

Okay. That's it. Remember, this is all you should do when you see the category labels at the end. In this experiment I'm interested in how well this strategy works, not in how well you can memorize the words, so please just do your best following the instructions I've given you, even if you think another strategy would work better. One more thing: I must ask you to please not discuss what you did today with people outside this group, until after next week's session. The other groups in the experiment are learning different study strategies, and if you talk to each other about it, I can't be sure the results will be valid. Thank you very much for coming and I'll see you at my office, same time next week.

Training F

Cue Repetition - New Item Cue

Next week you'll be shown a list of words similar to today's, but I'd like you to follow the strategy I'm about to teach you when you see the new words at the end of the list. I will demonstrate the strategy for you first, then I will ask you to try it yourselves, aloud. After that, I'll give you a couple of chances to practice it mentally, since that's how you'll have to do it next week. It will seem like a simple task, but since you may not be used to doing it, and you only have 3 seconds between each word, it's important for you to learn it really well so you can do it for each new word.

Print on board:

Boys

Peter
Charles
Mark
Eddie
. . . .

Girls

Mary
Susan
Janet
Diane

Tommy
Nick

Then say:

Okay. Here's your list of words, but remember, you'll see them one at a time. When you get to where the new words are shown, at the end *(point)*, do the following: As each new word is presented to you, repeat the word to yourself mentally, as many times as you can before the next word is shown. So, you'll see the regular list, and then I'll say "Okay, here are the new

words." When you see the first one *(point to "Tommy")*, say to yourself, "Tommy Tommy Tommy, . . " as many times as you can. Then, when the next word comes up *(point to "Nick")*, do the same with it: "Nick Nick Nick . . .". Are there any questions? Okay. Let's try it with a couple of the words you saw earlier. Do whatever you normally do while looking at the regular list. Then I'll say, "Okay, here are the new words belonging to the categories." As I show it, repeat it to yourself as fast as you can. Do it aloud this time. Ready? *(Show the first new word, lead them in repeating the word. Do this again with the next word.)* Okay. Are there any questions about what to do? Let's just try it a couple of times without saying it aloud. Do the same thing, but do it in your heads, okay? Here we go. *(Show next two words, spaced 3 seconds apart.)* Okay. That's it. Remember, this is all you should do when you see the new words at the end. In this experiment I'm interested in how well this strategy words, not in how well you can memorize the words, so please just do your best following the instructions I've given you, even if you think another strategy would work better. One more thing: I must ask you to please not discuss what you did today with people outside this group, until after next week's session. The other groups in the experiment are learning different study strategies, and if you talk to each other about it I can't be sure the results will be valid. Thank you very much for coming and we'll see you at my office, same time next week.

Day Two - Introduction A

Will you please print your names at the top of your answer booklets. Today's task will be much like last week's, except that you'll be asked to answer a couple of extra questions at the end. Just to review for a moment, remember that there are seven categories, with seven* words in each, and that you'll have three seconds between. . . .

Say one of the following:

a. *control* - the words

b. *item cue* - the repeated words, to identify the appropriate category and mentally review all the words in that category, each time you see a repeated word. Remember to include the repeated word you are looking at, when you do the review.

c. *category cue* - repeated category labels, to mentally review all the words in the category, each time you see a label repeated. Remember to include the category label you are looking at, when you do the review.

d. *new item cue* - the new category members at the end, to identify the appropriate category and mentally review all the words in that category. Remember, when you see the second new member for a category, review all 9 words: those in the original list, the first new member you saw, and the new member you are looking at.

Again, please follow these instructions as closely as you can--they are the most important part of the experiment. Any questions? Okay, here is the list.

Follow instructions for "Basic Task"

9-word control: 9 words in each

Day Two - Introduction B

Will you please print your names at the top of your answer booklets. Today's task will be much like last week's except that you'll be asked to answer a couple of extra questions at the end. Just to review for a moment, remember that there are seven categories, with seven words in each, in the regular list. Then you'll be shown. . . .

Say one of the following:

a. *item cue* - two words from each category again.

b. *category cue* - each of the category labels again.

c. *new item cue* - two new words that logically belong to each category.

When you see each of these (new) repeated words, you are to repeat it to yourself mentally as many times as you can before the next one is shown. Again, please follow these instructions as closely as you can--they are the most important part of the experiment. Any questions? Okay, here's the list.

Follow instructions for "Basic Task"

Day Two - Introduction C

Will you please print your names at the top of your answer booklets. Today's task will be somewhat different from last week's, so please listen carefully to the directions I'm about to give you. The list you will see is composed of different words, but they are in the same format as last time. This means there are seven categories with seven words in each, and again you'll see one word every three seconds. This time though, after you've seen the whole list, you'll be shown some "extra" words. Each "extra" word may or may not have been a word you saw in the original list. Your task is to try to memorize the original list as well as you can, because when you see each "extra" word at the end, I want you to decide whether or not it was shown before. Here's what you do: Each time you see an "extra" word appear, . . .

Say one of the following:

a. *item cue*)
) - Put a check mark at the bottom of your answer booklet if you have not seen the word in the original list.
   category cue)

b. *new item cue* - Put a check mark at the bottom of your answer booklet if you saw the word in the original list.

As soon as you've decided whether or not you saw the word before, start counting backwards from 10 until the next "extra" word appears. You probably won't have time to count all the way from 10 to one, but just go as far as you can before the next word appears. Does everyone understand what to do? Please follow these instructions as closely as you can. That means, even if you might normally have done something else, like repeating the "extra" words to yourself, it is important that you do only what I've instructed you to do. These instructions are the most important part of the experiment. Okay, just

to re-cap briefly: When you see the original list, do whatever you can to try to memorize all the words. Then, when you see each "extra" word at the end, . . .

Say one of the following:

a. *item cue*)
) - Put a check mark at the bottom of your booklet if
   category cue)
   you've not seen the word before.

b. *new item cue* - Put a check mark at the bottom of your booklet if you've seen the work before

Then start counting backwards from 10, until the next word appears. Do this for all the "extra" words. Afterwards you'll be asked to recall all the words you can remember. Okay, is everyone ready? Here's the list.

Follow instructions for "Basic Task"

APPENDIX C

ANSWER BOOKLETS

This appendix contains a sample of each type of answer booklet used in both experiments. The booklets that were used for different groups on a given day, within each experiment varied only slightly. These variations occurred on the third page of the booklets. They are slight changes in wording which applied to different cue conditions and types of instructions. The third page of the booklets used for Experiment I differed considerably from those in the booklets used for Experiment II. These differences are described in Chapter III. Table C identifies the different booklets and the experimental sessions and groups for which they were used.

Table C

Identification of Answer Booklets for Experiments I and II, by Experimental Session and Experimental Group

Answer Booklet	Session Used	Experimental Group
		EXPERIMENT I
IA	Day One	All Groups
	Day Two	Control
IB	Day Two	Item Cue
		Category Cue
		New Item Cue
		EXPERIMENT II
IIA	Day One	Control
	Day Two	
IIB	Day One	Item Cue Groups
IIC	Day One	Category Cue Groups
IID	Day One	New Item Cue Groups
IIE	Day Two	Item Cue - Complete Set Repetition - Cue Repetition
IIF	Day Two	Category Cue - Complete Set Repetition - Cue Repetition
IIG	Day Two	New Item Cue - Complete Set Repetition - Cue Repetition
IIH	Day Two	All Cue Conditions - Recognition

I A

NAME: _____

Part I.

Sample: _____

Set A: _____

Set B: _____

Set C: _____

Part II.

Sample: _____

Set D: _____

Set E: _____

Set F: _____

(Please do not turn page until told to do so.)

Please write all the words you can remember from the list, in any order you wish. Include category labels.

(Please do not turn page until told to do so.)

Please write a brief description of what you did mentally as you looked at the words on the list, in order to memorize them.

I B

NAME: _____

Part I.

Sample: _____

Set A: _____

Set B: _____

Set C: _____

Part II.

Sample: _____

Set D: _____

Set E: _____

Set F: _____

(Please do not turn page until told to do so.)

Please write all the words you can remember from the list, in any order you wish. Include category labels.

(Please do not turn page until told to do so.)

1. We trained you to use a specific strategy to learn the list of words. Please tell, in your own words, what that strategy.

2. How much did you actively use that strategy to learn the words? Please check, ✓)

Not at all	a little bit	about half the time	mostly	used trained strategy only
_____	_____	_____	_____	_____

3. How much did you use your own strategy, which you described for us on Tuesday? (Please check, ✓)

Not at all	a little bit	about half the time	mostly	used my own strategy only
_____	_____	_____	_____	_____

4. Do you think the instructions helped you to remember more words than you would have without instructions? (Please check, ✓)

Not at all	slightly	somewhat	quite a bit	greatly helped
_____	_____	_____	_____	_____

II A

NAME: _____

Part I.

Sample: _____

Set A: _____

Set B: _____

Set C: _____

Part II.

Sample: _____

Set D: _____

Set E: _____

Set F: _____

(Please do not turn page until told to do so.)

Please write all the words you can remember from the list, in any order you wish. Include category labels.

(Please do not turn page until told to do so.)

Please write a brief description of what you did mentally as you looked at the words on the list, in order to memorize them.

NAME: _____

Part I.

Sample: _____

Set A: _____

Set B: _____

Set C: _____

Part II.

Sample: _____

Set D: _____

Set E: _____

Set F: _____

(Please do not turn page until told to do so.)

Please write all the words you can remember from the list, in any order you wish. Include category labels.

(Please do not turn page until told to do so.)

1. Please write a brief description of what you did mentally as you looked at the words on the list, up until the point when Dawn said, "O.K., here are the repeated words."

2. What did you do mentally when you saw each repeated word?

II C

NAME: _____

Part I.

Sample: _____

Set A: _____

Set B: _____

Set C: _____

Part II.

Sample: _____

Set D: _____

Set E: _____

Set F: _____

(Please do not turn page until told to do so.)

Please write all the words you can remember from the list, in any order you wish. Include category labels.

(Please do not turn page until told to do so.)

1. Please write a brief description of what you did mentally as you looked at the words on the list, up until the point when dawn said, "O.K., here are the repeated category labels."

2. What did you do mentally when you saw each repeated category label?

II D

NAME: _____

Part I.

Sample: _____

Set A: _____

Set B: _____

Set C: _____

Part II.

Sample: _____

Set D: _____

Set E: _____

Set F: _____

(Please do not turn page until told to do so.)

Please write all the words you can remember from the list, in any order you wish. Include category labels.

(Please do not turn page until told to do so.)

1. Please write a brief description of what you did mentally as you looked at the words on the list, up to the point when Dawn said, "O.K., here are the new category members."

2. What did you do mentally when you saw each new category member (after the original list was shown)?

II E

NAME: _____

Part I.

Sample: _____

Set A: _____

Set B: _____

Set C: _____

Part II.

Sample: _____

Set D: _____

Set E: _____

Set F: _____

(Please do not turn page until told to do so.)

Please write all the words you can remember from the list, in any order you wish. Include category labels.

(Please do not turn page until told to do so.)

1. We trained you to use a specific strategy for using the repeated words from the list. Please tell, in your own words, what that strategy was.

_____

_____

2. How much did you actively use the strategy we trained you to use? (Pease check ✓)

Not at all	a little bit	about half the time	mostly	used trained strategy only
_____	_____	_____	_____	_____

3. How much did you use your own strategy, which you described for us last week, while viewing the repeat words? (Please check ✓)

Not at all	a little bit	about half the time	mostly	used my own strategy only
_____	_____	_____	_____	_____

4. Do you think the instructions helped you to remember more words than you would have without instructions? (Please check ✓)

Not at all	slightly	somewhat	quite a bit	greatly helped
_____	_____	_____	_____	_____

5. When you studied the list today, up to the point when the repeated words were shown, did you: (Please check ✓)

Use exactly the same strategy to learn the words as last week?

YES ____ NO ____

If NO, (Please check, ✓ , those that apply):

a) Did you change your study strategy due to the training you had?

somewhat ____ a lot ____ completely ____

b) Change your study strategy for other reasons?

somewhat ____ a lot ____ completely ____

If you checked b (above), please give reasons.

_____

_____

_____

II F

NAME: _____

Part I.

Sample: _____

Set A: _____

Set B: _____

Set C: _____

Part II.

Sample: _____

Set D: _____

Set E: _____

Set F: _____

(Please do not turn page until told to do so.)

Please write all the words you can remember from the list, in any order you wish. Include category labels.

(Please do not turn page until told to do so.)

1. We trained you to use a specific strategy for using the repeated category labels. Please tell, in your own words, what that strategy was.

_____

_____

2. How much did you actively use the strategy we trained you to use? (Please check ✓)

Not at all	a little bit	about half the time	mostly	used trained strategy only
_____	_____	_____	_____	_____

3. How much did you use your own strategy, which you described for us last week, while viewing the repeated category labels? (Please check ✓)

Not at all	a little bit	about hale the time	mostly	used my own strategy only
_____	_____	_____	_____	_____

4. Do you think the instructions helped you to remember more words than you would have without instructions? (Please check ✓)

Not at all	slightly	somewhat	quite a bit	greatly helped
_____	_____	_____	_____	_____

5. When you studied the list today, up to the point when the repeated category labels were shown, did you: (Please check ✓)

Use exactly the same strategy to learn the words as last week?

YES ____ NO ____

If NO, (please check, ✓ , those that apply):

a) Did you change your study strategy due to the training you had?

somewhat ____ a lot ____ completely ____

b) Change your study strategy for other reasons?

somewhat ____ a lot ____ completely ____

If you checked b (above), please give reasons.

_____

_____

_____

II G

NAME: _____

Part I.

Sample: _____

Set A: _____

Set B: _____

Set C: _____

Part II.

Sample: _____

Set D: _____

Set E: _____

Set F: _____

(Please do not turn page until told to do so.)

Please write all the words you can remember from the list, in any order you wish. Include category labels.

(Please do not turn page until told to do so.)

1. We trained you to use a specific strategy for using the new category members. Please tell, in your own words, what the strategy was.

_____

_____

2. How much did you actively use the strategy we trained you to use? (Please check ✓)

Not at all	a little bit	about half the time	mostly	used trained strategy only
_____	_____	_____	_____	_____

3. How much did you use your own strategy, which you described for us last week, while viewing the new category members at the end? (Please check ✓)

Not at all	a little bit	about half the time	mostly	used my own strategy only
_____	_____	_____	_____	_____

4. Do you think the instructions helped you to remember more words than you would have without instructions? (Please check ✓)

Not at all	slightly	somewhat	quite a bit	greatly helped
_____	_____	_____	_____	_____

5. When you studied the list today, up to the point when the new category members were shown, did you: (Please check ✓)

Use exactly the same strategy to learn the words as last week?

YES ____ NO ____

If NO, (please check, ✓ , those that apply):

a) Did you change your study strategy due to the training you had?

somewhat ____ a lot ____ completely ____

b) Change your study strategy for other reasons?

somewhat ____ a lot ____ completely ____

If you checked b (above), please give reasons

_____

_____

_____

II H

NAME: _____

Part I.

Sample: _____

Set A: _____

Set B: _____

Set C: _____

Part II.

Sample: _____

Set D: _____

Set E: _____

Set F: _____

(Please do not turn page until told to do so.)

Please write all the words you can remember from the list, in any order you wish. Include category labels.

(Please do not turn page until told to do so.)

1. Please tell, in your own words, what you were instructed to do mentally when you saw the "extra" words, <u>following</u> the original list.

_____

_____

2. While viewing the extra words, how much of the time did you actually do this? (Please check ✓)

not at all	a little bit	about half the time	most of the time	all the time
_____	_____	_____	_____	_____

3. Did you do anything else (mentally) besides what you were instructed to do? Yes ____ No ____ (Please check ✓)

If "yes", please tell what you did mentally:

_____

_____

4. How do you think the instructions affected your ability to recall the words on the list, compared to the instructions you were given last week? (Please check ✓)

made it much harder	made it somewhat harder	no difference	helped somewhat	helped a lot
_____	_____	_____	_____	_____

5. When you studied the original list, <u>up to the point</u> when the "extra" WORDS were shown, did you: (Please check ✓)

Use the same strategy for memorizing as you used last week? Yes___ No ___

If <u>NO</u> (Please check, ✓ , those that apply):

a) Did you change your study strategy due to the instructions you were given this week?

somewhat ____ a lot ____ completely ____

b) Change your study strategy for other reasons?

somewhat ____ a lot ____ completely ____

If you checked (b) above, please give reasons.

_____

_____

_____