Children's spontaneous monitoring and control processes in a memory task.

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CHILDREN'S
SPONTANEOUS MONITORING AND CONTROL PROCESSES
IN A MEMORY TASK

by
Geraldine M. Church
B.A. University of New Brunswick, 1991

A Thesis
Submitted to the Faculty of Graduate Studies through the Department of Psychology in Partial Fulfillment of the Requirements for the Degree of Master of Arts at the University of Windsor Windsor, Ontario, Canada 1994
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ABSTRACT

Young school children are often given learning tasks where it is beneficial for them to use monitoring information. This study examined judgement-of-learning (JOL) monitoring information and children's spontaneous use of JOLs to regulate their study-time. Grades 1, 3, and 5 children were presented with picture-pairs of easily-named objects in 3 study-test trials of which the second and third study trials were self-paced. When children were prompted, it was found that all grades made accurate JOLs. However, only grades 3 and 5 children spontaneously utilized this information by allocating more study-time for items that were incorrect than for items that were correct on the previous test. The study is unique in the computerized method of presenting the pictures and recording study-time.
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CHAPTER I

INTRODUCTION

The present study is concerned with metamemory, a person's knowledge of memory phenomena (Flavell, 1971). There are two components involved in metamemory: metamemorial knowledge, which involves knowledge about the way memory works; and monitoring, which includes "certain ongoing, transient assessments people make about items in their memory" (Wellman, 1977b) and the regulation of current memory activities. This study's main focus is on the memory monitoring aspect of metamemory and on school children's use of memory monitoring information that leads them to decide on subsequent memory activity.

Some studies that have examined children in learning situations noticed that the activity of 6-year-old children is different from that of 8- and 10-year-old children. Dufresne and Kobasigawa (1989) and Kobasigawa and Metcalfe-Haggert (1993), for example, asked children to study sets of pictures for an upcoming test and, in their discussion, noted that the 8-year-old children more often used a self-testing strategy in order to assess their learning progress than 6-year-old children. The present study aimed to provide additional information about the developmental
sequence of the monitoring-control interaction by examining the study behaviour of grades 1, 3, and 5 children at different intervals in the course of learning a set of materials. Any new information about the developmental sequence of monitoring and control helps teachers to better understand when their students are ready to be trained to monitor and select appropriate strategies during study. Information about the importance of altering study behaviour at different intervals during the course of learning will encourage teachers to show their students the benefits of frequent exchange of monitor-control information. Students will subsequently (a) be more likely to choose for additional study the items which they have not yet mastered and (b) be better able to assess their recall readiness so that they know how much longer they need to spend studying.

In the next section of this chapter, a framework of cognition on which some studies in memory monitoring have been based will be introduced. Then will follow a presentation of relevant studies which led researchers to realize the importance of the monitor-control influence on memory performance. The last section of the introduction will explain the influence of one particular study and how it has led to this study.

**Theoretical Concepts**

In his model of cognitive monitoring, Flavell (1979) has proposed that cognitive monitoring "occurs through the
actions and interactions among 4 classes of phenomena: (a) metacognitive knowledge, (b) metacognitive experiences, (c) goals (or tasks), and (d) actions (or strategies)." For example, in preparation for a psychology test, a student may (a) know that, for her, chapter 1 is easier to comprehend than chapter 2; (b) realize during her study that she does not understand the author’s example of classical conditioning; (c) consider her goal: a test with essay questions and (d) assess the amount of time she needs to spend studying. The amount of time she decides to spend studying and any other strategies she chooses may depend on the kind of a test she will be given, what kind of material needs to be covered, and how difficult the material is for her to comprehend. Also, during the course of learning, her awareness of what she has already committed to memory may interact with or determine any subsequent action or strategy.

As children age, they encounter increasingly more and various memory tasks. From his studies on the development of memory and memory monitoring, Wellman (1977a, 1977b), concluded that, along with their increasing experience, children develop metamemory skills: their repertoire of memory strategies increases in number and variety, they gradually develop the ability to tailor strategies that are appropriate to the memory task, and they develop an awareness of memory problems and processes. Given a memory
task, students can draw on their experience and cognitive skills to help them achieve their memory goal. With these cognitive awareness skills, students are thus able to (a) make "ongoing, transient assessments" (memory monitoring judgements) about the information that has been learned, (b) search their repertoire for appropriate strategies to use, and then (c) use the designated strategy to advance toward the memory goal (Wellman, 1977a). Furthermore, Wellman (1977b) astutely observed that a memory task may initiate different kinds of memory monitoring judgements. Nelson and Narens (1990) subsequently developed a model which encapsulates those judgements.

According to Nelson and Narens' (1990) theoretical framework of metamemory, three kinds of monitoring judgements may occur in a learning task: (a) ease-of-learning (EOL), (b) judgements of learning (JOL), and (c) feeling of knowing (FOK). Ease-of-learning judgements are usually made in advance of learning, refer to items that have not yet been learned, and are predictions about the relative difficulty of the items that have to be learned. Judgements of learning may occur during or after the learning acquisition, refer to how well the items have been learned, and are predictions about recallability of the items on a test. Feeling of knowing judgements may occur during learning or after acquisition, refer to currently nonrecallable items, and are predictions about whether the
items would be recognized in a future test. The information that is generated from monitoring judgements, such as the above, leads the learner to take action to modify the current state of memory. In turn, this modification action, labeled the control process, may include any of the following: (a) initiating an action, (b) continuing an action, or (c) terminating an action.

In summary then, Flavell (1979), Wellman (1977a, 1977b) and Nelson and Narens (1990) altogether have illustrated the importance of a continual relationship between monitoring and control processing. Flavell’s groundwork research illustrated the various cognitive phenomena that interplay in monitoring situations. Wellman proposed how memory monitoring ability develops and centered on one of Flavell’s suggested phenomena, providing researchers with a breakdown of monitoring judgements. Nelson and Narens further expounded the importance of monitoring judgements and illustrated the role of such judgements in the learner’s decision to choose an action or strategy.

**Relevant Studies**

Empirical studies in the development of metamemory have traditionally focused on what young children know about their own memory. In a study designed to assess the accuracy of children’s memory span predictions, Flavell, Friedrich, and Hoyt (1970), also provided information about children’s assessment of their recall readiness.
Kindergarten, grades 1, 2, and 4 children were shown a set of pictures and asked to predict how many pictures they could remember. The children were then told to study the set of pictures until they could remember them all perfectly. Three study-test trials were given with a different set of pictures in each trial. Eight- and 10-year-old children were more accurate than 4- and 6-year-old children in their memory span predictions. The older children also estimated their recall readiness more accurately than the younger children. It was noted that these older children spent more time studying the pictures and used more strategies, i.e., naming, rehearsing, and testing than the younger children. (Studytime was measured by the length of time children held a button down to expose a picture.) The children’s memory-span predictions and study behaviours led the researchers to conclude that these two abilities are closely intertwined, i.e., children develop knowledge of their own memory ability and processes along with knowledge of what to do with material they have to remember.

Masur, McIntyre, and Flavell (1973) followed up with an investigation of the relationship between what children know about their own memory and the effect of this knowledge on what they do. This developmental study focused on children’s ability to monitor item difficulty (EOL) and use that information to allocate study time. Grades 1, 3, and
college students were presented with pictures in a multi-
trial, study-test sequence. Unlike the Flavell et al. 
(1970) study, the same items were used for four of the 
study-test trials. Following each 45-second study 
presentation, subjects were given a recall test, during 
which they were given feedback on the correctness of their 
responses. The subjects were then asked to select any half 
of the items for the next study trial. The older subjects 
(grade 3 and college students) tended to select for restudy 
the items that they had not recalled in the test while the 
grade 1 subjects selected for restudy both recalled and 
missed items.

Following a recall test in which not all the items were 
recalled, grade 1 subjects were shown the items and asked to 
identify which ones they had recalled and which ones they 
had missed (JOL). They correctly identified 98% of the 
recalled and 95% of the missed items. Clearly then, the 
young subjects’ selection of items for restudy was not due 
to their inability to discriminate the items known from the 
items not known. It appears that the youngest children in 
the study did not use their knowledge of item correctness 
when they selected items to study. Moreover, they took more 
trials before they reached the criterion of perfect recall 
than older subjects took to reach that criterion.

The Masur et al. (1973) study provided information on 
the development of the use of monitoring information, but it
did not determine how children would behave spontaneously. Children had been informed of the correctness of their responses, so it is not known whether they would have made these judgements independently. Children had been asked to select one-half of the items for further study. They may have behaved differently if they had not been asked explicitly to choose.

Wellman (1977b) introduced JOL and FOK questions into developmental studies of metamemory in order to determine children's memory monitoring abilities. Although this study suggested that the JOL and FOK of older children were superior to the JOL and FOK of younger children, other researchers (e.g., Bisanz, Vesonder, & Voss, 1978; Butterfield, Nelson, & Peck, 1988; Kobasigawa & Metcalfe-Haggert, 1993), have found that 6-year-old subjects can make accurate memory monitoring judgements. Butterfield et al. (1988) found that the FOK judgements of 6-year-olds are just as accurate as older subjects, and in their discussion, posited several questions raised from their research, viz., Do young children make monitoring judgements when they are left to make their own choices, or do they only make them when they are asked to do it?; and Do young children use this monitoring information spontaneously to select appropriate learning strategies?

Nevertheless, studies (e.g., Kobasigawa & Metcalfe-Haggert, 1993; Masur et al., 1973) have found that 6-year-
old students, even when they demonstrate ability to monitor, do not perform as well as older students do on memory tests. Apparently, the ability to judge the ease of learning did not account for the developmental differences in memory performance found in these studies. There may be other aspects of monitoring behaviour of 6-year-olds that differ from that of 8-year-olds.

Bisanz et al. (1978) conducted a study to examine their discrimination-utilization hypothesis. According to this hypothesis, individuals (a) discriminate, in a multi-trial learning situation, those items that were recalled correctly from those that were recalled incorrectly on an immediately preceding trial (JOL) and (b) then utilize such information to distribute processing time differentially on the subsequent trial. Six-, 8-, 10-, and 19-year-old subjects were presented pairs of pictures to remember. Then followed a study-test sequence until all the missing items could be recalled on a paired-associate recall test. On the second study trial and all the study trials that followed, the experimenter asked the subjects whether they got the items correct on the last test. These yes-no responses were termed postdictions of their former test responses. Thirty-three percent of the youngest subjects in the study made perfectly accurate postdictions, i.e., they discriminated recalled from nonrecalled items. Obviously, the authors demonstrated that 6-year-old subjects could be prompted to
accurately monitor their memory during the course of learning. The researchers also found, however, that the 6- and 8-year-olds who accurately discriminated recalled items from unrecalled items did not improve recall performance more rapidly than those who did not accurately discriminate such items. On the other hand, Bisanz et al. observed a substantial relationship between postdiction accuracy and acquisition performance for the grade 5 and college students. On the basis of these results, Bisanz et al. have concluded that older children and college students use the discrimination-utilization strategy whereas grade 3 or younger children do not.

The Bisanz et al. study has shown that even younger elementary school children have the ability to discriminate picture-pairs that they recalled from the ones that they did not recall. However, it is not clear whether older children, in fact, use such monitored information "to distribute processing time and/or effort on trial \( n + 1 \) so that the items that were incorrect on trial \( n \) would receive the greater processing effort." This "utilization" aspect of their hypothesis was not measured directly.

Dufresne and Kobasigawa (1989) designed a study in which young children were given the opportunity to spontaneously monitor and control their studytime. Grades 1, 3, 5, and 7 children were asked to study a booklet with hard-to-learn picture-pairs and a booklet with easy-to-learn
picture-pairs. Similar to the Bisanz et al. (1978) study, Dufresne and Kobasigawa (1989) found that subjects of all ages, including the grade 1 children, were aware of item difficulty (EOL). Even though grade 1 subjects discriminated the easy-to-learn items from the hard-to-learn items, they spent just as much time studying the booklet with the easy items as the booklet with the hard items. It seemed obvious that both of these studies found no relationship between grade 1 children’s monitoring information and their control processing. Although Dufresne and Kobasigawa (1989) provided a spontaneous learning situation where differential studytime could be determined, the method of observation does not allow an examination of trial-to-trial study behaviour. Only one study-test trial was given for each set of study material. All the hard items were contained in one booklet, and total time spent studying for that booklet was used in the analysis. Individual item studytime was not measured. Like the Dufresne and Kobasigawa (1989) study, the present study included a spontaneous condition but it also measured individual item study-time and followed the children’s study of those same items over two trials so that a more discriminatory analysis could be possible.

As demonstrated by Dufresne and Kobasigawa (1989) as well as other studies mentioned above, six-year-old children can sometimes make accurate monitoring judgements. However,
judgements about the relative difficulty of items (EOL) can be demanding even for older children. Owings, Peterson, Bransford, Morris, and Stein, (1980) examined grade 5 children's spontaneous monitoring and regulation of learning. The researchers found that children who were rated by their teachers as academically successful were more likely to choose for study those items that were more difficult to learn (incongruent passages of prose) than items that were easier to learn (congruent passages of prose). On the other hand, the grade 5 children who had been rated as less academically successful did not discriminate the incongruent material from the congruent material when they selected material for study. It is obvious that judging the relative difficulty of two items depends on the difference between those two items, i.e., if one item is familiar to the learner and another item is totally unfamiliar, younger subjects will more likely judge the items' ease of learning accurately and, subsequently, choose the unfamiliar item to study.

Even adults have difficulty discriminating the EOL of study material. Hunter-Blanks, Ghatala, Pressley, and Levin (1988) found that adults become aware of differential difficulty of sentences only after study and use this information to allocate more time to the more difficult sentences. Estimates of recall were most accurate only after the test. This information about the changing
monitoring information and potential alteration of control processing underlines the importance of designing studies that can measure memory monitoring and study behaviour at various intervals throughout the learning process. Zimmerman (1986) described self-regulated learners as "persons who self-monitor and self-evaluate at various stages during the learning process." Children need to make an initial EOL assessment of the material that they are about to study, judging the items that will be harder to learn and those that will be easier to learn, but when they set about the task of learning, they usually need to spend time studying the easy items as well as the hard items (as was the case in the Dufresne and Kobasigawa (1989) study. Students need to assess their to-be-learned material at the initial stage of learning when the material is first presented and continue to make accurate EOL, JOL, and FOK judgements during the learning process. When students can do this, they are self-regulated learners.

A recent study by Kobasigawa and Metcalfe-Haggert, (1993) has shed more light on the learning behaviours of young children. These researchers found that 6-year-old children spent a significantly greater amount of time on items that they judged harder to learn than on items that they judged easier to learn. The items to be learned were names of pictures of unfamiliar objects and pictures of familiar objects. Subjects accurately distinguished which
pictures would be harder to learn by pointing to the box that held the pictures of unfamiliar objects. Each picture was presented on a card that held a magnetic strip on the bottom so that when the picture card was run through a Language Machine, the name of the object could be heard. Subjects (grade 1, mean age 6.5 years and grade 3, mean age 8.5 years) were told to spend as much time as they needed to study the pictures until they could recall all the names perfectly. When the subjects indicated that they had spent enough time studying, their recall of the picture names was tested in a cued-recall task. Both age groups spent more time studying the unfamiliar objects than the familiar objects.

Although even the grade 1 subjects allocated more study time to the difficult items, their recall performance was not as good as that of the older subjects. Kobasigawa and Metcalfe-Haggert (1993) attributed the difference in performance to the more efficient self-testing strategies that the older subjects used while they were studying. The researchers demonstrated that 6-year-old children possess the skills necessary to monitor the EOL of the material that they have to study as well as their own JOL. The 6-year-olds' control processes are also efficient in the initial stage of acquisition because these young subjects use the information from their monitoring processes to allocate more time to studying difficult material.
Kobasigawa and Metcalfe-Haggert (1993) found that after the first recall test, the older subjects’ study behaviours differed from the younger subjects’ study behaviours. It seemed that the grade 3 subjects realized the importance of reassessing their learning progress and showed this awareness by continuing to monitor. They used a self-testing strategy to monitor their current state of learning (JOL), and, according to this information, altered their behaviour by, for example, separating the pictures that they recalled during the self-test from those they did not recall and allocating additional study time. The grade 1 subjects on the other hand probably did not reassess what they had learned. They did not change their strategy, but chose to study the items that they originally found difficult. It seems that they ignored the new information about how they performed on the recall test when they returned to the study task. The study assessed differential study behaviours for material that was either familiar or totally unfamiliar, and the researchers collapsed all the familiar items together and all the unfamiliar items together. This research of Kobasigawa and Metcalfe-Haggert (1993) invited a closer examination of the study behaviour of young children, about when children discriminate and utilize the information about discrimination to allocate differential study time.

**Present Study**

The present study was conducted to investigate further
age-related differences in children's tendency to monitor the differential learnability (make EOL and JOL judgements) of study material and use this information to allocate study time differentially. To this end, grades 1, 3, and 5 children were asked to learn a list of picture-pairs (e.g., pencil-comb; eye-door) under the multi-trial study-test procedure. To make the task difficulty approximately equal for the three grade levels, the list length was varied. Although the present procedure was similar to the one used by Bisanz et al. (1978), it differed at least in three ways: (a) In the Bisanz et al. study, the authors indirectly determined whether or not subjects allocated the greater processing time to previously unrecalled items. In contrast, a computer program was used in this study to present the picture-pairs for study and to measure directly the amount of time children spent for studying each pair. (b) Subjects in the Bisanz et al. study studied the picture-pairs during experimenter-paced trials (each item was presented for 5 s). Subjects in the present study were allowed to spend as much time on each item as they wanted in self-paced trials. (c) All of the subjects in the Bisanz et al. study were explicitly asked to monitor the differential learnability of the study items. On each study trial, as each item was presented, subjects were asked to indicate whether they had recalled that particular item correctly or incorrectly on the previous trial. The present study is
more similar to the Dufresne and Kobasigawa (1989) study where one half of the children were explicitly asked to monitor (prompt condition) and the remaining children were not (nonprompt condition).

The following three questions provided the focus of the present study. First, do children at all grade levels have the ability to monitor which items were correct and which ones were incorrect on the preceding trial? According to previous studies (e.g., Bisanz et al., 1978; Masur et al., 1973), the answer is yes; the ability appears to be well-developed even in grade 1 children. To measure the availability of this ability, children in the prompt condition were asked: "Did you get this one (picture-pair) right on the last test?"

Assuming that the answer to the first question is affirmative, the second question was: Do children spontaneously distinguish those items that they recalled correctly from those that they forgot, and then use this information to spend a greater amount of study time on unrealled items than on recalled items? On the basis of the previous findings, it was expected that grade 5 children would spontaneously spend more time for studying previously incorrect items than correct items, while grade 1 children might not show such differential allocation of study time even under the prompt condition.

Finally, children in the present research received
three study trials. The third question of the study was:
Does children’s differential allocation of study-time change
from trial 2 to trial 3?
CHAPTER II

METHOD

Design

This study used a 3 (Grade: 1, 3, and 5) X 2 (Prompt: present vs absent) X 2 (List: I vs II) X 2 (Gender) X 3 (Trial) mixed design for test performance scores and a 3 (Grade: 1, 3, and 5) X 2 (Prompt: present vs absent) X 2 (List: I vs II) X 2 (Gender) X 2 (Trial) mixed design for study-time scores. Trial was the within-subject factor in both analyses.

Subjects

A total of 72 children took part in this study. Twenty-four children from each of grades 1 (M age = 6.7), 3 (M age = 8.5), and 5 (M age = 10.7) were recruited from three elementary schools of the Essex County Public School system. The study used a 2 X 2 design within each grade, resulting in four groups: Prompt List I; Prompt List II; Nonprompt List I; Nonprompt List II. Six children (3 girls and 3 boys) were randomly assigned to each of the four groups.

Materials

Paired-Associate Items. Paired-associate items were line drawings of common objects from the Snodgrass and Vanderwart (1980) standardized set of 260 pictures selected so that they could be easily named by 6-year-old children. First, 71 pictures rated most familiar by subjects in
Snodgrass and Vanderwart's standardization study were selected. Then a further selection process ensured that pictures were homogenous in familiarity, also according to ratings given in the standardization study. (See Appendix for the items and their familiarity ratings.) Two picture sets (i.e., lists 1 and 2) of each 8, 12, and 16 pairs were used for the grades 1, 3, and 5 children, respectively. According to the Bisanz et al. (1978) study, this is the number of picture-pairs that would lead to uniformity of recall scores across different grades. Another reason for using these list lengths was because Bisanz et al.'s findings have suggested that most children would be unlikely to get all picture-pairs correct within the first two trials. (It was important that children be unable to recall at least one item in each of these two trials.)

Each set of pictures consisted of pairs of varying familiarity, yet matched to the other set in overall familiarity, according to the ratings by Snodgrass and Vanderwart (1980). There was no obvious associative value between the pictures in a pair. Two arrangements of picture-pairs of each set were presented for study to control for list-specific effects. (Pictures that occupied the left position in the first set occupied the right position in the second set.) There were three different arrangements of each set of picture-pairs, one for each of the recall tests. Six additional pictures from the
Snodgrass and Vanderwart (1980) picture set were selected for a practice run.

Pictures were digitized in TIF format on a 3 1/2 in floppy disk so that they could be graphically displayed within the computerized slide program Word Perfect Presentations 2.0 (Windows version). Thirteen different slide shows – 1 practice slide show and 12 experimental slide shows (4 for each grade) – were put on the computer’s hard drive. A digital clock, measuring approximately 1/2 in X 1 1/2 in, and reading the hour, minute, and second was located at the bottom center of the computer screen throughout all of the presentations.

Computer Equipment. The main computer equipment consisted of an IBM compatible 486DX33 computer with a 210 Meg hard drive, a keyboard, and a monitor. Other equipment included a Jovian Genie 2.0 signal converter and a video cassette recorder (VCR). (The converter enabled input from the computer monitor to be converted to television video signals so that they could be recorded onto the VCR tapes.) An additional video monitor was included for the experimenter’s unobstructed viewing of the computer activity. (This extra monitor also enabled the experimenter to check the equipment to see that the computer activity was being recorded.)

Procedure

Children were brought individually to a designated room
in the school and seated at the computer terminal. A chair and small desk had been placed behind and to the right of the child's chair for the experimenter. In order to assess their study-time behaviour, children received repeated study-test trials with an array of picture-pairs. The children were required to use the spacebar on the keyboard to control the amount of time each picture-pair remained on the screen. First, the experimenter administered a practice set of trials to (a) familiarize the children with the task and the computer and (b) confirm their ability to complete the task. Three practice pairs of pictures were presented while the experimenter, seated next to the subject, pointed at the appropriate area of the computer, and conveyed the following instructions:

On this computer screen, you will see pairs of pictures, one pair at a time, and you should try to remember the pictures as pairs - in other words, remember the picture on the right that is with the picture on the left. After you have had a chance to study the pairs of pictures, I will give you a test. In the test, you will be shown the left picture of the pair and asked to try to name the one that went with it on the right. You should study the pairs of pictures so that you will remember them in the test.
First, I am going to give you a practice, during which I will tell you what you have to do. Now you see a pair of pictures on the computer screen. The first thing you do is tell me the name of each of these pictures. The pictures stay there for only 5 s, when another pair comes on the screen. OK, now name this pair. (And so on, until all three pairs have appeared.) Now comes a test. You see the left-hand side picture of the pair. What is the name of the missing right-hand side picture? (At this point, children may name the missing item.) Here comes another left-hand side picture. Each time that a left-hand side picture appears alone, tell me the name of the picture that went with it. Now you have another chance to study the pictures. This time, though, you can study the picture-pairs as long as you want. (Additional instructions for children in the prompt condition: "As soon as you see each pair of pictures, I want you to tell me if you got this one correct on the last test. You will say 'Yes' if you believe you got it right, or 'No' if you believe you got it wrong.") Just press the space bar, here (experimenter points to space bar), when you want to go to the next pair of pictures. Study the pictures hard, because after you have
finished studying, I will give you another test. This is a practice to help you understand the procedure, so that you will know what to do when I give you another set of pictures to remember.

During the practice trials the experimenter assisted the children when it appeared that they did not understand the procedure. Following the first test, and upon presentation of the first pair of pictures in the study trial, children in the prompt condition were asked, "Did you get this one correct on the last test?" For each pair presented for study, a similar question was asked so that children in this group responded with a shorter question: "This one?" and finally, "Yes or No?" The prompt question was gradually eliminated, so that children in the Prompt condition responded "Yes" or "No" without being asked. The pictures in each study trial followed the same order as the first presentation order. The order of pictures in each test trial, however, was different. See Appendix for picture sequence of picture set 8-IA. The practice trials lasted until children got all three picture pairs correct and they demonstrated the ability to follow the procedure without further guidance from the experimenter. Only 2 children needed more than the standard 3-trial practice.

Following the practice trials, children were asked to perform the main task with the following instructions:
Now I am going to give you different set of pictures that you should try to remember. This time there will be more pictures than the set you had in the practice. There will be 8 (12, or 16) pairs of pictures in this set. Just as in the practice, you will name the pictures when they first appear as pairs.

The procedure for the main task followed the same study-test format as the practice procedure, except that there were three study-test experimental trials for all subjects.

The experimenter manually recorded (a) each name that the child gave to each pictorial item and (b) verbal responses that she/he gave during each of the cued-recall tests and (for children in the prompt condition) to the metamemory question. The VCR recorded everything that was displayed on the computer screen during each session, i.e., study items and the digital clock. Thus was produced a VCR tape recording of the length of time, in seconds, that each pair of pictures remained on the screen during study trials.
CHAPTER III

Results

Preliminary analyses of the data indicated that the variables gender and list (lists 1 vs 2) did not have any effect on the children's recall scores, monitoring of recalled and unrecalled pairs, or on their study time scores. Consequently, the data were collapsed across these two variables. For significant interactions described in the subsequent sections, follow-up mean comparisons were made with Tukey H.S.D. tests (Cicchetti, 1972).

Recall Data

Since children of different grades were presented with different numbers of pairs, proportions of items correctly recalled were used for examining children's recall performance. Table 1 presents the mean proportion of items correctly recalled on each of the three trials for each grade under each prompt condition. For the present study, however, recall scores on trials 1 and 2 are of most interest. The data were analyzed in terms of a 3 (Grade) X 2 (Prompt: present vs absent) X 3 (Trial) mixed-design analysis of variance, with the last factor being the within-subjects factor.

The analysis of the data revealed a significant main effect for trial, $F(2,132) = 241.22$, $p<.001$ and a significant interaction between grade and trial, $F(4,132) = 6.92$, $p<.001$. As shown in Table 2, this significant

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Table 1

Mean Proportion of Items Correct and Standard Deviations for Each Trial by Children of Each Grade and at Each Prompt Condition

<table>
<thead>
<tr>
<th>Grade</th>
<th>Condition</th>
<th>n</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Prompt</td>
<td>12</td>
<td>.385</td>
<td>.542</td>
<td>.635</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td></td>
<td>.146</td>
<td>.187</td>
<td>.635</td>
</tr>
<tr>
<td></td>
<td>Non-Prompt</td>
<td>12</td>
<td>.354</td>
<td>.635</td>
<td>.708</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td></td>
<td>.149</td>
<td>.216</td>
<td>.234</td>
</tr>
<tr>
<td>3</td>
<td>Prompt</td>
<td>12</td>
<td>.326</td>
<td>.521</td>
<td>.743</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td></td>
<td>.265</td>
<td>.249</td>
<td>.229</td>
</tr>
<tr>
<td></td>
<td>Non-Prompt</td>
<td>12</td>
<td>.285</td>
<td>.667</td>
<td>.813</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td></td>
<td>.179</td>
<td>.195</td>
<td>.188</td>
</tr>
<tr>
<td>5</td>
<td>Prompt</td>
<td>12</td>
<td>.193</td>
<td>.547</td>
<td>.724</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td></td>
<td>.114</td>
<td>.253</td>
<td>.202</td>
</tr>
<tr>
<td></td>
<td>Non-Prompt</td>
<td>12</td>
<td>.266</td>
<td>.661</td>
<td>.849</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td></td>
<td>.167</td>
<td>.286</td>
<td>.156</td>
</tr>
<tr>
<td>Grade</td>
<td>n</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>----</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>24</td>
<td>.370</td>
<td>.589</td>
<td>.672</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>24</td>
<td>.306</td>
<td>.594</td>
<td>.778</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>24</td>
<td>.229</td>
<td>.604</td>
<td>.786</td>
<td></td>
</tr>
</tbody>
</table>
interaction can be explained by the fact that a simple main
effect for grade was statistically reliable on trial 1,
$F(2, 69) = 3.91, p < .05$, but not on trials 2 and 3. On trial
1, grade 1 children attained significantly higher recall
scores than grade 5 children, $p < .05$. It is important to
note that by trial 2, however, children of the three
different grades had achieved comparable recall levels.

The analysis also revealed a significant prompt by
trial interaction, $F(2, 122) = 3.63, p < .05$. This significant
interaction emerged because children in the prompt condition
($M = .536$) had lower recall scores on trial 2 than children
in the nonprompt condition ($M = .655$), while this prompt
effect was not statistically reliable on trial 3. (N.B.: Children in the prompt condition were first asked the
metamemory question following the first test, during their
first self-paced study trial. The posed question may have
temporarily impeded their study, thus producing lower scores
on the next test.)

**Metacognitive Data**

To allocate study time differentially in the present
learning task, children must be able to recognize which
items they just recalled correctly and which items they did not. In order to assess this ability, children in the
prompt condition were asked: "Did you get that one right on
the last test?" The mean proportion of correct responses to
this metamemory question is presented in Table 3.
Table 3
Mean Proportions (and Standard Deviations) of Correct Responses to Metamemory Question

<table>
<thead>
<tr>
<th>Grade</th>
<th>Trial 2</th>
<th>Trial 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.875 (.177)</td>
<td>.813 (.247)</td>
</tr>
<tr>
<td>3</td>
<td>.938 (.072)</td>
<td>.938 (.113)</td>
</tr>
<tr>
<td>5</td>
<td>.917 (.077)</td>
<td>.917 (.077)</td>
</tr>
<tr>
<td>All</td>
<td>.910 (.118)</td>
<td>.889 (.168)</td>
</tr>
</tbody>
</table>

n = 12 in each grade.
A 3 (Grade) X 2 (Trial: 2 vs 3) mixed-design analysis of variance was performed on the data. There was no significant effect of either grade or trial, nor was there any interaction of these variables. As can be seen in the table, most children responded correctly with an overall mean of .899.  

**Study-Time Data**

The main focus of this study was to determine whether children would study previously recalled and unrecalled items differently. To this end, those children who recalled all of the items on trial 1 or trial 2 (2 grade 3 and 3 grade 5) and those who recalled none of the items on trial 1 or trial 2 (1 grade 3 and 2 grade 5) were excluded from the data analysis. In addition, one grade 3 boy from the nonprompt condition was not included in the analysis as he had studied more than five times longer than the rest of the grade 3 children. Each of the remaining 63 children (24 grade 1, 20 grade 3, and 19 grade 5) was assigned two study-time scores: one study-time score that is the average of study times for the unrecalled items and one study-time score that is the average of study times for the recalled items.

Table 4 presents the mean study times, in seconds, for the unrecalled and recalled items separately for grades, prompt conditions, and trials. These time data were analyzed by performing a 3 (Grade) X 2 (Prompt: present vs
Table 4
Mean Seconds Study Time with Standard Deviations for Items
Unrecalled and Recalled on Each Trial by Children at Each
Grade and Monitoring Condition

<table>
<thead>
<tr>
<th>Grade</th>
<th>Unrecalled</th>
<th>Recalled</th>
<th>Unrecalled</th>
<th>Recalled</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>4.791</td>
<td>4.753</td>
<td>3.647</td>
</tr>
<tr>
<td></td>
<td>Nonprompt</td>
<td>4.682</td>
<td>4.637</td>
<td>4.447</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>1.649</td>
<td>2.154</td>
<td>1.525</td>
</tr>
<tr>
<td>3</td>
<td>Prompt</td>
<td>6.049</td>
<td>5.167</td>
<td>6.130</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>2.294</td>
<td>3.626</td>
<td>2.619</td>
</tr>
<tr>
<td></td>
<td>Nonprompt</td>
<td>6.608</td>
<td>5.621</td>
<td>4.745</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>3.434</td>
<td>3.377</td>
<td>1.875</td>
</tr>
<tr>
<td>5</td>
<td>Prompt</td>
<td>8.985</td>
<td>8.422</td>
<td>7.042</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>6.319</td>
<td>6.676</td>
<td>6.433</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>3.471</td>
<td>2.955</td>
<td>7.460</td>
</tr>
<tr>
<td>All</td>
<td></td>
<td>7.356</td>
<td>6.382</td>
<td>6.370</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>4.198</td>
<td>4.267</td>
<td>4.482</td>
</tr>
</tbody>
</table>
absent) X 2 (Types of Items: unrecalled vs recalled) X 2 (Trial) mixed-design analysis of variance, with type of item and trial being within-subjects variables. The analysis showed a significant main effect for type of item, $F(1, 57) = 17.89, p < .001$. As can be seen in Table 4, children spent a greater amount of time studying previously unrecalled items ($M = 6.86$ s) than previously recalled items ($M = 5.69$ s). The analysis also revealed a significant main effect for trial, $F(1, 57) = 10.05, p < .005$ and a significant grade by prompt by trial interaction, $F(2, 57) = 4.56, p < .05$. This significant second-order interaction can be attributed to the fact, as will be explained below, that the prompt by trial interaction was significant within grade 1 but not within grade 3 or 5.

The expected grade by type of item interaction was not statistically reliable. However, since the main interest of the present research was grade level differences in differential study-time, study-time data were analyzed further at each grade level to measure the effect of the major factor (type of item: unrecalled or recalled) on study-time. Consequently, the study-time data were further analyzed at each grade level separately using a 2 (Prompt) X 2 (Trial) X 2 (Type of Item) mixed-design ANOVA.

These analyses revealed a distinction of the study-time activity between grade 1 and the other two grades: (a) Although for grade 1 children, the mean study-time for
unrecalled items was slightly greater than that for recalled items \((M_{\text{unrecalled}} = 6.40 \text{ vs } M_{\text{recalled}} = 5.78)\), the difference was not significant. As can be seen in Table 4, a greater trend toward differential allocation of study-time was shown by children in the prompt condition than in the nonprompt condition. However, this type of item by prompt trend was nonsignificant, \(p > .10\). Grade 1 data produced main effects for prompt, \(F(1,22) = 8.34, p < .01\), and trial, \(F(1,22) = 12.72, p < .05\). In addition, as mentioned previously, the prompt by trial interaction was significant, \(F(1,22) = 5.94, p < .05\). (b) For the older children, only the main effect of type of item was significant: grade 3, \(F(1,18) = 8.35\); and grade 5, \(F(1,17) = 7.24, p < .02\). Older children spent more time studying previously unrecalled items, \(M_{\text{grade 3}} = 5.88\); \(M_{\text{grade 5}} = 8.48\), than previously recalled items, \(M_{\text{grade 3}} = 4.85\); \(M_{\text{grade 5}} = 6.44\).
CHAPTER IV
DISCUSSION

The initial question that was addressed in the present study was: In a multi-trial learning situation, are elementary school children able to monitor which items were correct and which ones were incorrect on the preceding trial? Apparently, this monitoring ability is present at a very young age. The results for the prompt condition showed that even grade 1 children were highly accurate when they were asked about their previous test performance. Numerous studies have shown that young children have excellent recognition memory skills (identification of which items had been previously presented from a set of previously-presented and new items). It is not surprising then, that these children's identification for recalled and nonrecalled items was also excellent. Previous studies (e.g., Bisanz et al. 1978; Butterfield et al., 1988; and Masur et al., 1973), too, had found that 6-year-old children can make accurate memory monitoring judgements.

The results have shown that children of all grades in the present study demonstrated comparable levels of learning at least on trial 2. Given these sets of data, it is appropriate to examine the second question that guided this study: Do children spontaneously distinguish those items that they had recalled from those that they had not recalled and, subsequently, do they use this information to spend a
greater amount of study-time on those items that had not been recalled rather than on those that had been recalled? According to the present study-time data, grade 1 children did not show differential allocation of study-time even when they were prompted to monitor the recallability of items.Apparently, children at this grade level do not use the monitored information on a spontaneous basis to regulate the use of study-time on subsequent trials. In contrast, grades 3 and 5 children spontaneously (as data from the non-prompt condition indicated) spent more time studying previously incorrect items than correct items.

The present findings for grade 1 children converges with the findings of other previously mentioned studies (e.g., Dufresne & Kobasigawa, 1989; Masur et al. 1973) which had examined children in learning situations and found that grade 1 children do not allocate study-time differentially according to difficulty (hard vs easy) or recallability (unrecalled vs. recalled) level. Just as I found in the present study, Masur et al. (1973), for example, found that grade 1 children, though aware of which items they had recalled on the previous test, did not discriminate unrecalled items from recalled items even when they were explicitly asked to study selectively. Basing their findings on correlational analyses, Bisanz et al. (1978) (who had given children material similar to that given in the present study) also concluded that grade 1 children do
not regulate their use of study time.

The present study's findings differ from Kobasigawa and Metcalfe-Haggert (1993) who found that grade 1 children spent more time studying unfamiliar items rather than familiar items in preparation for a test. This divergence probably occurred because of the type of study material that was administered to the children. Kobasigawa and Metcalfe-Haggert gave children familiar and unfamiliar pictures to study, whereas the present researcher (like the Masur et al. study) administered all familiar items. Whatever cognitions induced children to spend more time looking at items that were totally unfamiliar rather than at items that were totally familiar may not be a factor that is involved when children are in a situation like the present study where all items given for study are familiar. For example, the initial EOL judgement of items that are either very familiar or very unfamiliar may readily evoke cognitions such as short-lived metacognitive experiences. In a situation like the present study when study items are all familiar to children, it may be difficult for young children to maintain these initially-evoked metacognitive experiences that some of the items are harder than others along with the continuously-changing information from JOLs that some items are known better than others. Apparently, it is only when the differential learnability of items is very distinctive, such as in the Kobasigawa and Metcalfe-Haggert study, and
not when it is homogenous, such as in the present study, that grade 1 children show an ability to regulate their use of study-time.

Unlike the grade 1 children in the study, the grade 3 children clearly differentiated unrecalled from recalled items when they were free to spend as much time studying as they wanted. So, not only were they able to proclaim whether an item was correct or not correct on the previous test, but they used this information to allocate more time for those items that were incorrect over those items that were correct. This differential allocation of study-time was evident whether the children were prompted or not. Masur et al. (1973) also found that grade 3 children tended to select for restudy the items that they had not recalled in the test, although in that study children were requested to select only half the items for restudy, plus they were given immediate feedback on the correctness of their responses.

Bisanz et al. (1978) gave children in their study material that was similar to the material in the present study – pairs of pictures of common objects – and assessed the children’s JOL of that material. Although they did not directly measure the children’s use of JOL monitoring information, Bisanz et al. concluded that grade 3 children do not use JOL information to regulate the use of study-time. The methodology of the present study permitted a
direct assessment of children’s use of the JOL monitoring information and, in so doing, found that grade 3 children actually did utilize the information of which items were correct and not correct to allocate time differentially.

As expected, the oldest age group (grade 5) children elected to study longer those items that they did not recall in the previous test rather than items that they recalled. Obviously then, once they have acquired this study strategy (at some time around grade 3), children continue to use it when they find themselves in similar study situations. This finding corresponds with Dufresne and Kobasigawa (1989) and Masur et al., (1973) who had also found that by this age, children show study-time differentiation when selecting material to study.

In addition to the questions pertaining to allocation of study-time on different items, a question was raised concerning different trials, viz.: Do children of different grades allocate similar patterns of study-time from trial to trial? Although there was no statistical evidence to support such differentiation, different grades seemed inclined to allocate different patterns of study-time when they were not prompted with the metamemory question. Grade 1 children spent less study-time than either of the two older groups in both trials but also, unlike the other two groups, they tended to spend the same amount of time on each kind of item across the two trials. It appears that grade 1
children continue to spend the same amount of time studying both recalled and unrecalled items even when they receive additional feedback information about how they perform on recall tests. Grade 3 and 5 children, on the other hand, continue to differentiate unrecalled from recalled items in subsequent trials by allocating more time for unrecalled items. Among the literature that was reviewed for this study, none of the studies had investigated differential allocation of the same study material over multiple trials.

All in all, the present study has adequately shown that the investigated (monitor-control) strategy of regulating the use of study time by utilizing the information about recallability of items, shows age-related changes during the early school years. Although, as stated earlier, other studies had examined how children allocate their time in study situations, they did not research what children do spontaneously and they did not follow the children’s activities over multiple study trials. This study, while approximating other studies, (e.g., Bisanz et al. 1978), was unique in the method by which items were presented and in which the study-time for each item was measured. This method provided a more precise measuring tool than the previous ones and, consequently, will prove to be useful to future researchers investigating similar kinds of data.

Perhaps by using such a technique, the study provided a learning task that is not like a classroom kind of learning
task. Nonetheless, the skills (e.g., JOL monitoring: Did I get this one right on the last test?; and study-time control: regulating the use of study time) that were demonstrated in this study are skills that are prominent in classroom learning situations as well.

As Wellman (1977b) pointed out, memory tasks initiate different kinds of memory monitoring judgements about information that has been learned. In addition to JOL monitoring, children need to make accurate EOL (e.g., This item will be hard for me to learn.) and FOK (e.g., I’m sure that I will remember this item on the test.) judgements. It is important for researchers to further the understanding of all the skills that children require to monitor spontaneously the progress of learning. It would be worthwhile to investigate how these memory monitoring judgement skills spontaneously interact during children’s study-time endeavors and we may then also discover what skill or combination of skills leads them to make particular strategy decisions.
REFERENCES


APPENDIX A

PICTURE STIMULI WITH FAMILIARITY RATINGS

<table>
<thead>
<tr>
<th>Item</th>
<th>Rating</th>
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<tr>
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<td>Arm</td>
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<td>Bed</td>
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<td>Belt</td>
<td>4.12</td>
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<td>Bicycle</td>
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<td>Bird</td>
<td>3.62</td>
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<tr>
<td>Book</td>
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<td>Bowl</td>
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<td>Brush</td>
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<td>Ear</td>
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ENVELOPE  4.12
EYE    4.88
FLOWER  3.88
FOOT   4.78
FORK   4.78
GLASS  4.78
GRAPES 3.65
GUITAR 3.58
HAND   4.82
HANGER 4.52
HEART  3.72
HORSE  3.55
IRON   3.65
KEY    4.85
KNIFE  4.45
LAMP   4.20
LEAF   4.30
LIPS   4.50
NOSE   4.52
PANTS  4.55
PEAR   3.55
PEN    4.78
PENCIL 4.42
PLUG   4.18
POT    4.22
REFRIGERA 4.68
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\[ n=71 \quad \Sigma x = 303.66 \]

Mean Familiarity Rating = 4.2769
APPENDIX B

LISTS OF PICTURE STIMULI IN ORDER OF PRESENTATION

16 PAIRS

LIST I - ORDER A

PENCIL-COMB
HANGER-SHOE
EYE-DOOR
GUITAR-BANANA
FORK-HORSE
SANDWICH-SQUIRREL
CAT-POT
BICYCLE-PANTS (Mean Familiarity Rating of top half = 4.265)
SOCK-KNIFE
APPLE-SHIRT
TRAIN-GLASS
LIPS-BOOK
BRUSH-CAKE
TELEPHONE-GRAPES
DESK-LEAF
IRON-LAMP (Mean FR of bottom half = 4.27)
LIST I - ORDER B

SHIRT-LIPS
BOOK-FORK
PANTS-APPLE
CAKE-TELEPHONE
GLASS-BRUSH
LEAF-EYE
BANANA-CAT
COMB-HANGER
GRAPES-DESK
POT- SOCK
SQUIRREL-BICYCLE
DOOR-IRON
HORSE-PENCIL
LAMP-SANDWICH
KNIFE-TRAIN
SHOE-GUITAR
16 PAIRS

LIST II - ORDER A

PEN-TREE
RULER-BIRD
SKIRT-DOG
TABLE-SCISSORS
TOMATO-ARM
BELT-CHAIR
ENVELOPE-SUN

CUP-BUS (Mean FR top half = 4.273)
NOSE-UMBRELLA
CARROT-BUTTON
FOOT-SPOON
KEY-TIE
PLUG-PEAR
HAND-REFRIGER
WINDOW-THUMB
BREAD-HEART (mean FR bottom half = 4.268)
LIST II - ORDER B

SPOON-SKIRT
DOG-CARROT
REFRIGER-FOOT
SCISSORS-HAND
BUS-PEN
BUTTON-WINDOW
BIRD-ENVELOPE
HEART-TABLE
UMBRELLA-KEY
CHAIR-NOSE
THUMB-TOMATO
PEAR-RULER
TIE-BREAD
SUN-CUP
TREE-BELT
ARM-PLUG
12 PAIRS

LIST I - ORDER A

PENCIL-COMB
HANGER-SHOE
EYE-DOOR
GUITAR-BANANA
FORK-HORSE
SANDWICH-SQUIRREL
CAT-POT
BICYCLE-PANTS
SOCK-KNIFE
TRAIN-GLASS
IRON-LAMP
DESK-LEAF (Mean FR = 4.2754)
LIST I -- ORDER B

LAMP—SANDWICH
KNIFE—SOCK
POT—BICYCLE
HORSE—PENCIL
COMB—EYE
PANTS—TRAIN
BANANA—IRON
SHOE—DESK
LEAF—HANGER
DOOR—GUITAR
GLASS—BRUSH
SQUIRREL—FORK
12 PAIRS

LIST II - ORDER A

PEN-TREE
RULER-BIRD
SKIRT-DOG
TABLE-SCISSORS
TOMATO-ARM
BELT-CHAIR
ENVELOPE-SUN
CUP-BUS
NOSE-UMBRELLA
FOOT-SPoon
KEY-TIE
PLUG-PEAR  (Mean FR = 4.2675)
LIST II - ORDER B

CHAIR-ENVELOPE
UMBRELLA-FOOT
DOG-TABLE
ARM-BELT
PEAR-PEN
TIE-PLUG
TREE-RULER
SPOON-KEY
SUN-CUP
BUS-NOSE
SCISSORS-TOMATO
BIRD-SKIRT
8 PAIRS

LIST I - ORDER A

PENCIL–COMB
HANGER–SHOE
EYE–DOOR
GUITAR–BANANA
FORK–HORSE
SANDWICH–SQUIRREL
CAT–POT
BICYCLE–PANTS  (mean FR = 4.265)

LIST I - ORDER B

HORSE–HANGER
DOOR–BICYCLE
SQUIRREL–FORK
COMB–SANDWICH
SHOE–CAT
POT–EYE
BANANA–PENCIL
PANTS–GUITAR
8 PAIRS

LIST II - ORDER A

PEN–TREE
RULER–BIRD
SKIRT–DOG
TABLE–SCISSORS
TOMATO–ARM
BELT–CHAIR
ENVELOPE–SUN
CUP–BUS (mean FR = 4.273)

LIST II - ORDER B

SCISSORS–SKIRT
CHAIR–RULER
BUS–PEN
BIRD–TOMATO
SUN–CUP
TREE–BELT
ARM–ENVELOPE
DOG–TABLE
PRACTICE
BED—EAR
BOWL—COUCH
FLOWER—WATCH
VITA AUCTORIS

Born Geraldine Mary Yetman in Corner Brook, Newfoundland

Attended Regina High School, Corner Brook, and Holy Heart of Mary High School, St. John’s

Received teacher’s certificate, Littledale, St. John’s (affiliated with MUN)

Taught grades 5 and 6 for Roman Catholic School Board in Corner Brook - 3 years

Married Bill Church

Produced three wonderful sons - Billy, Brian, and Mark

Returned to school in 1987

Graduated in 1991 with Bachelor of Arts Degree, First Class Honours in Psychology, University of New Brunswick

Entered Human Development graduate program in 1991 at University of Windsor

Graduating in 1994 with Master’s Degree in Human Development at University of Windsor

Future undecided, yet promising