1994

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

Geraldine M. Church
University of Windsor

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

National Library of Canada

Acquisitions and Bibliographic Services Branch

395 Wellington Street
Ottawa, Ontario
K1A 0N4

Bibliothèque nationale du Canada

Direction des acquisitions et des services bibliographiques

395, rue Wellington
Ottawa (Ontario)
K1A 0N4

Your file Votre référence

Our file Notre référence

ISBN 0-612-01393-6

Canada

Name Geraldine M. Church

Dissertation Abstracts International is arranged by broad, general subject categories. Please select the one subject which most nearly describes the content of your dissertation. Enter the corresponding four-digit code in the spaces provided.

Developmental Psychology — SUBJECT TERM

0585 — SUBJECT CODE

0620

U·M·I

Subject Categories

THE HUMANITIES AND SOCIAL SCIENCES

COMMUNICATIONS AND THE ARTS
- Architecture 0729
- Art History 0377
- Cinema 0900
- Dance 0378
- Fine Arts 0357
- Information Science 0723
- Journalism 0391
- Library Science 0399
- Mass Communications 0708
- Music 0413
- Speech Communication 0459
- Theater 0465

EDUCATION
- General 0515
- Administration 0514
- Adult and Continuing 0516
- Agricultural 0517
- Art 0273
- Bilingual and Multicultural 0282
- Business 0688
- Community College 0275
- Curriculum and Instruction 0727
- Early Childhood 0518
- Elementary 0524
- Finance 0277
- Guidance and Counseling 0519
- Health 0680
- Higher 0745
- History of 0520
- Home Economics 0278
- Industrial 0521
- Language and Literature 0279
- Mathematics 0280
- Music 0522
- Philosophy of 0998
- Physical 0523
- Psychology 0525
- Reading 0535
- Religious 0527
- Sciences 0714
- Secondary 0533
- Social Sciences 0534
- Sociology of 0340
- Special 0529
- Teacher Training 0530
- Technology 0710
- Tests and Measurements 0288
- Vocational 0747

LANGUAGE, LITERATURE AND LINGUISTICS
- Language
  - General 0679
  - Ancient 0289
  - Linguistics 0290
  - Modern 0291
- Literature
  - General 0401
  - Classical 0294
  - Comparative 0295
  - Medieval 0297
  - Modern 0298
  - African 0316
  - American 0591
  - Asian 0305
  - Canadian (English) 0352
  - Canadian (French) 0355
  - English 0593
  - Germanic 0311
  - Latin American 0312
  - Middle Eastern 0315
  - Romance 0313
  - Slavic and East European 0314

PHILOSOPHY, RELIGION AND THEOLOGY
- Philosophy 0422
- Religion
  - General 0318
  - Biblical Studies 0321
  - Clergy 0319
  - History of 0320
  - Philosophy of 0322
- Theology 0469

SOCIAL SCIENCES
- American Studies 0323
- Anthropology
  - Archaeology 0324
  - Cultural 0326
  - Physical 0327
- Business Administration
  - General 0310
  - Accounting 0272
  - Banking 0770
  - Management 0454
  - Marketing 0338
- Canadian Studies 0385
- Economics
  - General 0501
  - Agricultural 0503
  - Commerce-Business 0505
  - Finance 0508
  - History 0509
  - Labor 0510
  - Theory 0511
- Folklore 0358
- Geography 0366
- Gerontology 0351
- History
  - General 0578
  - Ancient 0579
  - Medieval 0581
  - Modern 0582
  - Black 0328
  - African 0331
  - Asia, Australia and Oceania 0332
  - Canadian 0334
  - European 0335
  - Latin American 0336
  - Middle Eastern 0333
  - United States 0337
- History of Science 0585
- Law 0398
- Political Science
  - General 0615
  - International Law and Relations 0616
  - Public Administration 0617
- Recreation 0814
- Social Work 0452
- Sociology
  - General 0626
  - Criminology and Penology 0627
  - Demography 0938
  - Ethnic and Racial Studies 0631
  - Individual and Family Studies 0628
  - Industrial and Labor Relations 0629
  - Public and Social Welfare 0630
  - Social Structure and Development 0700
  - Theory and Methods 0344
- Transportation 0709
- Urban and Regional Planning 0999
- Women's Studies 0453

THE SCIENCES AND ENGINEERING

BIOLOGICAL SCIENCES
- Agriculture
  - General 0473
  - Agronomy 0285
  - Animal Culture and Nutrition 0475
  - Animal Pathology 0476
  - Food Science and Technology 0359
  - Forestry and Wildlife 0478
  - Plant Culture 0479
  - Plant Pathology 0480
  - Plant Physiology 0817
  - Range Management 0777
  - Wood Technology 0746
- Biology
  - General 0306
  - Anatomy 0287
  - Biostatistics 0308
  - Botany 0309
  - Cell 0379
  - Ecology 0329
  - Entomology 0353
  - Genetics 0369
  - Limnology 0793
  - Microbiology 0410
  - Molecular 0307
  - Neuroscience 0317
  - Oceanography 0416
  - Physiology 0433
  - Radiation 0821
  - Veterinary Science 0778
  - Zoology 0472
- Biophysics
  - General 0786
  - Medical 0760

EARTH SCIENCES
- Biogeochemistry 0425
- Geochemistry 0996
- Geodesy 0370
- Geology 0372
- Geophysics 0373
- Hydrology 0388
- Mineralogy 0411
- Paleobotany 0345
- Paleoecology 0426
- Paleontology 0418
- Paleozoology 0985
- Palynology 0427
- Physical Geography 0368
- Physical Oceanography 0415

HEALTH AND ENVIRONMENTAL SCIENCES
- Environmental Sciences 0768
- Health Sciences
  - General 0566
  - Audiology 0300
  - Chemotherapy 0992
  - Dentistry 0567
  - Education 0350
  - Hospital Management 0769
  - Human Development 0758
  - Immunology 0982
  - Medicine and Surgery 0564
  - Mental Health 0347
  - Nursing 0569
  - Nutrition 0570
  - Obstetrics and Gynecology 0380
  - Occupational Health and Therapy 0354
  - Ophthalmology 0381
  - Pathology 0571
  - Pharmacology 0419
  - Pharmacy 0572
  - Physical Therapy 0382
  - Public Health 0573
  - Radiology 0574
  - Recreation 0575
  - Speech Pathology 0460
  - Toxicology 0383
- Home Economics 0386

PHYSICAL SCIENCES

Pure Sciences
- Chemistry
  - General 0485
  - Agricultural 0749
  - Analytical 0486
  - Biochemistry 0487
  - Inorganic 0488
  - Nuclear 0738
  - Organic 0490
  - Pharmaceutical 0491
  - Physical 0494
  - Polymer 0495
  - Radiation 0754
- Mathematics 0405
- Physics
  - General 0605
  - Acoustics 0986
  - Astronomy and Astrophysics 0606
  - Atmospheric Science 0608
  - Atomic 0748
  - Electronics and Electricity 0607
  - Elementary Particles and High Energy 0798
  - Fluid and Plasma 0759
  - Molecular 0609
  - Nuclear 0610
  - Optics 0752
  - Radiation 0756
  - Solid State 0611
- Statistics 0463

Applied Sciences
- Applied Mechanics 0346
- Computer Science 0984
- Engineering
  - General 0537
  - Aerospace 0538
  - Agricultural 0539
  - Automotive 0540
  - Biomedical 0541
  - Chemical 0542
  - Civil 0543
  - Electronics and Electrical 0544
  - Heat and Thermodynamics 0348
  - Hydraulic 0545
  - Industrial 0546
  - Marine 0547
  - Materials Science 0794
  - Mechanical 0548
  - Metallurgy 0743
  - Mining 0551
  - Nuclear 0552
  - Packaging 0549
  - Petroleum 0765
  - Sanitary and Municipal 0554
  - System Science 0790
- Geotechnology 0428
- Operations Research 0796
- Plastics Technology 0795
- Textile Technology 0994

PSYCHOLOGY
- General 0621
- Behavioral 0384
- Clinical 0622
- Developmental 0620
- Experimental 0623
- Industrial 0624
- Personality 0625
- Physiological 0989
- Psychobiology 0349
- Psychometrics 0632
- Social 0451

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.

ACKNOWLEDGEMENTS

I would like to express sincere appreciation to my supervisor and chair of my Master's thesis committee, Dr. A. Kobasigawa, for the help and guidance he has provided me in the months prior to the completion of this thesis. I would also like to thank the members of my committee, Dr. J. Namikas, Dr. A. McCabe, and Dr. L. Morton for making themselves available to me when I needed them, and for their valuable suggestions which guided me to the finished product. Also I would like to thank Dr. W. Donaldson of the University of New Brunswick, for sparking my interest in this area of research.

Three people to whom I owe a debt of gratitude for their help in constructing the computer presentation are Dr. J. Snodgrass, New York University, Dr. D. Mitchell, Southern Methodist University, and Don Snider, University of Windsor.

My whole family has been a great source of inspiration and support to me ever since that day, seven years ago, when I decided to "go back to school". Special thanks go to my parents, Mary and Mike Yetman, who have shown me that learning is a lifelong process; to my sons, Billy, Brian, and Mark, who reminded me whenever I was discouraged that I should never give up; and most of all to my husband Bill, the best friend a person could have, for his encouragement, love, and total support.

TABLE OF CONTENTS

LIST OF TABLES

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 $\underline{n}$ + 1 so that the items that were incorrect on trial $\underline{n}$ 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 spontanenous 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 unrecalled 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 spacebar, here (experimenter points to spacebar), 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

Table 1

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

Grade		*n*	Test 1	Test 2	Test 3
1	Prompt	12	.385	.542	.635
	SD		*.146*	*.187*	*.635*
	Non-Prompt	12	.354	.635	.708
	SD		*.149*	*.216*	*.234*
3	Prompt	12	.326	.521	.743
	SD		*.265*	*.249*	*.229*
	Non-Prompt	12	.285	.667	.813
	SD		*.179*	*.195*	*.188*
5	Prompt	12	.193	.547	.724
	SD		*.114*	*.253*	*.202*
	Non-Prompt	12	.266	.661	.849
	SD		*.167*	*.286*	*.156*

Table 2

<u>Mean Proportion of Items Correct on Each Trial by Children of Each Grade</u>

		Test		
Grade	*n*	1	2	3
1	24	.370	.589	.672
3	24	.306	.594	.778
5	24	.229	.604	.786

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

	Trial	
Grade	2	3
1	.875 (.177)	.813 (.247)
3	.938 (.072)	.938 (.113)
5	.917 (.077)	.917 (.077)
All	.910 (.118)	.889 (.168)

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

		Trial			
		2		3	
Grade		Unrecalled	Recalled	Unrecalled	Recalled
1	Prompt	9.432	8.173	7.033	6.260
	SD	*4.791*	*4.753*	*3.647*	*3.477*
	Nonprompt	4.682	4.637	4.447	4.062
	SD	*1.649*	*2.154*	*1.525*	*1.868*
3	Prompt	6.049	5.167	6.130	5.050
	SD	*2.294*	*3.626*	*2.619*	*2.712*
	Nonprompt	6.608	5.621	4.745	3.563
	SD	*3.434*	*3.377*	*1.875*	*.736*
5	Prompt	8.985	8.422	7.042	4.512
	SD	*6.319*	*6.676*	*6.433*	*3.074*
	Nonprompt	8.629	6.251	9.378	6.586
	SD	*3.471*	*2.955*	*7.460*	*3.252*
All		7.356	6.382	6.370	4.990
	SD	*4.198*	*4.267*	*4.482*	*2.804*

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, $\underline{F}(1,57) = 17.89$, $<.001$. As can be seen in Table 4, children spent a greater amount of time studying previously unrecalled items ($\underline{M} = 6.86$ s) than previously recalled items ($\underline{M} = 5.69$ s). The analysis also revealed a significant main effect for trial, $\underline{F}(1,57) = 10.05$, $\underline{p}<.005$ and a significant grade by prompt by trial interaction, $\underline{F}(2,57) = 4.56$, $\underline{p}<.05$. 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 ($\underline{M}_{unrecalled}$ = 6.40 vs $\underline{M}_{recalled}$ = 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, $\underline{p} > .10$. Grade 1 data produced main effects for prompt, $\underline{F}(1,22) = 8.34$, $\underline{p} < .01$, and trial, $\underline{F}(1,22) = 12.72$, $\underline{p} < .05$. In addition, as mentioned previously, the prompt by trial interaction was significant, $\underline{F}(1,22) = 5.94$, $\underline{p} < .05$. (b) For the older children, only the main effect of type of item was significant: grade 3, $\underline{F}(1,18) = 8.35$; and grade 5, $\underline{F}(1,17) = 7.24$, $\underline{p}s < .02$. Older children spent more time studying previously unrecalled items, $\underline{M}_{grade\ 3} = 5.88$; $\underline{M}_{grade\ 5} = 8.48$, than previously recalled items, $\underline{M}_{grade\ 3} = 4.85$; $\underline{M}_{grade\ 5} = 6.44$.

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

Bisanz, G.L., Vesonder, G.T., & Voss, J.F. (1978). Knowledge of one's own responding and the relation of such knowledge to learning. Journal of Experimental Child Psychology, 25, 116-128.

Butterfield, E.C., Nelson, T.O., & Peck, V. (1988). Developmental aspects of the feeling of knowing. Developmental Psychology, 24, 654-663.

Dufresne, A. & Kobasigawa, A. (1989). Children's spontaneous allocation of study time: Differential and sufficient aspects. Journal of Experimental Child Psychology, 47, 274-296.

Flavell, J.H. (1971). First discussant's comments: What is memory development the development of. Human Development, 14, 272-278.

Flavell, J.H. (1979). Metacognition and cognitive monitoring. American Psychologist, 34, 906-911.

Flavell, J.H., Friedrich, A.G., & Hoyt, J.D. (1970). Developmental changes in memorization processes. Cognitive Psychology, 1, 324-340.

Hunter-Blanks, P., Ghatala, E.S., Pressley, M., & Levin, J.R. (1988). Comparison of monitoring during study and during testing on a sentence-learning task. Journal of Educational Psychology, 80, 279-283.

Kobasigawa, A. & Metcalfe-Haggert, A. (1993). Spontaneous allocation of study time by grades 1 and 3 children in a simple memory task. Journal of Genetic Psychology, 154, 223-235.

Kreutzer, M.A., Leonard, C., & Flavell, J.H. (1975). An interview study of children's knowledge about memory. Monographs of the Society for Research in Child Development, 40, 1, Serial No. 159.

Masur, E.F., McIntyre, C.W., & Flavell, J.H. (1973). Developmental changes in apportionment of study time among items on a multitrial free recall task. Journal of Experimental Child Psychology, 15, 237-246.

Nelson, T.O. & Narens, L. (1990). Metamemory: A theoretical framework and new findings. The Psychology of Learning and Motivation, 26, 125-173.

Owings, R.A., Peterson, G.A., Bransford, J.D., Morris, C.D., & Stein, B.S. (1980). Spontaneous monitoring and regulation of learning: A comparison of successful and less successful fifth graders. Journal of Educational Psychology, 72, 250-256.

Snodgrass, J.G. & Vanderwart, M. (1980). A standardized set of 260 pictures: Norms for name agreement, image agreement, familiarity, and visual complexity. Journal of Experimental Psychology: Human Learning and Memory, 6, 174-215.

Wellman, H.M. (1977a). The early development of intentional memory behavior. Human Development, 20, 86-101.

Wellman, H.M. (1977b). Tip of the tongue and feeling of knowing experiences: A developmental study of memory monitoring. Child Development, 48, 13-21.

Zimmerman, B.J. (1986). Becoming a self-regulated learner: Which are the key sub-processes? Contemporary Educational Psychology, 11, 307-313.

APPENDIX A

PICTURE STIMULI WITH FAMILIARITY RATINGS

APPLE	3.98
ARM	4.75
BANANA	3.65
BED	4.72
BELT	4.12
BICYCLE	3.78
BIRD	3.62
BOOK	4.75
BOWL	4.18
BREAD	4.40
BRUSH	3.80
BUS	4.50
BUTTON	3.85
CAKE	4.02
CARROT	3.55
CAT	4.22
CHAIR	4.58
COMB	4.52
COUCH	4.40
CUP	4.40
DESK	4.32
DOG	4.60
DOOR	4.68
EAR	4.50

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

RULER	3.58
SANDWICH	4.45
SCISSORS	3.98
SHIRT	4.56
SHOE	4.62
SKIRT	3.64
SOCK	4.52
SPOON	4.50
SQUIRREL	3.82
SUN	4.90
TABLE	4.35
TELEPHONE	4.80
THUMB	4.72
TIE	3.80
TOASTER	4.08
TOMATO	3.78
TRAIN	4.15
TREE	4.68
UMBRELLA	3.95
WATCH	4.58
WINDOW	4.40

n=71 ΣX=303.66

Mean Familiarity Rating = 4.2769

APPENDIX B

LISTS OF PICTURE STIMULI IN ORDER OF PRESENTATION

<u>16 PAIRS</u>

<u>LIST I - ORDER A</u>

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

<u>12 PAIRS</u>

<u>LIST I - ORDER A</u>

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

<u>12 PAIRS</u>

<u>LIST II - ORDER A</u>

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