# EFFECTS OF SUMMARIZATION AND ELABORATION ON THE ACQUISITION OF FACTUAL INFORMATION

by

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EFFECTS OF SUMMARIZATION AND ELABORATION ON THE

ACQUISITION OF FACTUAL INFORMATION


## Abstract

In the three studies reported here, the relative effectiveness of questioning and summarization strategies was investigated in the context of manipulating the domain-specificity of to-be-learned factual information. Undergraduate students were asked to study expository text information about familiar and unfamiliar animals either by generating summaries, answering "why" a given fact is true, or reading information. Findings revealed fundamental differences in the ways in which generating summaries and answering "why-questions" might facilitate learning, with summarization prompting integration and answering "why-questions" prompting both integration of novel information and activation of prior knowledge. Also, differences in the efficiency of the strategies were discussed. Specifically, differences among the strategies might be apparent in the supports required to implement the strategies effectively, as well as in the potential for eliciting the compounding of strategies through spontaneous activation of other associative strategies. Educational implications pertaining to the importance of promoting effective strategy use as opposed to simply encouraging production of strategies are discussed.

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## Dedication

To my parents. Their patience, encouragement, advice and support were invaluable over the course of my graduate training and during the completion of this dissertation.

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# EFFECTS OF SUMMARIZATION AND ELABORATION ON THE ACQUISITION OF FACTUAL INFORMATION

## General Introduction

The comprehension and retention of factual information presented in expository text is a crucial, yet challenging task, for most students. There are several determinants of the difficulties inherent in the processing and comprehension of expository text, including the familiarity of the topic domain, and the structure of text in which facts are embedded (McDaniel & Einstein, 1989; Taylor, 1982). Furthermore, there is a tendency for students to focus on the verbatim presentation of text and rely on low-order rote-learning types of strategies to encode information rather than more sophisticated strategies that prompt the learner to create meaningful associations between new information and prior knowledge (Cook & Mayer, 1983; Feldt, 1990; Wade, Trathen & Schraw, 1990; Garner, 1990b; Wittrock, 1974, 1990).

Prompting students to engage in more sophisticated processing of information has been the focus of much contemporary research. For example, Pressley and colleagues (e.g., Pressley, McDaniel, Turnure, Wood, & Ahmad, 1987; Pressley, Symons, McDaniel, Snyder, & Turnure, 1988) have been investigating the efficacy of a strategy, *elaborative interrogation*, thought to enhance comprehension and recall of factual information via a generative process of establishing associations between new information and existing knowledge. Another strategy thought to enhance comprehension and recall of new information is *summarization* (e.g., Brown & Day, 1983; Hidi & Anderson, 1986; Wittrock, 1990). Both these strategies entail more extensive processing than simple rote strategies, such as rereading information. The relative efficacy, as well as the precise nature of the mechanisms underlying effective implementation of elaborative interrogation and summarization strategies is, however, unclear. In the studies reported here, such issues will be investigated.

Facilitation of Strategic Information Processing through Summarization

Many researchers have advocated the importance of summarization for learning (Brown & Campione, 1990; Brown, Campione, & Day, 1981; Brown & Day, 1983; Brown, Day, & Jones, 1983; Day, 1986; Doctorow, Marks, & Wittrock, 1978; Garner, 1982; Hidi & Anderson, 1986; Johnson, 1983; Reder & Anderson, 1980,; Stein & Kirby, 1992; Taylor & Beach, 1984; Taylor & Berkowitz, 1980; Winograd, 1984; Wittrock, 1990). Summarization is an organizational strategy entailing the extraction of important information from text through the use of various macrorules (vanDijk, 1977) such as deletion and selection. Producing and studying summaries has been demonstrated to facilitate the comprehension and recall of textual content (Brown & Day, 1983; Hidi & Anderson, 1986; Kintsch & vanDijk, 1978; Reinhart, Stahl, & Erikson, 1986; Stein & Kirby, 1992).

VanDijk and Kintsch (1983) proposed that proficient readers abstract a *macrostructure* from text, a coherent and organized representation of the gist of the text (see also, Meyer, 1975; Rumelhart & Ortony, 1977). Such a structure provides a framework for encoding and recalling important textual elements (Armbruster, Anderson, Ostertag, 1987; Kintsch & vanDijk, 1978).

The ability to identify important facts appears to be associated with the generation of adequate summaries (Taylor, 1986; Winograd, 1984). Generally, students of all ages realize that summaries reflect the important ideas extracted from text (Garner, 1985; Winograd, 1984). An obstacle, however, to the successful implementation of summarization skills in novices might be their lack of awareness of the ways in which ideas are organized in expository as opposed to narrative text (Spiro & Taylor, 1980, as cited by Armbruster, Anderson, and Ostertag, 1987), which might hinder effective extraction of the most important ideas presented in text. Novices also might be less adept at discerning important information from text (Brown & Smiley, 1977; Garner, 1985; Winograd, 1984) because they rarely

receive any formal instruction in summarization (Guthrie and Mosenthal, 1987). Garner (1987) suggested that less proficient learners might be less skilful summarizers in that they exaggerate the relevance of highly salient or interesting information, they are distracted by text structure when evaluating textual content in that they often consider the first statement in a paragraph to contain important information, and they read without comparing the relative significance of information presented in text (see also Markman, 1981). Garner (1987) describes these learners as operating at a level of "strategic deficiency" (see also, Scardamalia & Bereiter, 1983).

In summarization, the goal is to produce a more "streamlined" representation of text via selection, deletion, and modification of textual content. Kintsch and vanDijk (1978; and vanDijk, 1977) presented a model of summarization in which various macrorules are used to select the details to be included in a summary. The use of such macrorules underlies effective text comprehension via the formation of a macrostructure that contains the gist of important ideas presented in text. It is this macrostructure that learners recall and also use as a retrieval cue for recalling to-be-learned details.

According to Kintsch and vanDijk, learners possess "schematic structures" for different kinds of text (i.e., for narratives, expository texts, etc.). Such schemes dictate the macrostructure extracted from text through differential application of macrorules. Macrorules, such as *deletion, generalization, integration, and construction*, are imposed on the units of information presented in text (i.e., "micropropositions") in order to extract a condensed macrostructure. *Deletion* refers to the elimination of trivial and redundant information when producing a summary; *generalization*, refers to the use of superordinate terms to encompass lists of objects; *integration* refers to the use of superordinate terms to encompass lists of actions; and *construction* refers to the selection or creation of a *topic sentence* that captures the gist of text.

The application of such rules for summarizing does not guarantee, however, the comprehension and recall of textual information. It has been argued that the efficacy of summarization, as a strategy for text comprehension and recall, can be explained in terms of the generative nature of the task (Wittrock, 1974, 1990; Wittrock & Alesandrini, 1990). Inherent features of a generative process such as summarization are: (i) use of one's own words and knowledge in the construction of novel sentences that convey the meaning of information presented in text; (ii) derivation or extraction of relations among the ideas presented in text; and (iii) formation of relations or associations between the textual information and prior knowledge.

By using one's own words when generating a summary, as opposed to adhering to the wording of the original text, the association between new information and prior knowledge is facilitated since the words generated by the learner in producing a summary are connected to existing information. That is, presumably the vocabulary chosen to reformat the text is part of the learner's existing knowledge; as such, a connection between new information and prior knowledge is established, hence facilitating recall of new information (King, 1995). Furthermore, the generation of novel sentences which relate the ideas presented in text facilitates the formation of mental representations of textual information, and hence facilitates recall (King, 1995). Also, the summarization strategy primes the knowledge base through the generation of superordinate terms to represent lists of information presented in text.

Composing generative summaries requires considerable effort on the part of learners who must paraphrase and find relations among ideas presented in text. King (1995) argued that, in most studies on summarization, such extensive modification or processing of original text is not a requirement. Although the generative nature of summarization has been emphasized as underlying successful comprehension and recall of text, the findings of several research reports reveal that learners exhibit

great difficulty in the elaboration of textual information when generating summaries. Indeed, Brown and Day (1983) found that although learners demonstrate competence in the simple selection, deletion, and manipulation of text-provided sentences when summarizing text, the task of *invention* (or *construction*, Kintsch & vanDijk, 1978), necessary for the generation of adequate summaries, is difficult to execute, even for adults. The task of *invention* requires extensive manipulation of text via the addition of information using the learner's own words, and to this extent, deviates from the less sophisticated verbatim, "sequential unit by unit," *copy-delete* approach exercised by many novice learners (Brown, 1981).

Brown and colleagues have argued that the *copy-delete* approach to summarization is a "partially adequate" strategy in that the learner is provided with an identifiable summary that facilitates, although sporadically, their recall of information. As such, the use of the copy-delete approach to summarization is perpetuated as a result of such "intermittent reinforcement" of the strategy. Students might benefit from direct instruction in summarization. Simply recognizing that summaries entail the extraction of important elements from text is not sufficient for effective summarization. The summarization skills of most learners are not sophisticated. Although they use several summarization rules, these rules are not applied systematically or efficiently, an exception being the deletion of trivial and redundant information from text (Brown & Day, 1983). Direct instruction entails modelling the strategy and providing guided practice as well as corrective feedback about the quality of summaries generated and the proper application of rules, and finally asking students to practice the strategy independently (see Hare & Borchardt, 1984). This approach has been found to be effective in fostering good summarization skills in adolescent learners with extensive training (Hare & Borchardt, 1984). Indeed, many researchers agree that the active, flexible, and independent application of strategies for

effective text processing cannot be achieved without extensive training over many sessions.

Inherent in summarization is the direction of attention toward important textual information which would be expected to facilitate learning (Brown & Day, 1983; Garner, 1982). Summarization is an active process whereby textual information is transformed, for example, evaluated and condensed (Hidi & Anderson, 1986). To this extent, summarization entails deep processing of information. Craik and Lockhart (1972) presented their depth of processing model as a framework for researchers investigating human memory processes. According to Craik and Lockhart, information is made more memorable to the extent that it is processed at deeper levels. Deep processing entails the transformation of information. Indeed researchers have demonstrated that rote rehearsal, which entails mere repetition of information, does not facilitate, to any significant degree, the learning and comprehension of that information (Garner, 1990a, 1990b). Presumably, to the extent that information is transformed from its original form such that the learner can create associations between the new information and prior knowledge, information is made more memorable.

Stein and Kirby (1992) present a depth of processing (Craik & Lockhart, 1972) explanation of the memory enhancing effects of summarization. Specifically, they argue that deep processing is inherent in the extraction or recognition of important ideas from text, and that learners must process central ideas in order to understand and recall the information contained in lengthy text. Furthermore, when generating summaries, learners must consider the adequacy of their transformation of textual information by continually relating their summaries to the original text (Hidi & Anderson, 1986). Therefore, summarization is an elaborative strategy to the extent that it entails deep processing of information.

Learning strategies can function to facilitate the organization of new information by prompting

the learner to make judgements about the importance of textual elements in an effort to extract the gist of text. Elaboration is another method of enhancing text comprehension by prompting the learner to relate new information with prior knowledge. These strategies are not, however, mutually exclusive. Proficient readers, for example, might activate prior knowledge in the process of organizing information presented in expository text. Less proficient learners might be distracted, in that they attend to irrelevant details presented in text, which might in turn interfere with effective processing of information.

Although summarization entails some deep level of processing, the goal in summarization is not to generate novel information, but simply to evaluate and decide what information is important in the text. Since most students believe that the main task in summarizing is to determine whether information contained in text should be incorporated or deleted from a summary (Brown & Day, 1983; Hidi & Anderson, 1986), the task of summarization does not facilitate the spontaneous activation of prior knowledge, although proficient readers tend to relate information they are reading to their prior knowledge (Garner, 1990b; Guthrie & Mosenthal, 1987), and generative summarization (Wittrock, 1990) also might facilitate the creation of associations between textual information and existing knowledge. High-order questioning strategies such as elaborative interrogation have been demonstrated to facilitate memory through activation of prior knowledge (Willoughby, Waller, Wood, MacKinnon, 1993). The relative efficacy of the elaborative interrogation and summarization strategies is, however, unclear.

Elaboration Strategies

The strategic processing of information has been thought to be facilitated by elaboration (Pressley, McDaniel, Turnure, Wood, & Ahmad, 1987; Pressley, Symons, McDaniel, Snyder, & Turnure, 1988). There are several ways in which new information might be elaborated to become more memorable, including making information less arbitrary by explaining the relations among to-be-learned

elements (Pressley, Wood, & Woloshyn, 1990; Schneider, 1986), or creating interactive mental images (Willoughby, 1993).

Recently, a series of articles has advocated an associative learning strategy, elaborative interrogation, for facilitating the acquisition of factual information (Pressley, et al., 1987; Pressley, et al., 1988; Woloshyn, Willoughby, Wood, & Pressley, 1990). In elaborative interrogation learners are instructed to answer a "why-question" when presented with to-be-learned material. In this way, information is made more meaningful, and hence memorable, through activation of associative connections within learners' semantic repertoires (Willoughby, Waller, Wood, MacKinnon, 1993). To this extent, the advantage conferred to learners using elaborative interrogation is thought to be most evident in associative memory tasks such as cued-recall and matching (Pressley, Levin, Kuiper, Bryant, & Michener, 1982).

Although several researchers have advanced competing hypotheses about the mechanisms underlying the effective application of questioning strategies (Jacoby, 1978; Slamecka & Fevreiski, 1983; Slamecka & Graf, 1978; Tyler, Hertel, McCallum, & Ellis, 1979), questioning is thought to enhance storage and retrieval of information by prompting the learner to relate new information to previous knowledge (Willoughby, et al., 1993). The associationistic nature of the elaborative interrogation strategy implies that prior knowledge is an important requisite for the effective use of the strategy. The notion of associative connections within cognitive repertoires is akin to schema theory which posits that conceptual knowledge is assembled within interrelated networks, with the ease of accessing or searching the knowledge base being directly proportional to the complexity and sophistication with which the network is organized (Rumelhart, 1981). The suggestion has been made that elaborative interrogation can be explained in the context of schema theory because responding to

"why" questions in elaborative interrogation is dependent on the formation of associations between new information and prior knowledge (Willoughby et al., 1993). That is, generating a response to the "why-question" in elaborative interrogation necessitates the activation of prior knowledge (i.e., schemata) which would facilitate the organization of to-be-learned information, making it easier to retrieve. Willoughby et al., (1993) demonstrated that information drawn from a familiar topic domain for which learners can be presumed to possess some prior knowledge is more memorable than information drawn from unfamiliar topic domains. The interpretation is that information for which some previously organized/encoded knowledge exists is more likely to activate nodes within semantic memory and is hence more easily integrated within the learner's semantic repertoire.

Performance on an intentional learning task for adults instructed to use elaborative interrogation has been shown to be approximately one standard deviation above that of adults instructed to use the default rehearsal strategy or rehearsal of experimenter provided elaborations (Pressley, McDaniel, Turnure, Wood, & Ahmad, 1987; Pressley, Symons, McDaniel, Snyder, & Turnure, 1988). Also, the potency of the elaborative interrogation strategy has been demonstrated using a variety of to-be-learned facts, including facts about Canadian provinces (Martin & Pressley, 1991; Pressley et al., 1988), gender differences (Pressley et al., 1988), Canadian universities (Woloshyn et al., 1990), science (Woloshyn, Paivio, & Pressley, 1994), and animals (Willoughby et al., 1993).

The quality of elaborations generated in response to the "why" question in elaborative interrogation also has been shown to impact on learning. For example, precise elaborations, compared to imprecise ones, are more memorable (see Stein, 1978; Stein & Bransford, 1979). Stein and colleagues provide the following examples of precise and imprecise elaborations: "The tall man purchased the crackers *that were on sale.*" and "The tall man purchased the crackers *that were on the*

*top shelf.*" In the former example, the italicized phrase is an imprecise elaboration of the base sentence because it fails to explain the significance of a *tall* man purchasing the crackers, although it is semantically congruous with the base sentence. In the latter example, the italicized phrase specifies the significance of a *tall* man purchasing the crackers and hence is a precise elaboration since the arbitrariness between the conceptual elements of the sentence is reduced, making the information more meaningful.

For adults studying facts about animals, provinces, science, etc., the generation of elaborations containing correct prior knowledge explaining why a fact is true is associated with greater recall. The quality of generated elaborations, however, is not so crucial for recall when to-be-learned information is about a topic domain for which some prior knowledge can be presumed to exist (see Pressley, McDaniel, Turnure, Wood, & Ahmad, 1987; Woloshyn, Willoughby, Wood, & Pressley, 1990). It might seem that, for adults, the mere attempt to generate an elaboration involves such thorough processing that learning is enhanced. Consistent with the depth of processing theory of memory (Craik & Lockhart, 1972), if learners have a developed knowledge base, they would have a rich semantic network from which to draw information. Students have to engage in a thorough search in order to access the appropriate semantic network. This would be considered deep processing rather than the more peripheral processing that might be invoked with strategies such as repetition.

To the extent that the elaborative interrogation strategy entails the formation of meaningful associative connections between new information and prior knowledge related to the fact, it is a generative process (i.e., Wittrock, 1990). Hunt and Einstein (1981) argued that elaboration strategies entail the encoding of "distinctive" information in that the relation within a given individual fact is processed as opposed to the relations among facts. Support for this notion comes from research in

which the level of prior knowledge for a given topic domain of to-be-learned facts was manipulated, with students demonstrating enhanced memory performance relative to a reading control group for facts drawn from familiar but not unfamiliar topic domains (Willoughby, Waller, Wood, & MacKinnon, 1993). Despite lack of empirical support for the following suggestion, it is plausible that learners studying a series of to-be-learned facts, the typical procedure used in studies of elaborative interrogation, might use information presented earlier to encode newer facts. The comparison of information across facts, however, does not imply necessarily that elaborative interrogation promotes relational processing (Hunt & Einstein, 1981).

Elaborative Interrogation and Summarization

Both elaborative interrogation and summarization are generative strategies involving deep processing. A primary goal of summarization, however, is to evaluate the importance of textual information rather than to relate information to prior knowledge (Hidi & Anderson, 1986). This is not to imply that summarization precludes the activation of prior knowledge. Indeed, proficient summarizers might relate textual information to prior knowledge. The memory advantages for elaborative interrogation are thought to be due to the priming of the knowledge base through the formation of associations *within* facts, and for summarization are thought to be due to the formation of relations *among* facts.

## STUDY 1

### Introduction

In the first study presented here, the relative efficacy of elaborative interrogation and summarization strategies was compared. Performance in these conditions was compared to that of students in a control condition who were instructed to engage in rote repetition as a learning strategy. Finally, transfer effects from one strategy to another were considered by examining the potential benefits of prior instruction in one strategy for performance when using a second strategy. To this end, students in another condition were trained to use summarization and then, in another session, to use elaborative interrogation to study the same information. The order of strategies was decided arbitrarily, since this condition was included here simply as a preliminary investigation of the benefits of providing instruction in more than one strategy.

As a method of ensuring that participants in the four experimental conditions received equal exposure to target information, students in all conditions studied the same target information twice. Students in all conditions participated in an initial practice session in which they received detailed instruction and practice in their respective learning strategy. During these practice sessions, students studied non-target information until they were fluent in their respective strategies.

Students in all conditions returned for two further sessions. During the second session, students in the Elaborative Interrogation condition (EI) answered a why-question for each fact presented in passages about familiar and unfamiliar animals. They returned a few days later for a third session and used the elaborative interrogation strategy again to study the same information about animals. Students in the Summarization condition (S) summarized target passages about familiar and unfamiliar animals during the second session. They too returned a few days later and studied the

same information about animals by generating summaries of the target passages. Students in the Repetition Control condition (RC) also studied the passages about familiar and unfamiliar animals during a second session. They engaged in a rote repetition task as a study strategy, and returned a few days later and studied the same information using the same repetition strategy they used in the previous session. Finally, students in the Summarization/Elaborative Interrogation condition (S/EI) studied the information about familiar and unfamiliar animals by generating summaries of target passages during the second session. They returned a few days later for a third session and studied the same information about animals by engaging in the elaborative interrogation strategy.

In all, then, students participated in three sessions (session 1: practice of strategy; session 2: studying passages about animals; session 3: again studying passages about animals). Session two corresponds to existing research. Session three provides an extension of these earlier studies by allowing for repeated strategy opportunities.

The performance of students engaging in either summarization or elaborative interrogation was compared to that of students using repetition as a strategy. Furthermore, comparisons among the Summarization, Elaborative Interrogation, Repetition, and Summarization/Elaborative Interrogation conditions were conducted in order to investigate whether the combination of summarization and elaboration strategies (S/EI condition) is more beneficial than the use of single strategies (S, EI, & RC conditions).

Given that several learning strategies have been demonstrated to facilitate learning and that the prerequisites for implementing the strategies are variable, researchers have advocated the importance of flexibility in the use of strategies (Brown, Bransford, Ferrara, & Campione, 1983; Brown & Campione, 1990; Brown & Palincsar, 1985). In regards to the issue of transfer effects of strategic

processing, it was considered possible that performance in elaborative interrogation might be expected to be enhanced by prior instruction in summarization. Since summarizing is thought to promote learning via the formation of a *macrostructure* (Kintsch & vanDijk, 1978) of text, further instruction in elaborative interrogation, a strategy that activates prior knowledge, might maximize the potential for learning. Moreover, students who have been sensitized to text structure (Kintsch & vanDijk, 1978) through training in summarization might be processing text more effectively when asked to study using elaborative interrogation. On the other hand, it might be possible that learners use strategies independently such that they do not apply previously learned strategies in a new learning situation. This would be consistent with Garner's position (1990a; 1990b) that learners will default to using the least sophisticated strategy in their repertoire. Therefore, when given a chance to transfer the effects of one strategy to a new learning situation, students might fail, and their performance might depend on the efficacy of the strategy in which they are instructed. To this extent, although students are studying information to which they were previously exposed, they might not compound the strategies in their repertoire spontaneously when faced with encoding information in a new learning situation. Alternatively, the task of producing summaries might prime the knowledge base to the extent that learners transform the original text by using their own words to capture the gist of important textual elements. Therefore, students instructed in elaborative interrogation who have received previous instruction in summarization (i.e., students in the Summarization/Elaborative Interrogation condition), might be expected to perform better upon first exposure to elaborative interrogation than students in the Elaborative Interrogation condition who were exposed to elaborative interrogation without prior exposure to summarization.

Another interesting consideration would be the relative performance of students in the

Elaborative Interrogation and the Summarization/Elaborative Interrogation conditions at session three. At session three, students in the Elaborative Interrogation and Summarization/Elaborative Interrogation conditions would be exposed to the same information they studied during session two. The difference would be that students in the EI condition would have been exposed previously to the elaborative interrogation strategy, while students in the S/EI condition would have been exposed to the summarization strategy at session two. Repeated exposure to the elaborative interrogation strategy not only maximizes the potential for enhanced performance in the Elaborative Interrogation condition due to experience with the strategy, but it might be expected that repeated activation of prior knowledge also would facilitate performance. It would be interesting to observe whether the performance of students in the S/EI condition would be enhanced similarly due to prior exposure to the summarization rather than to the elaborative interrogation strategy.

## Method

### Participants

Sixty students attending a Canadian university volunteered to participate in this study on intentional learning. The sample was comprised of a heterogenous group of undergraduate students enrolled in an introductory psychology course. Participants were assigned to one of four experimental conditions (Summarization, Elaborative Interrogation, Summarization/Elaborative Interrogation, & Repetition Control). Fifteen students were assigned randomly to each condition. Conditions were comprised of approximately equal proportions of males and females. The mean age of the sample was 26 years (SD = 8.4). Analysis of the verbal achievement scores (see below), based on vocabulary and reading comprehension, revealed that scores were comparable across all four experimental conditions ($\underline{M}_{RC}$ = 56.40; $\underline{M}_{EI}$ = 60.21; $\underline{M}_{S}$ = 58.40; $\underline{M}_{S/EI}$ = 57.13). Students worked independently during each

phase of this study, although groups of five to 10 students worked in the same room and received instructions as a group.

Materials and Procedure

Session 1. This session lasted approximately 60 minutes. In the first phase of participation, students in each condition were asked to complete the vocabulary subtest of the Metropolitan Achievement Test (MAT6-- Form M, Prescott, Balow, Hogan, & Farr, 1986; see Appendix A). All students were provided with detailed instructions, as well as examples, for completing the vocabulary subtest of the MAT6. Vocabulary test items consisted of 24 sentences, with each sentence containing a blank. Four choices for "filling in the blank" are provided. Students were asked to choose the word that best fits the sentence. An understanding of correct semantics and syntax is essential for good performance on the vocabulary subtest of the MAT6. Students were allowed 10 minutes to complete this subtest.

After completing the Metropolitan Achievement Test, students in each condition were instructed in a strategy and were asked to practice using that strategy by studying information on "sound recording." Students in each condition received instructions as a group, yet worked independently. Students in two of the conditions, Summarization (S) and Summarization/Elaborative Interrogation (S/EI) received training in summarization (n = 30). In another condition, Elaborative Interrogation, students were instructed in a "why-questioning" strategy (n = 15). Finally, in a Repetition Control condition (RC), students were instructed to engage in rote repetition as a learning strategy (n = 15).

Students receiving instruction in summarization were provided with rules for summarizing (see Appendix B). Six practice passages on the topic of "sound recording" were used to instruct students in the summarization strategy (adapted from Wood, Winne, & Carney, 1995; see Appendix C). The

experimenter guided students through the steps used to generate a summary for the first training passage on sound recording. For subsequent training passages, on the same topic, students were asked to participate more actively in generating summaries along with the experimenter. Finally, students were asked to generate their own summary for the sixth training passage on sound recording. After completion of this training session, students counted down from 100 by seven's as a distracter task. Then students answered cued-recall questions on facts presented in the training passages (see Appendix D).

Students in the Elaborative Interrogation condition (EI) were trained in the use of EI, a "why questioning" learning strategy that has been shown to be effective in facilitating recall of factual information (Pressley, McDaniel, Turnure, Wood, & Ahmad, 1987; Pressley, Symons, McDaniel, Snyder, & Turnure, 1988). Students were provided with detailed instructions on how to use the EI strategy. They were told that asking "why" questions helps people remember information. Several sample sentences about men were used to familiarize students with the EI strategy. For example, students were presented with the following sentence: "The tall man bought the crackers that were on the top shelf," and were asked to answer the question "Why does that man do that?" The experimenter specified that good answers to "why" questions explain why a given fact is true of that "type of man" in particular rather than a different type of man. Students were asked to generate answers to the "why question" until the experimenter was satisfied that all students in the group could generate adequate elaborations. No time constraints were imposed for these practice trials. The experimenter provided feedback and prompting until an adequate elaboration was generated. After three practice trials, students were asked to study 30 man-sentences (see Appendix E) using EI. Sentences were presented individually on an overhead projector with an orienting prompt typed below

(e.g., "Why does that man do that?"). Students were given enough time to write out their answers to the why-question for each sentence. In this way, students worked independently. After studying the man-sentences, students counted down from 100 by seven's as a distracter task. Then, they completed a cued-recall test (see Appendix F) for the practice items (i.e., "Which man bought the crackers on the top shelf? Answer: the tall man).

Finally, students in the Repetition Control condition (RC) were asked to study information by engaging in rote repetition. To ensure that the length of participation in this study was equivalent across conditions, and that students in each condition received the same amount of training in their respective strategies, students in the RC condition received training in repetition as a strategy for studying information. Students were presented with the training passage on sound recording and asked to engage in rote repetition and writing out of the passage as a strategy for helping them remember the information. Then, students counted down from 100 by seven's as a distracter task, and were asked to complete a cued recall test for information contained in the training passages on sound recording.

Session 2. Students returned for another session two days after participating in session one. This session lasted approximately an hour. Students were asked to use the same strategy they used during their last session. This time, however, they were instructed to study six passages about familiar and unfamiliar animals (Appendix G). The first three passages were about familiar animals (Little Brown Bat, House Mouse, Blue Whale); the next three passages were about unfamiliar animals (American Pika, Pronghorn, Collared Peccary). Each target passage was tested for readability through the use of a standard computer program (STYLE) available on the main frame system at the University of Waterloo. Through the STYLE readability program the following information was obtained for each

of the six passages used in this study: readability grades (i.e., Kincaid, Coleman-Liau, Flesch); sentence information (i.e., number of sentences, number of words, average sentence length, average word length, number of questions, number of imperatives, number of short sentences, number of long sentences, etc.); sentence types (i.e., percentage simple, complex, & compound sentences); word usage (i.e., verb, noun, adjective, adverb, pronoun, & conjunction types as a percentage of the respective total number of such word types); and sentence beginnings (i.e., noun, pronoun, verb, etc.). Comparable readability ratings were observed for each passage (see appendix H for readability data). Note that slight increases in the readability grades of passages about unfamiliar animals are due to the complexity of the words making up the animal names.

Students in the Summarization and Summarization/Elaborative Interrogation conditions were reminded of the rules used to generate summaries. The experimenter also went over one of the summaries on sound recording and explained how the summarization rules were used to derive the summary. Students were provided with an opportunity to ask any questions they might have regarding the summarization strategy. When there were no more questions, students were asked to use the summarization rules to generate summaries of target passages on familiar and unfamiliar animals. Students were given five minutes to generate a summary for each passage. Students were asked to work on the same passage for the entire five minutes even if they did not need the entire five minutes to generate a summary. After students generated all six summaries, they worked on the reading comprehension subtest of the Metropolitan Achievement Test (MAT6; see Appendix I) for 10 minutes. This served as a distracter task. Finally, students completed a cued-recall test of the facts presented in the passages (Appendix J).

Students in the Elaborative Interrogation condition (EI) were asked to answer "why-questions"

about information contained in the target passages on animals (Appendix K). Students were reminded of their use of the elaborative interrogation strategy to study the man-sentences in the previous session. The experimenter went over some examples and asked students to generate elaborations to the why-question. When the experimenter was sure that students were re-familiarized with elaborative interrogation and had no further questions regarding the use of the strategy, students were told that they now would be using the EI strategy to study information about familiar and unfamiliar animals. Students were presented with the same information available to students who summarized. The method of presentation differed, however, across conditions. While students who summarized were exposed to the relevant information in paragraph form, students in the EI condition were exposed to one segment of the passage at a time. There were six segments in each passage, each segment containing one true fact about the animal of interest. The experimenter read the relevant segment of the passage, and then asked students to answer "Why does that animal do that?" for the underlined fact contained in the segment. Students wrote out their answers to the why-questions. Each segment of the passage was presented individually to students for 50 seconds. In this way, students in the EI condition were exposed to the same information for the same length of time as students in the other conditions. After all the information contained in the target passages about familiar and unfamiliar animals was presented, students worked on the reading comprehension subtest of the Metropolitan Achievement Test (MAT6). This served as a distracter task before students completed the cued-recall test. The recall test consisted of the same questions asked of students in the other conditions. All recall test questions were asked in a fixed random order across participants.

Students in the Repetition Control condition (RC) were reminded that they used repetition as a strategy during the last session to study information about sound recording. After the experimenter

was sure that students understood how to use the repetition strategy to study, students were asked to engage in rote rehearsal and to write out the target passages on animals. Students were asked to spend five minutes on each passage. Students then worked on the reading comprehension subtest of the Metropolitan Achievement Test (MAT6) for 10 minutes. This served as a distracter task. Then, students completed a cued-recall test of the facts contained in the target passages.

In order to verify that students were actively engaged in the strategy in which they were instructed, the quality of generated summaries and elaborations was evaluated. The coding of generated summaries entailed assessing whether or not the facts contained within the original passages were included in the summaries. Interrater reliability was established by having two raters score a third of the cases in the summarization condition. Results revealed 100% agreement between raters on whether or not a given fact was included or excluded from summaries generated by learners. The remaining two thirds of the summaries were coded by one rater. On average, learners included 79% (or 28.4/36) of the facts in their summaries. The coding of elaborations generated in the Elaborative Interrogation condition entailed assessment of the quality of elaborations generated in response to the why-question. The adequacy of generated elaborations was coded with the criteria that good elaborations of to-be-learned information should contain information that might provide a good retrieval link. Elaborations were coded as either adequate or inadequate, with adequate elaborations being those containing true information that is specific to the to-be-learned fact, and inadequate elaborations being those containing vague or general information that is non-specific to the to-be-learned information. Interrater reliability was established by having two raters score one third of the elaborations generated in the elaborative interrogation condition. Results revealed 92% agreement on the classification of the adequacy and correctness of the information contained in the generated

elaborations. Analysis of the findings revealed that learners generated a response to every why-question for each fact, with 48% (or 17.3/36) being inadequate, and 52% (or 18.7/36) being adequate. These instructional checks provided sufficient indication that students were actively engaged in their respective strategies.

Session 3. Finally, students returned for a third session which lasted approximately an hour. This session took place five days after session two.

Students in the Summarization condition (S) were asked to use the same rules they used to summarize the same target passages they summarized during their last session. Students spent five minutes generating a summary for each passage. Then they worked on the reading comprehension subtest of the Metropolitan Achievement Test for another 10 minutes as a distracter task. Afterwards, they completed the cued-recall test of information contained in the target passages.

Students in the Elaborative Interrogation (EI) and Summarization/Elaborative Interrogation (S/EI) conditions were asked to use the EI strategy to study the same target passages about animals that they studied during the previous session. Students in the S/EI condition who were not previously exposed to the EI strategy received instruction in EI until the experimenter was sure that they were fluent in the EI strategy and generating adequate elaborations to the why-questions. The same procedure implemented during session two was used for presenting information to students during session three. After studying the target information, students worked on the reading comprehension section of the Metropolitan Achievement Test for another 10 minutes as a distracter task. Students then completed the same cued-recall test of information contained in the target passage.

Finally, students in the Repetition Control condition again were asked to use repetition to study the same target passage on familiar and unfamiliar animals presented during the previous session.

They were given five minutes to read each target passage and write it out. Then, students in the RC condition worked on the reading comprehension section of the Metropolitan Achievement Test for another 10 minutes as a distracter task. Finally, students completed the same cued-recall test used in session two of information presented in the target passage on familiar and unfamiliar animals.

## Results and Discussion

Analyses were conducted on the recall scores of information contained in the passages about familiar and unfamiliar animals. Recall scores from sessions two and three were considered in the analyses (session 1 was a practice session). The means and standard deviations of recall scores across conditions are presented in Table One. A 4 (condition) X 2 (session) X 2 (familiarity) repeated measures analysis of variance was conducted, where condition (Repetition Control, Elaborative Interrogation, Summarization, & Summarization/Elaborative Interrogation) served as a between subjects factor, and session (2 & 3) and familiarity (familiar & unfamiliar) were within subject factors. The analysis revealed significant main effects for all three factors, as well as one significant two-way interaction. There was a significant main effect for condition, $F(3,56) = 8.59$, $p \leq .001$ ($M_{RC} = 21.87$; $M_{EI} = 30.93$; $M_{S} = 28.43$; $M_{S/EI} = 26.13$). Also, there were significant main effects for session, $F(1,56) = 59.27$, $p \leq .001$ ($M_{session2} = 23.88$; $M_{session3} = 29.80$), and for familiarity of topic domain, $F(1,56) = 85.37$, $p \leq .001$ ($M_{familiar} = 14.66$; $M_{unfamiliar} = 12.18$).

Tukey HSD post hoc comparisons (Kirk, 1982; Marascuilo & Serlin, 1988) were conducted for each main effect. Consistent with previous research (Pressley, McDaniel, Turnure, Wood, & Ahmad, 1987; Pressley, Symons, McDaniel, Snyder, & Turnure, 1988), students in the Elaborative Interrogation condition outperformed those in the Repetition Control condition. Performance of students in the Summarization condition did not differ significantly from that of students in the Reading Control or

Table 1

Average Recall Scores For Strategy Conditions by Session and by Familiarity

| | Condition | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Repetition Control | | | Elaborative Interrogation | | | Summarization | | | Summarization/ Elaboration | | |
| Session | M | SD | n | M | SD | n | M | SD | n | M | SD | n |
| Session Two | | | | | | | | | | | | |
| Familiar | 9.80 | 2.81 | 15 | 15.87 | 1.81 | 15 | 14.73 | 2.52 | 15 | 14.07 | 2.79 | 15 |
| Unfamiliar | 8.13 | 3.44 | 15 | 12.13 | 4.76 | 15 | 10.73 | 4.95 | 15 | 10.07 | 4.32 | 15 |
| Session Three | | | | | | | | | | | | |
| Familiar | 13.60 | 2.44 | 15 | 17.20 | 0.86 | 15 | 16.73 | 1.34 | 15 | 15.27 | 3.26 | 15 |
| Unfamiliar | 12.20 | 3.28 | 15 | 16.67 | 1.84 | 15 | 14.67 | 3.85 | 15 | 12.87 | 4.84 | 15 |

Note. Maximum score is 18 per cell.

Elaborative Interrogation conditions. As expected, performance in the Summarization condition did not differ from the Elaborative Interrogation condition, presumably because both strategies entail sophisticated processing. However, performance in the Summarization condition did not differ significantly from that in the Reading Control condition, suggesting a slightly less powerful effect for summarization. The limited performance benefits of summarization may be a product of the kind of summaries generated. All summaries were scored for quality. One concern about the quality of the summaries generated was that they were unrefined. Despite detailed instruction and practice in the summarization strategy, students generated summaries that could be described as a "gist and list" effort to condense the information presented in the original passage. That is, almost all of the summaries appear to have been generated by a process of identifying factual content and simply listing that information in the summary. This occurred even though modification of the wording and order of presentation of information in the original passages was encouraged at all sessions. Furthermore, the restructuring of original text in the generation of summaries was demonstrated at length in several practice passages at session one. In generating their summaries, however, students did not deviate to any significant degree from the original text. The following are a few examples of the summaries generated in the Summarization condition:

> The American Pika is only found in British Columbia and prefers living in and around rock piles that are high up into the mountains where trees can't grow. The American Pika sleeps during the night; eats grasses and flowering plants; and falls prey to birds and weasels.
>
> The Pronghorn prefers prairies and plains of North America, live in open areas, threatened by fences and other man made barriers, eats herbs, usually has twins that always sleep apart and they have a white rump patch that is covered with hair that is raised if they are alarmed. At one time there was the concern of extinction.
>
> The House Mouse can be found in Southern Canada and throughout the United States. They like to live in warm, dry areas with a rapid rate of reproduction. A typical diet for a House Mouse would include nuts, vegetables, fruits and grains.

Other generated summaries contained either too much extraneous information or were based solely on information that is irrelevant. The following are some examples:

> The habitat of the CP (description of important features in the environment that might be occupied by a given species) is SW US. The social organization (relationship that exists among group members of a species) is that there are no leaders. Predation is defined as the relationship in which 1 animal benefits and the prey is effected adversely. CP's biggest danger are jaguar and mountain lion.
>
> Most of us in Can, & the U.S. are familiar with the House Mouse. It lives in warm, dry areas, and has been known to humans for many generations. We have also created expressions such as "quiet as a mouse" based on the animal's qualities of being shy & timid.
>
> The Little Brown Bat is a commonly known animal who resides in eastern Canada. People don't like bats because they associate them stereotypically with evil, dangers, dark eerie places. In fact we know that bats are harmless in fact they benefit people by eating insects. Bats sleep all winter; can live in diverse environments.

Finally, in choosing a label for their summary, students almost invariably chose the animal name. There were, however, a few exceptions where students generated more precise labels, but those summaries were not better integrated or elaborated than those with less explicit labels. For example:

> Label: Oddities about the Blue Whale
>
> Summary: The Blue Whale lives in the Arctic and Antarctic oceans and prefers to be near the surface of the water. One odd thing is that they eat only 3 months of the year, usually ocean plants and small shrimp-like creatures. Sleep by resting only half its brain at a time.

The nature of these summaries reflect that students who summarized (S and S/EI conditions at session two) correctly identified, and included in their summaries, 79% of the facts presented in the original text. As such, students were very adept at implementing the rule of summarization that requires identification of the important elements contained in a given passage. Indeed, by session three, students included 93% of the critical facts in their summaries. In an attempt to determine whether correct identification of factual content facilitated recall of that information, item-by-item conditional probabilities were calculated. At session two, the probability of correct recall for facts

included in the summary was .72, and the probability of correct recall when facts were not included in the summary was .69; at session three, these conditional probabilities were .92 and .87, respectively. These probabilities are not significantly different, the implication being that the probability of correct recall is not dependent simply on whether a fact was included or not included in a summary.

The performance of students in the combined Summarization/Elaborative Interrogation condition was not significantly different from the RC, EI, or S conditions. One explanation for this finding is that students are not applying one or both of the strategies appropriately, perhaps because summarization and elaborative interrogation are fundamentally too different, or because the amount of training in each strategy was not sufficiently extensive to facilitate performance. Although adult learners might be presumed to possess a repertoire of sophisticated strategies, it does not imply necessarily that they would employ or compound these strategies spontaneously or that they would use these strategies efficiently. It is possible that the approach used in this study to prompt the compounding of elaboration and summarization strategies was not effective. A more effective approach to encouraging students to compound the summarization and elaborative interrogation strategies might be to ask them to select important textual elements and then to compose and answer questions that would facilitate the comprehension of that information. This approach has been demonstrated to be effective in facilitating the comprehension of text in adolescent learners (MacDonald, 1986).

As mentioned earlier, the main effects described are qualified by a significant interaction of session by familiarity, $F(1,56) = 45.94$, $p = .002$ (see Table 2 for mean recall scores). Other 2-way interactions and the 3-way interaction were not significant. Tukey post hoc comparisons were conducted for analysis of the 2-way interaction. First, the recall scores of information about familiar

Table 2

Average Recall Scores by Session and Familiarity

| | Familiarity | | | | | |
|---|---|---|---|---|---|---|
| | Familiar | | | Unfamiliar | | |
| Session | M | SD | n | M | SD | n |
| Session Two | 13.62 | 3.37 | 60 | 10.27 | 4.53 | 60 |
| Session Three | 15.70 | 2.56 | 60 | 14.10 | 3.94 | 60 |

Note. Maximum score is 18 per cell.

animals was contrasted with that about unfamiliar animals separately for sessions two and three. Second, the recall scores of information at session two were contrasted with those at session three separately for information about familiar animals and for unfamiliar animals. Performance at session three exceeded that at session two both when students studied information drawn from familiar topic domains and when they studied information drawn from unfamiliar topic domains (*t*'s(2,58) = 3.81 & 4.94, respectively). More interestingly, recall of information about familiar animals exceeded that of unfamiliar animals at session two, but not at session three (*t*'s(2,58) = 4.60 & 2.64, respectively). A possible explanation for this pattern of findings is that repeated processing of information serves to facilitate the recall of information drawn from unfamiliar topic domains to a greater extent than the recall of information drawn from familiar topic domains. Indeed, by session three, it might be the case that recall scores of information about unfamiliar animals might be enhanced as a result of students allocating more resources to studying this information since they are expecting the presentation of information about unfamiliar animals and realize that such information will be more difficult to encode. Alternatively, this familiarity difference observed at session two, but not session three, might be an artifact of a ceiling effect operating at session three. Specifically, it is possible that the more pronounced gains in recall scores for information about unfamiliar animals than familiar animals across sessions might be evident only because the recall scores for information about familiar animals are already high at session two and approach the ceiling value by session three. The possibility that this session by familiarity interaction is a product of a ceiling effect was investigated further in study two, where the number of facts was increased from 36 to 60.

## STUDY 2

### Introduction

The findings of the first study suggest that the Elaborative Interrogation strategy is effective in facilitating performance relative to repetition. Performance in the Summarization condition was not different, however, from that in the Repetition Control condition. Although this suggests a less powerful effect for summarization, performance in the Summarization and Elaborative Interrogation conditions did not differ. Another finding was that repeated exposure to a strategy facilitates memory performance, and that such benefits might be more apparent in the memory of information drawn from unfamiliar compared to familiar domains. These conclusions are, however, tentative until replicated because of the potential for ceiling effects in the first study. To explore further the relative effectiveness of these strategies across sessions, experiment two was conducted as a replication study in which more challenging materials were used. Also, the findings pertaining to repeated exposure to strategies were considered again in order to investigate whether the session by familiarity interaction would replicate with the use of more challenging materials. In the first study, the gains in memory scores for information about unfamiliar animals were more pronounced across sessions than were the gains for information about familiar animals across sessions (nearly a 2:1 ratio). This finding might imply that repeated application of strategies might be a method of facilitating the acquisition of information for which learners possess no prior knowledge. In addition, other findings provided support for the benefits of repeated strategy instruction, mainly the observation of more pronounced differences between recall of information about familiar animals compared to unfamiliar animals at session two than at session three. The possibility remains, however, that these effects might be the product of memory scores approaching ceiling values by session three, especially for familiar animals.

In order to reduce the chances of a ceiling effect in study two, the number of target passages used in the second study was increased from six to 10. In this way, the cued recall test was comprised of 60 questions (6 questions about each of 10 animals). In study one, the recall test was comprised of 36 items (6 questions about each of 6 animals). Again, the sets of facts embedded in the target passages about familiar and unfamiliar animals were used in several previous studies. The facts were pre-tested for content, readability, complexity, etc. Finally, given the limited benefits from combining strategies in Study one, only individual strategies were examined in Study two.

## Method

### Participants

Eighty-one students attending a Canadian university volunteered to participate in this study on intentional learning. The sample was comprised of a heterogenous group of undergraduate students enrolled in introductory psychology at the University of Waterloo. Participants were assigned randomly to one of three strategy conditions (Summarization, Elaborative Interrogation, & Repetition Control). There were 27 students assigned per condition, and male and female students were represented in approximately equal proportions across conditions. The mean age of the sample was 21 years (SD = 4.8). Students worked independently during each phase of this study, although groups of five to 10 students in the same strategy condition worked in the same room and received instructions as a group.

### Materials and Procedure

Session 1. This session lasted approximately 45-60 minutes. Students in each condition were instructed in either summarization, elaborative interrogation, or repetition, and were asked to practice their respective strategy by studying information on "sound recording." As in study one, students in each condition received instructions as a group, yet worked independently. Also, the time of

participation in this study was equivalent across conditions, with students in each condition receiving the same amount of training in their respective strategies.

Students in the Summarization condition (S) were provided with instructions and practice in the summarization strategy. The same procedures (Appendix B) and practice materials (Appendix C) used at session one in the first study were provided to these students in the S condition. Also consistent with Study one, after completing instruction and practice in the summarization strategy, students counted down from 100 by seven's as a distracter task , and then answered cued-recall questions on facts presented in the training passages (Appendix D).

Students in the Elaborative Interrogation condition (EI) were instructed in the EI strategy through the same procedures and materials used during the practice session in study one. Students used EI to study the man-sentences (Appendix E). Then, they were asked to count down from 100 by seven's as a distracter task before completing a cued-recall test (Appendix F) for the information contained in the practice items.

Finally, students in the Repetition Control (RC) condition were asked to study information by engaging in rote repetition of the training passages on sound recording used in study one (Appendix C). After studying the information through rote repetition of the passages, students were asked to count down from 100 by seven's as a distracter task before completing a cued recall test for information contained in the training passages (Appendix D).

Session 2. Consistent with study one, students returned for another session two days after participating in session one. This session lasted approximately 75 minutes. The experimenter reminded students of the strategy in which they received prior instruction, and a few examples for proper execution of the strategy were provided. Then, students were asked to use their respective

strategy to study 10 passages about familiar and unfamiliar animals. Students studied five passages about familiar animals (Little Brown Bat, House Mouse, Blue Whale, Emperor Penguin, Townsend Mole) followed by five passages about unfamiliar animals (American Pika, Pronghorn, Collared Peccary, Chickaree, Coati). All target passages were tested for readability (STYLE program). As discussed in study one, comparable readability ratings were observed for each passage (see appendix L for the readability data on the target passages). Finally, students in all conditions completed the same distracter task (Appendix N) and cued-recall test (Appendix O).

Students in the Summarization condition generated summaries of the target passages on familiar and unfamiliar animals (Appendix M). As in study one, students were given five minutes to generate a summary for each passage. After generating all 10 summaries, students spent 10 minutes completing a portion of the Learning and Study Strategies Inventory (LASSI, Weinstein, 1987; see Appendix N) as a distracter task. Then, students completed a cued-recall test for the information presented in the passages (Appendix O).

Students in the Elaborative Interrogation Condition (EI) were asked to use EI to study information contained in the target passages on familiar and unfamiliar animals (Appendix P). Students were asked to write out their answer to the why-question for each underlined fact contained in the target passages. Each fact contained in a segment of the target passages was presented for 50 seconds in order to ensure that students in the EI condition were exposed to the target passages for the same length of time as students in the other conditions. After generating "why-answers" to all 60 facts contained in the 10 target passages, students spent 10 minutes completing a portion of the LASSI as a distracter task before completing the cued-recall test for the information contained in the target passages (Appendix O).

Finally, students in the Repetition Control condition (RC) used the repetition strategy to study the information contained in the 10 passages about familiar and unfamiliar animals (Appendix M). Consistent with the procedures used in study one, and with the times allotted to the study of each passage in the other conditions, students in the RC condition were asked to spend five minutes studying each passage. Students then completed a portion of the LASSI for 10 minutes as a distracter task before completing a cued-recall test for the information contained in the target passages (Appendix O).

Session 3. Consistent with the procedures in study one, students returned for a third session. This session was conducted a week after session two, and lasted approximately 75 minutes. Again, students in all conditions were reminded of the instructions for executing their respective strategy.

Students in the Summarization condition were asked to summarize the same target passages on familiar and unfamiliar animals that they summarized during the last session (Appendix M). Again, students spent five minutes generating a summary for each passage. Then they engaged in a distracter task (LASSI), and completed a cued-recall test of information contained in the target passages (Appendix O).

Students in the Elaborative Interrogation condition were given 50 seconds to answer the why-question for each of the 60 facts presented in the passages on familiar and unfamiliar animals (Appendix P). After studying the target information, students worked on the latter half of the LASSI as a distracter task, and then completed the same cued-recall test of information contained in the target passages (Appendix O).

Finally, students in the Repetition Control condition were asked to use repetition to study the target passages on familiar and unfamiliar animals presented during the previous session (Appendix

M). They were given five minutes to study the information contained in each target passage. Then, students in the RC condition completed the latter portion of the LASSI as a distracter task, followed by the cued-recall test of information presented in the target passages (Appendix O).

## Results and Discussion

As reported for the previous study, analyses were conducted on the recall scores of information contained in the passages about familiar and unfamiliar animals at sessions two and three (session 1 was a practice session). The means and standard deviations of recall scores across conditions are presented in Table Three. A 3 (condition) X 2 (session) X 2 (familiarity) repeated measures analysis of variance was conducted, where condition (repetition control, elaborative interrogation, & summarization) served as a between subjects factor, and session (2 & 3) and familiarity (familiar & unfamiliar) were within subject factors. As in study one, a repeated measures analysis of variance revealed significant main effects for condition, $F(2,78) = 17.93$, $p \leq .001$ (, $p \leq .001$ ($M_{RC} = 29.87$; $M_{EI} = 43.02$; $M_S = 35.81$), session, $F(1,78) = 83.75$, $p \leq .001$ ($M_{session2} = 32.46$; $M_{session3} = 40.01$), and familiarity $F(1,78) = 146.63$, $p \leq .001$ ($M_{familiar} = 20.65$; $M_{unfamiliar} = 15.58$).

Tukey HSD post hoc comparisons (Kirk, 1982; Marascuilo & Serlin, 1988) revealed that students in the Elaborative Interrogation condition outperformed those in the Repetition Control condition. This replicates the finding reported in study one, and is consistent with the findings of previous research (Pressley, McDaniel, Turnure, Wood, & Ahmad, 1987; Pressley, Symons, McDaniel, Snyder, & Turnure,1988). Also, as was reported in study one, the performance of students in the Summarization condition did not differ significantly from that of students in the Reading Control or Elaborative Interrogation conditions. The lack of significance between performance scores in the S condition relative to the RC condition again appears to be a product of the poor quality of the

Table 3

Average Recall Scores For Strategy Conditions by Session and by Familiarity

| | Condition | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | RC | | | EI | | | S | | |
| Session | M | SD | n | M | SD | n | M | SD | n |
| Session Two | | | | | | | | | |
| Familiar | 14.52 | 4.20 | 27 | 22.85 | 3.56 | 27 | 20.19 | 3.93 | 27 |
| Unfamiliar | 12.93 | 3.75 | 27 | 15.37 | 6.32 | 27 | 11.52 | 6.20 | 27 |
| Session Three | | | | | | | | | |
| Familiar | 16.37 | 4.46 | 27 | 26.74 | 3.07 | 27 | 23.26 | 4.08 | 27 |
| Unfamiliar | 15.93 | 6.08 | 27 | 21.07 | 6.49 | 27 | 16.67 | 6.06 | 27 |

Note. Maximum score is 30 per cell.

summaries. Again, students generated summaries that could be described as "gist and list" representations of the information presented in the original passage. The facts extracted from the text were not integrated in a sophisticated manner, nor was the information modified or elaborated in any way. This occurred even though it was made clear in the instructions, and further demonstrated through practice passages, that the wording and order of presentation of information could be modified in the generation of summaries.

Summaries were coded for information that was *integrated* or *elaborated.* Integration was defined as attempts to link related facts, even if the wording of the facts contained in the original text was not modified to a significant extent. It was not considered an instance of integration if unrelated facts were presented in the order in which they appeared in the original text, and simply linked by the word "and" or separated by a comma. Such presentation of information in a summary was considered a "gist and list" method of summarization. Also, sentences were not considered integrative if facts were linked with irrelevant information contained in the original passage. Elaborations were defined as instances in which factually correct information, that was not contained in the original passage, was used to explain information presented in the summary. A third of the data were coded by two raters in order to establish interrater reliability for the coding of integrations. Cohen's Kappa (Cohen, 1960) was calculated, revealing a high level of agreement between raters on the identification of instances of integration contained in summaries ($K = .86$). The remaining two thirds of the data were coded by one rater. Interrater reliability for the identification of elaborations contained in summaries was not calculated as too few instances of elaboration were observed, and no further analysis based on elaborations contained in summaries was conducted.

The following are examples of sentences extracted from various summaries generated in study

two in which there was evidence of integration:

> The Chickaree lives in dense forests and is highly protective of its living space.
>
> Interesting behaviours of the Coati include the female being dominant over the male, and rolling its prey under its front feet.
>
> It is hard to find the Townsend Mole because they live in tunnels and nap throughout the day.

The following examples are sentences containing information that was not modified sufficiently enough to be coded as an integration:

> The Townsend Mole eats insects and grubs and can be found anywhere in the world.
>
> The Pronghorn eats herbs, has twins that sleep apart, and a white rump patch whose hair is raised if alarmed.
>
> Whales worst danger is being caught under the ice and it sleeps by resting half of its brain at a time.

The following are examples of elaboration of information contained in the summaries:

> Evolution of the Blue Whale has given it the ability to sleep by resting one half of the brain at a time and to eat only 3 months of the year.
>
> The Emperor Penguin sleeps longer in extreme cold, allowing it to endure severe weather conditions.

Instances of integration were tallied across all 10 summaries generated by each of 27 students at session two. Across the 270 summaries (135 summaries for familiar and 135 for unfamiliar animals), there were 254 instances of integration. This translates into 9.41 instances of integration across 10 passages per student or only slightly less than one instance of integration per summary. Furthermore, instances of integration were tallied separately for passages about familiar and about unfamiliar animals, and no differences were observed as a function of familiarity. That is, 4.52 versus 4.89 instances of integration occurred across passages about familiar animals and unfamiliar animals, respectively.

The results pertaining to elaboration of information contained in generated summaries revealed only 9 instances of spontaneous elaboration of information across all 270 summaries (4 elaborations from summaries about familiar animals, and 5 from those about unfamiliar animals). This is not a surprising finding since a goal of summarization is to condense, and students were not provided with instructions to elaborate upon the information contained in their summaries. To this extent, it appears that the summarization strategy does not prompt the spontaneous activation of other associative strategies such as elaboration. The generation of elaborations may be a key distinction between the summarization and elaborative interrogation strategies. In coding the elaborations generated in the Elaborative Interrogation condition, it was observed that the EI strategy prompted both access of prior knowledge and some amount of integration. More specifically, elaborations generated in the EI condition were coded for whether (i) information presented in an earlier fact was included in the elaboration, and/or (ii) new, and factually correct information was included in an elaboration. The following are examples of elaborations in which references were made to previously presented facts:

Elaboration: flying insects also sleep all winter
(Presented fact: The Little Brown Bat sleeps all winter.)

Elaboration: Martens also abundant in W. Canada
(Presented fact: The Chickaree is in danger from Martens.)

The following are examples of elaborations that contain new information that is factually correct:

Elaboration: because snakes can crawl into their tunnels and prey on them
(Presented fact: There are few dangers for the mole except for snakes.)
(Note: This elaboration would be scored as both containing new information and as making reference to previously presented information.)

Elaboration: so it can see its predators at long distances
(Presented fact: The American Pika lives so high up in the rocky mountains that trees can't grow.)

Again, one third of the cases were coded by two raters to establish interrater reliability. There

was 90% agreement on the classification of elaborations as containing references to previously presented information, or to new, factually correct information. The number of references made to previously presented information was used as a rough index of the extent to which students using EI attempted to integrate to-be-learned facts. The number of elaborations containing new information was used as an index of whether students were accessing prior knowledge when generating elaborations. Analysis of the elaborations generated in the EI condition revealed that references to previously presented information occurred about 11.7% of the time (or 171 times out of 1458 possible opportunities to refer back to previous information). The number of referrals to previously presented facts did not vary as a function of familiarity. That is, of the references to previously presented information, 44% of them were made in elaborations of facts about familiar animals, and 56% of them of facts about unfamiliar animals. Among generated elaborations, 33% contained new, factually correct information. Consistent with previous research, the generation of factually correct elaborations was more likely in the study of information about familiar than about unfamiliar animals (Willoughby, Waller, Wood, & MacKinnon, 1993). In this study, 62% of the elaborations containing factually correct information were generated in response to why-questions about familiar animals, and 38% were generated in response to why-questions about unfamiliar animals.

This pattern of results suggests that there are fundamental differences in the ways in which summarization and elaborative interrogation facilitate learning. The construction of knowledge in summarization appears to be a product of integration of information, whereas EI appears to prompt both access of prior knowledge and some amount of integration. Although performance in the Summarization and Elaborative Interrogation conditions did not differ significantly, memory scores in the Elaborative Interrogation condition exceeded those in the Summarization Condition. It is possible

that the additional processing encouraged by the Elaborative Interrogation strategy may explain its slightly more powerful effect.

Finally, although post hoc analysis of the main effect of condition revealed that performance in the EI condition exceeded that of the RC condition, with no other comparisons being significant, the findings were qualified by a significant condition by familiarity interaction, $F(2,78) = 23.95$, $p \leq .001$ (see Table 4 for means and standard deviations). Post hoc comparisons revealed that students using either EI or S outperformed those in the RC condition when studying facts about familiar animals ($t(3,78) = 9.91$ & 6.65, $p$'s $< .05$, respectively). There was a trend toward students in the EI condition outperforming those in the S condition for information about familiar animals, $t(3,78) = 3.30$ (critical $t$ value = 3.40). When studying information about unfamiliar animals, there were no significant differences in recall scores across conditions (highest $t = 2.88$ for the comparison of the EI and S conditions). This analysis indicates that the effective application of both elaborative interrogation and summarization is dependent upon the familiarity of the information being processed. Considerable previous literature has demonstrated that students using Elaborative Interrogation acquire more information when information draws upon a familiar knowledge base than an unfamiliar one. Presumably this is a reflection of the strategy's dependence upon the formation of associative connections between new information and prior knowledge. Of interest here was that this pattern of findings also was observed for students engaged in the summarization strategy. This implies that performance in summarization also varies as a function of the familiarity of topic domain studied. As discussed earlier, the comprehension of discourse is dependent on many factors, including the familiarity of the topic domain being studied. When summarizing, the resolution of ambiguous, missing, irrelevant, and distracting information in text is easier when processing text about a familiar as opposed

Table 4

Average Recall Scores by Condition and Familiarity

| | Condition | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | RC | | | EI | | | S | | |
| Familiarity | M | SD | n | M | SD | n | M | SD | n |
| Familiar | 15.44 | 3.64 | 27 | 24.80 | 2.99 | 27 | 21.72 | 3.73 | 27 |
| Unfamiliar | 14.43 | 3.87 | 27 | 18.22 | 5.94 | 27 | 14.09 | 5.73 | 27 |

Note. Maximum score is 30 per cell.

to unfamiliar topic. To this extent, it is reasonable that the performance of students engaged in summarization would be facilitated when studying information for which they possess some prior knowledge rather than information drawn from unfamiliar domains.

Previously, however, it was argued that the tasks inherent in summarization might facilitate the organization of text via the formation of connections among ideas, which in turn might be expected to promote the formation of a hierarchical memory structure that could serve to facilitate recall. As such, it was suggested that, relative to elaborative interrogation, the task of summarizing might not be so dependent upon the formation of associations between new information and prior knowledge, and therefore, students who summarized might be expected to outperform those using elaborative interrogation when studying information drawn from an unfamiliar topic domain. This possibility was not supported by post hoc comparisons of the condition by familiarity interaction. The performance of students in the S condition was not significantly different from that of students who used EI to study information about unfamiliar animals.

One reason why performance in the Summarization and Elaborative Interrogation conditions did not differ significantly is that compounding of strategies might be occurring in the EI condition, producing a relative advantage for elaborative interrogation over summarization when studying information drawn from unfamiliar domains. Specifically, elaborative interrogation is thought to elicit the spontaneous activation of imagery (Wood, Fler, & Willoughby, 1991), a strategy demonstrated to be effective in promoting the acquisition of factual information drawn from unfamiliar topic domains (Willoughby et al., 1993).

Another possibility, however, might be that students are not applying the summarization strategy effectively. More accurately, it might be the case that students are engaging in a rote-

repetition-like exercise when generating summaries. This is evidenced by the quality of the summaries generated, in that students demonstrated proficiency at selecting facts for inclusion in their summary, yet they made few attempts to transform, integrate, or elaborate that information. Hidi and Anderson (1986) described summarization as an active process whereby textual information is transformed, for example, evaluated and condensed. Furthermore, when generating summaries, learners must consider the adequacy of their transformation of textual information by continually relating their summaries to the original text. Moreover, Stein and Kirby (1992) argued that deep processing is inherent in the extraction or recognition of important ideas from text, and that learners must process central ideas in order to understand and recall the information contained in lengthy text. Despite rigorous training in summarization, students were not generating high quality summaries. This might explain why students in the summarization condition do not outperform those in the Elaborative Interrogation condition, even when the to-be-learned information is drawn from unfamiliar topic domains.

It is not clear why students in the Summarization condition are not performing well. Perhaps the instructions provided for summarizing are discrepant from students' own approaches to generating summaries. It also might be the case that students will favour the least sophisticated approach in their repertoire when studying new information (Garner, 1990a, 1990b). When processing information drawn from unfamiliar topic domains, capacity limitations become an issue, with learners demonstrating difficulties in engaging in endeavours such as strategy execution or activation of prior knowledge (Bjorklund, 1987). Furthermore, capacity limitations might become evident when learners are using a sophisticated strategy that is itself unfamiliar or less familiar to them. Learner's resources are allocated toward becoming fluent in the strategy, and therefore they may be unable to use the strategy efficiently. Given that the summaries generated in these studies consist of a list-like presentation of the important

information contained in the text, akin to the copy-delete strategy described by Brown and Day (1983), it appears that students are devoting fewer resources to producing refined summaries, perhaps because their energies are being allocated toward becoming fluent in the strategy itself. As such, their approach to summarization entails searching for factual content and listing that information verbatim in the summaries they generate. This approach might be considered only slightly more beneficial than a rote-rehearsal strategy. Proficiency in summarization as a learning strategy might require several supports and extensive training (see MacDonald, 1986; Symons, Richards, & Greene, 1995). Elaborative Interrogation, on the other hand, is an efficient strategy in which students can be trained in a relatively short amount of time, although a limitation of the EI strategy is that it is not effective for learning factual information that is drawn from topic domains for which the learner possesses little or no prior knowledge.

Finally, Tukey post hoc comparisons were conducted for the session by familiarity interaction, $F(1,78) = 8.47$, $p = .005$ (see Table 5 for means). As in study one, the recall scores of information about familiar animals was contrasted with those for about unfamiliar animals, separately for sessions two and three. Also, the recall scores of information at session two were contrasted with those at session three, separately for information about familiar animals and about unfamiliar animals. Results of the former set of $t$-tests revealed that performance at session three exceeded that at session two, both when students studied information drawn from familiar topic domains and when they studied information drawn from unfamiliar topic domains, $t(2,79) = 3.38$ & $4.78$, respectively (critical $t$ value = 2.83). This is consistent with the findings reported in study one, that gains in memory scores for information about unfamiliar animals were more pronounced across sessions than were the gains for information about familiar animals across sessions (again, nearly a 2:1 ratio). This finding implies that

Table 5

Average Recall Scores by Session and Familiarity

| | Familiarity | | | | | |
|---|---|---|---|---|---|---|
| | Familiar | | | Unfamiliar | | |
| Session | M | SD | n | M | SD | n |
| Session Two | 19.19 | 5.21 | 81 | 13.27 | 5.71 | 81 |
| Session Three | 22.12 | 5.81 | 81 | 17.89 | 6.55 | 81 |

Note. Maximum score is 30 per cell.

repeated application of strategies might be a method of facilitating the acquisition of information for which learners possess no prior knowledge.

The findings of the latter set of *t*-tests, however, were inconsistent with those reported in study one. In study one, the difference between recall of information about familiar versus unfamiliar animals was significant at session two but not at session three. Post hoc comparisons in study two revealed that recall of information about familiar animals exceeded that of unfamiliar animals both at session two and at session three, $t(2,79) = 6.89$ & 4.35, respectively. Therefore, it is likely that, in study one, the significant difference between recall of information about familiar animals compared to unfamiliar animals at session two but not at session three was the product of recall scores for familiar animals approaching ceiling values by session three.

## STUDY 3

### Introduction

This third study was conducted in order to replicate and extend the findings of the first and second studies, while examining variables that might have been operating to inflate performance in the Elaborative Interrogation condition relative to other conditions. For example, it should be noted that in studies one and two, there is the possibility that the method of presentation of to-be-learned information is biased in favour of the Elaborative Interrogation condition. Facts contained in the text passages studied by students in the EI condition were presented in segmented form, with each segment containing a fact that was underlined. Learners in the Summarization and Reading Control conditions studied information that was presented in non-segmented paragraph form without any underlining of information. The underlining of facts in the EI condition may have enhanced performance.

In order to determine the impact of underlining, students in all conditions were exposed to information that contained underlined facts. Students in the Elaborative Interrogation condition were presented with segmented passages containing underlined facts, and were asked to study the information as per the method employed in the first and second studies. Then, they were asked to read over the passages presented in paragraph form with no segmenting or underlining. Students in the Summarization condition were asked to study information by summarizing paragraphs containing no segmenting or underlining. Afterwards, they were asked to read the passages they just summarized, the difference being that the information in the passages was segmented and facts were underlined to be consistent with the presentation of information in the EI condition. Finally, two reading control conditions were included. Students in one Repetition Control condition ($RC_1$) served as a control for the Elaborative Interrogation condition. These students applied the repetition strategy for studying

passages containing segmenting and underlining of facts. Then, they read over the material they just studied, presented in paragraph form with no segmenting or underlining. Another Repetition group ($RC_2$) served as a control for the Summarization condition. They used the repetition strategy for studying information presented in paragraph form with no segmenting or underlining of information. Then they read over the information presented in segmented form with relevant facts underlined.

Students in all conditions were exposed to the target information twice and for the same length of time. If the segmenting and underlining of information did not confer an unfair advantage to students in the Elaborative Interrogation condition, it was expected that the patterns of results observed in the previous studies would be replicated in this third study. Also, it was expected that the performance of students in the two reading control conditions would not differ.

Finally, the order of presentation of the passages about familiar and unfamiliar animals was different from that of the first two studies. In studies one and two, the first five passages were about familiar animals (Little Brown Bat, House Mouse, Blue Whale, Emperor Penguin, Townsend Mole), and the next five passages were about unfamiliar animals (American Pika, Pronghorn, Collared Peccary, Chickaree, Coati). In study three, the order of presentation of animal passages was mixed such that not more than two passages about either a familiar or unfamiliar animal were presented in sequence. This served to ensure that the order of presentation of facts matched that of existing research on elaborative interrogation while controlling for possible order effects.

## Method

### Participants

Ninety-six students attending a Canadian university volunteered to participate in this study. The sample was comprised of a heterogenous group of undergraduate students enrolled in an

introductory psychology course. Students were assigned randomly to one of four experimental conditions (Summarization, Elaborative Interrogation, Repetition Control$_1$, & Repetition Control$_2$). There were 24 students per condition, with males and females being represented equally in all conditions. The mean age of the sample was 22 years (SD = 4.4). Students worked independently during each phase of this study, although groups of five to 10 students worked in the same room and received instructions as a group.

Materials and Procedure

Session 1. This session matched the practice session conducted in both studies one and two. This practice session lasted approximately 45-60 minutes. The same practice instructions and materials used in studies one and two to instruct students in their respective strategy were used in this third study. Again, students in each condition received instructions as a group, yet worked independently.

Students in the Summarization condition received training (Appendix B) and practice (Appendix C) in the summarization strategy. In another condition, students were instructed in a "why-questioning" strategy, elaborative interrogation, and applied the strategy to the study of practice materials (Appendix E). Finally, two repetition control conditions were included: one served as a control for the EI condition and the other as a control for the S condition. In the repetition conditions, students were instructed to study practice materials (Appendix C) using a rote repetition strategy. Students in all conditions were asked to count down from 100 by seven's as a distracter task before completing the cued recall test for the information contained in the practice materials.

Session 2. Consistent with the procedures used in studies one and two, students returned for another session a week after participating in the first session. This session lasted slightly over 95

minutes. Students were asked to use the strategy in which they received instruction during session one to study the target information about 10 animals (5 familiar and 5 unfamiliar) used in study two. The order of presentation of these passages differed, however, from that of the first and second studies. In studies one and two, students first studied the five passages about familiar animals (Little Brown Bat, House Mouse, Blue Whale, Emperor Penguin, Townsend Mole), and then studied the five passages about unfamiliar animals (American Pika, Pronghorn, Collared Peccary, Chickaree, Coati). In study three, the passages about animals were presented in a fixed and random order, with the restriction that not more than two passages about either a familiar or unfamiliar animal were presented in sequence (Appendix Q; see Appendix L for readability data).

Consistent with studies one and two, students in all conditions were reminded of the strategy in which they received prior instruction, and a few examples for proper execution of the strategy were provided. Then, students were asked to use their respective strategy to study the 10 target passages about familiar and unfamiliar animals. As an addition to the procedures outlined in studies one and two, students in the third study were asked to read over the target passages after applying their respective strategy to studying the target information. The format of the information presented to students after the study portion of this session was different across conditions so that students in all conditions received exposure to passages presented in both formats: students in the S and $RC_2$ conditions who were not presented with segmented and underlined target information when applying their respective study strategy were asked to read passages containing underlining and segmenting; students in the EI and $RC_1$ conditions who applied their strategy to studying target information containing segmenting and underlining now read passages without any segmenting or underlining.

Students in the Summarization condition generated summaries of the passages on familiar and

unfamiliar animals (Appendix Q). As in studies one and two, students were given five minutes to generate a summary for each passage. After students completed their summaries, they were asked to read the same information contained in the passages they just summarized. This information, however, was presented to them in a different format. Specifically, they were asked to read the information about animals in the format in which it was presented to students in the EI condition--segmented with factual content underlined. Students were given two and an half minutes to read each passage. Students then were asked to complete a portion of the Learning and Study Strategies Inventory (LASSI; Weinstein, 1987; see Appendix N) as a distracter task before completing a cued-recall test of the information presented in the target passages (Appendix O).

Students in the Elaborative Interrogation Condition (EI) were asked to use EI to study information contained in the target passages on familiar and unfamiliar animals (Appendix R) by answering a why-question for each underlined fact contained in the target passages. Each fact contained in a segment of the target passages was presented for 50 seconds in order to ensure that students in the EI condition were exposed to the target passages for the same length of time as students in the other conditions. After all the information contained in the target passages about familiar and unfamiliar animals was presented, students were asked to read over the passages that contained no underlining or segmenting (Appendix Q). They were given two and a half minutes to read each passage. Then they completed a portion of the LASSI as a distracter task, followed by a cued-recall test of the information contained in the target passages (Appendix O).

Finally, students in the Repetition Control conditions ($RC_1$ & $RC_2$) were asked to use the repetition strategy to study the information contained in the 10 passages about familiar and unfamiliar animals. In order to ensure that the format of materials studied in the control conditions matched that

of the S and EI conditions, students in the $RC_1$ condition studied passages containing segmenting and underlining of information (Appendix R), and students in the $RC_2$ condition studied passages containing no segmenting or underlining of information (Appendix Q). The $RC_1$ condition served as a control group for the EI condition and the $RC_2$ condition served as a control for the S condition. Consistent with the procedures used in studies one and two, and with the times allotted to the study of each passage in the other conditions, students in the RC conditions were asked to spend five minutes studying each passage. After this study portion of the session, students in the RC conditions were asked to read over the target passages in the format to which they were not exposed previously in applying the repetition strategy. That is, students in the $RC_1$ condition were asked to read over the passages that contained no underlining or segmenting (Appendix Q), and students in the $RC_2$ condition were asked to read over passages containing segmenting and underlining of target information. Again, students were given two and a half minutes to read each passage. Students then completed a portion of the LASSI for 10 minutes as a distracter task before completing a cued-recall test for the information contained in the target passages (Appendix O).

## Results and Discussion

Analyses were conducted on the recall scores of information contained in the passages about familiar and unfamiliar animals. Only recall scores from session two were used in the analyses (session 1 was a practice session). The means and standard deviations of recall scores across conditions are presented in Table Six.

A 4 (condition) X 2 (familiarity) repeated measures analysis of variance was conducted, where condition (Repetition $Control_1$, Repetition $Control_2$, Elaborative Interrogation, & Summarization) served as a between subjects factor, and familiarity (familiar, unfamiliar) as a within subjects factor.

Table 6

Average Recall Scores For Strategy Conditions by Familiarity

| | Condition | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $RC_1$ | | | $RC_2$ | | | EI | | | S | | |
| Familiarity | M | SD | n | M | SD | n | M | SD | n | M | SD | n |
| Familiar | 17.21 | 5.36 | 24 | 17.25 | 4.48 | 24 | 24.96 | 3.50 | 24 | 22.50 | 4.15 | 24 |
| Unfamiliar | 14.25 | 3.76 | 24 | 14.17 | 4.87 | 24 | 15.13 | 5.74 | 24 | 14.21 | 4.92 | 24 |

Note. Maximum score is 30 per cell.

Consistent with studies one and two, repeated measures analysis of variance revealed significant main effects for condition, $F(3,92) = 6.13$, $p \leq .001$ ($M_{RC1} = 31.46$; $M_{RC2} = 31.42$; $M_{EI} = 40.08$; $M_S = 36.71$) and familiarity, $F(1,92) = 219.45$, $p \leq .001$ ($M_{familiar} = 20.48$; $M_{unfamiliar} = 14.44$).

Tukey HSD post hoc comparisons (Kirk, 1982; Marascuilo & Serlin, 1988) for overall performance across condition revealed no significant effects, although there was a strong trend for enhanced performance in the Elaborative Interrogation condition relative to the Repetition Control condition ($t(92) = 3.6$ (cutoff $t = 3.7$). Consistent with studies one and two, performance in the EI condition was not significantly greater than that in the Summarization condition. Furthermore, students in the Summarization condition did not outperform those in the Repetition or Elaborative Interrogation conditions. This pattern of findings replicates those of studies one and two, and previous research comparing the elaborative interrogation with repetition strategies. Finally, performance in the $RC_1$ and $RC_2$ conditions did not differ. This pattern of findings indicates that the results reported in these studies are not artifacts of variance due to underlining and segmenting of information presented in text materials. As such, the advantage conferred to students in the Elaborative Interrogation condition is not due to artificial inflation of scores due to the underlining of facts contained in the passages. As discussed earlier, one could argue that the elaborative interrogation strategy is more efficient than summarization. Typically, fluency with the elaborative interrogation strategy is evident after only a single session (e.g., Pressley, McDaniel, Turnure, Wood, & Ahmad, 1987; Pressley, Symons, McDaniel, Snyder, & Turnure, 1988), whereas learners might require several supports to implement the summarization strategy effectively. In addition to requiring fewer supports, the elaborative interrogation strategy possibly might elicit the spontaneous activation of other associative strategies such as imagery.

Finally, consistent with Study two, there was a significant condition by familiarity interaction, $F(3,92) = 18.89$, $p \leq .001$ (see Table 6 for means). Students in the Elaborative Interrogation and Summarization conditions outperformed those in the Repetition Control conditions when studying information about familiar animals ($t(92) = 6.07$ & 4.11, respectively $p \leq .05$). For information about unfamiliar animals, there were no significant differences in recall scores across conditions (highest $t(92) = 0.68$, $p \geq .05$). This pattern of findings is consistent with those reported in studies one and two.

As in study two, summaries were coded for information that was *integrated* or *elaborated.* Integration was defined as attempts to link related facts, even if the wording of the facts contained in the original text was not modified to a significant extent. Elaborations were defined as instances in which factually correct information, that was not contained in the original passage, was used to explain information presented in the summary. A third of the data was coded by two raters in order to establish interrater reliability for the coding of integrations. The remaining two thirds of the data were coded by one rater. The Kappa statistic (Cohen, 1960) revealed a high level of agreement on the scoring of integrations ($K = 0.87$). Interrater reliability for the scoring of elaborations was not calculated because too few cases of elaboration were observed to warrant any analysis based on elaboration scores.

Instances of integration were tallied across all 10 summaries generated by each of 24 students at session two. Across the 240 summaries (120 summaries for familiar and 120 for unfamiliar animals), there were 262 instances of integration. This translates into 10.9 instances of integration across 10 passages per student or only slightly more than one instance of integration per summary. Furthermore, instances of integration were tallied separately for passages about familiar and about unfamiliar animals, and no differences were observed as a function of familiarity. That is, 5.83 versus

5.08 instances of integration occurred across passages about familiar animals and unfamiliar animals, respectively.

The results pertaining to elaboration of information contained in generated summaries revealed that only 6 instances of elaboration occurred across all 240 summaries (all 6 elaborations were from summaries about familiar animals). In considering that no instructions to elaborate the information in summaries were provided, any elaboration of information would have been generated spontaneously by learners. Again, it appears that the summarization strategy does not prompt the spontaneous activation of other associative strategies such as elaboration, and that the generation of elaborations may be a key distinction between the summarization and elaborative interrogation strategies.

In coding the elaborations generated in the Elaborative Interrogation condition, it was found that elaborative interrogation prompts both access of prior knowledge and some amount of integration. Again, one third of the cases were coded by two raters to establish interrater reliability. There was 91% agreement on the classification of whether elaborations contained references to previously presented information, or to new, factually correct information. The number of references made to previously presented information was used as a rough index of the extent to which students using EI attempted to integrate to-be-learned facts. The number of elaborations containing new information was used as an index of whether students were accessing prior knowledge when generating elaborations. Analysis of the elaborations generated in the Elaborative Interrogation condition revealed that references to previously presented information occurred about 11.3% of the time (or 146 times out of 1296 possible opportunities to refer back to previous information). As observed in study two, the number of referrals to previously presented facts did not vary as a function of familiarity. Again, approximately one third of generated elaborations also contained new, factually correct information.

Consistent with previous research, the generation of factually correct elaborations was more likely in the study of information about familiar than about unfamiliar animals (Willoughby, Waller, Wood, & MacKinnon, 1993). In this study, 60% of the elaborations containing factually correct information were generated in response to why-questions about familiar animals, and 40% were generated in response to why-questions about unfamiliar animals.

The qualitative features of the summaries and elaborations were consistent across studies two and three. Qualitative observations revealed fundamental differences in the mechanisms underlying the effective application of the elaborative interrogation and summarization strategies. It appears that summarization prompts integration, while elaborative interrogation prompts both access of prior knowledge and integration of information. The additional processing elicited by the elaborative interrogation strategy might account for the slightly more powerful effects of elaborative interrogation relative to summarization.

## GENERAL DISCUSSION

Throughout their academic endeavours, students are faced with the challenge of understanding and recalling information presented in expository text. For learners of any age, such explicit information often is difficult to learn and commit to memory. Acquiring and retaining information is especially important in this information-age. Over the last several decades, researchers interested in promoting memory development have studied the effects of learning strategies (Bjorklund & Douglas, in press).

The three studies described here were conducted in an attempt to investigate the efficacy of strategies thought to be effective in the acquisition and retention of factual information. The strategies of particular interest were summarization and elaborative interrogation. These strategies have been shown to be effective in facilitating memory performance. However, as described in the general introduction section, the mechanisms underlying the effectiveness of the elaborative interrogation and summarization strategies might be presumed to differ. The efficacy of elaborative interrogation has been shown to be dependent upon the formation of associative connections between new information and prior knowledge (Willoughby, Waller, Wood, & MacKinnon, 1993). In summarization, the use of "macrorules" to form a "streamlined" representation of textual information entails using one's own words and knowledge in constructing novel sentences, deriving relations among ideas in the text, and perhaps forming relations between textual information and the knowledge base (e.g., Brown & Day, 1983; Hidi & Anderson, 1986; & Wittrock, 1990). The relative efficacy of these strategies, as well as the distinguishing factors underlying their efficacy, were investigated in the studies reported here.

A consistent finding across all three studies was that the elaborative interrogation strategy facilitated overall memory performance relative to repetition (although the comparison was only

marginally significant in study 3). This finding is consistent with previous research comparing elaborative interrogation to simple repetition (Pressley, McDaniel, Turnure, Wood, & Ahmad, 1987; Pressley, Symons, McDaniel, Snyder, & Turnure, 1988). Also consistent across all three studies was the finding that overall performance in the Summarization condition did not differ significantly from that in the Elaborative Interrogation or Repetition Control conditions. Several explanations for the limited benefits of summarization were considered, including the quality of generated summaries. Generally, the quality of the summaries was poor across all three studies. As revealed in study one, learners were adept at identifying the factual information contained in the target passages, but the qualitative coding of the summaries generated in studies two and three revealed that students failed to modify the wording or elaborate the information contained in the original text. Although students demonstrated competence in correctly identifying facts presented in the target passages, as was observed in study one, the probability of correctly recalling a fact did not differ as a function of whether or not that fact was included in the summary.

Another explanation for the reduced benefits of summarization might be that the task of summarizing does not elicit the spontaneous activation of other associative strategies such as elaboration. Indeed, in coding the quality of summaries generated in study two, it was observed that only nine instances of elaboration were evident across 270 summaries. In study three, only six instances of elaboration occurred across 240 summaries. It was suggested that the slightly more powerful effects of the elaborative interrogation strategy might be the result of elaborative interrogation prompting the activation of prior knowledge as well as eliciting integration of information. Indeed the qualitative coding of the elaborations in studies two and three revealed that nearly 12% of elaborations contained references to previously presented information. Furthermore, nearly a third of the generated

elaborations contained new and factually correct information. Of these elaborations containing new and factually correct information, 62% versus 38% (in study 2) and 60% versus 40% (in study 3) were generated for facts about familiar and unfamiliar animals, respectively. This is consistent with previous research in which factually correct information was more likely to be observed in elaborations of facts about familiar than about unfamiliar animals (Willoughby, Waller, Wood, & MacKinnon, 1993).

Another explanation is that the encoding and retrieval cues might be biased in favour of the elaborative interrogation condition relative to the summarization condition. For example, it is plausible that the slightly enhanced benefit of elaborative interrogation relative to summarization might be attributable to the nature of the encoding and retrieval demands. Specifically, the memory test used in these studies is more compatible with the task demands of the Elaborative Interrogation condition than of the Summarization condition. Specifically, just as the encoding process of the elaborative interrogation strategy requires learners to form a precise association between an animal and its activity, the nature of the cued-recall test for which students are asked to match factual information with the name of the relevant animal is associative. Such a match in task demands does not exist for the Summarization condition since summarization does not entail such "proposition-specific" processing (McDaniel & Einstein, 1989) required for elaborative interrogation. Although summarization might facilitate the formation of relations among facts presented in text, the associative nature of the memory test would not be sensitive in detecting this kind of encoding. As such, students in the Summarization condition might be at a disadvantage relative to students in the Elaborative Interrogation condition. If, however, the nature of the memory test was different, for example, if it required identification of which facts clustered together for a given animal rather than matching of an animal with an action, the performance of students using summarization might be facilitated. This interpretation is admittedly

speculative. Whether variation in the nature of the recall test is accounting for any of these findings in memory scores across conditions is an empirical question that cannot be addressed based on the findings of the studies reported here. It should be noted, however, that although the nature of the recall test in this study might seem more compatible with the task demands of the Elaborative Interrogation condition than with those of the Summarization condition, students in both conditions were engaged in an associationistic process of relating the animal to its activities. More specifically, students in the Elaborative Interrogation condition were asked to answer why a particular animal would engage in a particular activity, and students in the Summarization condition were engaged in a task that entailed continually relating the information in the passage to the label assigned to the summary (mainly, the animal name).

Also consistent across all three studies was that there was no significant difference in the overall performance of students in the Summarization and Elaborative Interrogation conditions. This might be due to familiarity of topic domain not being taken into consideration at this particular level of analysis of overall performance scores. The familiarity of topic domain being studied might be an important consideration in the effective implementation of both the elaborative interrogation and summarization strategies. Indeed, the comprehension of discourse is dependent on many factors including the familiarity of the topic domain being studied. The elaborative interrogation strategy has been demonstrated to be dependent upon the formation of associative connections between new information and prior knowledge such that the benefits of elaborative interrogation relative to simple repetition are evident when to-be-learned information is drawn from familiar but not unfamiliar topic domains. Similarly, in summarization, the resolution of ambiguous, missing, irrelevant, and distracting information in text is easier when processing text about a familiar as opposed to unfamiliar topic. On

the other hand, one might have expected that the task of summarizing could facilitate the organization of text via the formation of connections among ideas, which in turn promotes the formation of a hierarchical memory structure that can serve to facilitate recall. As such, relative to elaborative interrogation, the task of summarizing might not be so dependent upon the formation of associations between new information and prior knowledge. To this extent, students who summarize might have been expected to outperform those using elaborative interrogation when studying information drawn from an unfamiliar topic domain. However, it is possible that the recall of information about unfamiliar animals is facilitated in the Elaborative Interrogation condition since the elaborative interrogation strategy has been found to elicit the spontaneous activation of imagery (Wood, Fler, & Willoughby, 1991), a strategy demonstrated to be effective in promoting the acquisition of factual information drawn from unfamiliar topic domains (Willoughby, 1993). This might explain why overall performance in the Elaborative Interrogation condition, but not the Summarization condition, was greater than that in the Repetition Control condition. Post hoc comparisons of the effect of familiarity across conditions could not be conducted in study one since the condition by familiarity interaction from the ANOVA procedure was not statistically significant. These issues were explored in studies two and three, where the number of to-be-learned facts was increased from 36 to 60 because of the possibility of a ceiling effect limiting the range of recall scores for information drawn from familiar topic domains, which might in turn have influenced the significance of the predicted condition by familiarity interaction.

In studies two and three, there was a significant condition by familiarity interaction, with students in the Elaborative Interrogation and Summarization conditions outperforming those in the Repetition Control condition when studying information about familiar animals, and no comparisons among conditions being significant when information about unfamiliar animals was studied. Therefore,

it appears that neither the elaborative interrogation or summarization strategies were effective in facilitating the acquisition of factual information drawn from unfamiliar topic domains.

Interestingly, the method of presentation of information provides another interpretation for the replicated observation that performance in the Summarization condition was not as robust as that in the Elaborative Interrogation condition. Specifically, in study three, after summarizing the text passages, students in the Summarization condition were exposed to the same passages containing segments with important facts underlined. It is possible that reading the segmented and underlined information after generating summaries of text provided learners with feedback and reinforced the choices they made in selecting the important details from text when generating their summaries. If one considers that students in the Summarization condition essentially were provided with corrective feedback when they were asked to read the segmented passages in which relevant facts were underlined, they were provided with an opportunity to confirm their selection of relevant facts through comparison of their own summaries with the passages provided by the experimenter. As such, they were provided with the opportunity to monitor their own performance in extracting the gist of a paragraph when generating their summaries. To this extent, their performance might have been expected to be facilitated. This was not, however, the case.

Another explanation for the less robust benefits of summarization might be that students were not using the summarization strategy effectively. Indeed, there was little evidence of transformation, integration, or elaboration of information contained in the summaries generated, although students demonstrated proficiency in applying the macrorule of selection. The unsophisticated nature of the summaries implies an inefficiency in strategy execution that might be related to capacity limitations operating when learners are attempting to become fluent in a given strategy. That is, learners might be

allocating their resources to becoming fluent in applying the rules of summarization. This is reasonable if one considers that strategies have been defined as "effortful mental processes, consuming some portion of a person's limited mental resources for their execution" (Bjorklund & Douglas, in press, p. 9). If learners are allocating resources to becoming fluent in a given strategy, they have fewer resources available for producing refined representations of the original text. Several researchers have argued that proficiency in summarization requires several supports and extensive training (e.g., MacDonald, 1986; Symons, Richards, & Greene, 1995). The more powerful effects of the elaborative interrogation strategy might reflect a more efficient application of the strategy, given that students can be trained to use elaborative interrogation effectively in a relatively short amount of time. Indeed, in study one, a manipulation check on whether students were actively engaged in the elaborative interrogation strategy revealed that learners generated a response to the why-question for each fact with over half these elaborations containing information that adequately explained the relation depicted in the fact. Relative to elaborative interrogation, learners might require further supports in order to become fluent in the use of summarization. As such, the slightly enhanced benefit of elaborative interrogation relative to summarization might reveal that learners using summarization are demonstrating a "utilization deficiency" (Miller, 1995). Although the concept of utilization deficiency was proposed in order to better understand memory development, specifically differences in the memory performance of younger versus older children, some aspects of the concept of utilization deficiency are applicable in this context. That is, utilization deficiencies have been used typically to describe early phases in the acquisition of a strategy, when few benefits to using the strategy are apparent (Miller, 1990, 1994). Initially, the application of a strategy can be characterized as sporadic, with that application becoming more systematic and effective across broader contexts of learning (Schneider & Bjorklund, in press).

Utilization deficiencies become evident in the acquisition of advanced strategies where the effort involved in executing the strategy might deplete the learner's capacity for other mnemonic operations including encoding or integration of strategies in the learner's repertoire (Miller, 1995).

It should be noted that utilization deficiencies have been demonstrated to be especially apparent when knowledge base is low (Miller, 1995). As such, some qualifiers to the explanations described here are necessary in light of the findings pertaining to the significant condition by familiarity interaction across the studies described here. Specifically, it should be noted that in all three studies, neither the summarization or elaborative interrogation strategies were effective in facilitating the recall of information drawn from unfamiliar domains. It is possible, however, that the more robust effects of the elaborative interrogation strategy might be due to the spontaneous activation of imagery thought to be elicited by elaborative interrogation (Wood, Fler, & Willoughby, 1991).

Another explanation lies in the effects of prior knowledge on processing efficiency. The relation between the efficiency of information processing and prior knowledge has been studied widely (e.g., Bjorklund, 1987; Chi & Ceci, 1987; Kee, 1994; Ornstein, Baker-Ward, & Naus, 1988; & Schneider, 1993). Bjorklund and colleagues have argued that "the primary effect that an elaborated knowledge base has on cognitive processing is to increase speed of processing for domain-specific information. Individual items can be accessed more quickly from the long-term store, as can relations among related items in the knowledge base... faster processing is equated with more efficient processing, which results in greater availability of mental resources. These mental resources can then be applied to... domain-specific strategies, or to metacognitive processes" (Bjorklund, Muir-Broaddus, & Schneider, 1990, p. 95).

Several educational implications of these studies are possible. For example, as recommended

by Miller (1995), the effectiveness of strategies needs to be developed, and simply encouraging the production of sophisticated strategies is not sufficient. Furthermore, Pressley and colleagues have stressed the importance of providing guided practice to students by facilitating their awareness of when it is appropriate to use a given strategy, and prompting them to relate new information to prior knowledge (Pressley, Goodchild, Fleet, Zajchowski, & Evans, 1989). The rationale for this was based on the idea that strategic learners demonstrate "metacognitive knowledge" of learning strategies in that they are proficient at judging whether a strategy was effective, and they know "when, where, and how" to implement a strategy. Finally, the pattern of findings in these studies suggests that the benefits of elaborative interrogation relative to summarization might be explained in terms of a key distinguishing feature of the strategies. That is, elaborative interrogation has been demonstrated to prompt both the activation of prior knowledge as well as some integration of information. Summarization was shown to prompt only integration. An implication for educators is that encouraging students to elaborate information by accessing prior knowledge might be effective in facilitating the application of summarization, a strategy used by many students. Interestingly, neglecting to elaborate information in their summaries might be a function of students' past experiences with text materials. Specifically, an analysis of textbook materials revealed that the information was not elaborated and did not contain many examples of the concepts being presented (Lloyd, 1990, as cited by Woloshyn, 1995). This method of presentation in texts is not conducive to facilitating student performance, especially less successful students who might be presumed to have less expansive knowledge bases or who might be less likely to activate prior knowledge spontaneously while reading texts (i.e., see Schneider & Pressley, 1989).

## Appendix A

The Metropolitan Achievement Test (Instructions & Sample Vocabulary Test Items) (from Prescott, Balow, Hogan & Farr, 1986).

What To Do. **Read** each sentence. **Pick** the word that best completes the sentence. **Mark** the letter for that word. **Now** look at Sample A.

Samples:

A. Terry _____ to the park today.

a. went c. home

b. likes d. fast

B. Give _____ a hot dog for lunch.

e. more g. eat

f. they h. her

## Appendix B

Summarization Instructions (from Wood, Winnie, & Carney, 1995).

Today we are going to teach you how to write a good summary. A good summary rearranges information that you have heard or read into a shorter but useful paragraph. We are going to give you four rules that will help you to make a good summary-- a summary that helps you to learn. First you will have a chance to see how these rules are used in some examples. Then you will have a chance to practice, using the rules, to make your own summaries. We will practice these rules in paragraphs about photography. You can ask questions at any time. The four rules for summarizing are:

1. Think up a label for the main ideas in the paragraph.
2. Write down the most important points that relate to the label.
3. Cross out some of the important points that seem less important.
4. Write a summary of 2-3 sentences based on the information that is left.

When you first read a paragraph, you should try to extract the main ideas. Usually there is only one main idea. Once you have decided what the main ideas is, think up a word, or short phrase, to label that idea. Write it down. That is rule number one.

Usually a paragraph also describes several specific features about the main idea. Make up short labels for these specific ideas too. Then write them down under the label for the main idea. That's how to use rule #2.

Once you have written down what you think are the most important ideas, you should go back through the paragraph to see if you have all the main ideas. Then look at the points you have listed. Some of the specific information that you have included probably isn't necessary to summarize the information in the paragraph. You should delete the specifics that aren't really crucial to the main

message. Usually these are details. They may be interesting, but they aren't necessary to understand the main idea-- they only provide extra information. This is the kind of information you want to get rid of-- it's not important for a summary. So, you cross out these less important specific ideas. That's using Rule #3.

Once you are sure that you have crossed out as many extra ideas as possible, leaving only those you need to understand the main idea, you should put the remaining ideas together in concise, meaningful sentences. You can change the wording and the phrases so that the ideas you consider to be most important are meaningful to you. When you put the ideas together in sentences, you are making a summary. The summary for the paragraph should be about 2 to 3 sentences long.

Let's use these four rules to write a summary for a real example. Read this paragraph. What is the first thing we do? We try to find the main idea. The main idea for this paragraph is: _____ _____. Now that we have a main idea, let's think about what specific ideas we think are really important. What are the important specific ideas we should include? It's a good idea to go back through the paragraph and skim it to find the specific ideas. In this example, I have included: _____. Now that I have a list of specific ideas, we will select what is really crucial to the main idea. What specific ideas are really crucial to the main idea? Well, this point (selected piece of information) is interesting, but it's really extra information about our main idea or label _____ _____. I don't need to know this to understand about _____ (Main Idea). So let's cross it out. What about this specific idea? _____. Is it important?

SAME FOR ALL POINTS: Either cross it out or say it is a good point and needed.

Now we are left with only the really crucial, specific ideas we need to understand this main idea. Let's try to put this information together. If we put this main idea _____ _____ and these specific ideas together, we can get a concise, meaningful sentence. What else can we put together? If we put this specific idea _____ and this one _____ together, we have another good sentence. Do we need another sentence? SAME CONSTRUCTION PROCEDURES AS FOR OTHER SENTENCES.

We have included all the ideas. Let's see if we followed all the rules. Did we have a label? Yes, it was _____. Did we write down all the important ideas? Yes, they were _____, _____, _____, etc... Then what did we do? We crossed out all the ideas that seemed less important for understanding the main idea. The last thing we did was join the ideas together in a few sentences in our own words. Would this be a good summary then? Summary: Yes, it tells us the main idea and some of the crucial information that helps explain the ideas.

PARAGRAPH TWO AND PARAGRAPH THREE: Same format as paragraph one for directions--except that the class is expected to participate in the question answering by paragraph three. The introduction to required responses is slowly introduced and intermittently expected during this phase.

PARAGRAPH FOUR: Expect the class to answer most questions.

PARAGRAPH FIVE: Expect the class to answer all questions.

PARAGRAPH SIX: Expect full participation from the class (written).

## Appendix C

Examples of Stories & Summaries Presented during Instruction in Summarization (from Wood, Winne, & Carney, 1995).

Tape recordings are common today. They provide long, uninterrupted recordings with low noise distortion. Tapes are easy to edit, which also makes them very popular. Tape recording changes sound waves to electromagnetic fields, and these magnetized spots are used to code the sounds onto the tape. Sound waves from the source are sent to an inductive coil through a microphone and amplifier. This causes particles on the moving tape to be magnetized and codes the sound. When these particles are moved past the read/write head, they create electric signals. These signals can then be converted back to sound waves that can be heard by the human ear.

LABEL: Tape recording

POINTS: - uses electromagnetic fields to code sounds on tapes
- electromagnetic fields changed back to electrical signals
- electrical signals translated back to sound

SUMMARY: Tape recordings use electromagnetic fields to code sounds. These magnetic spots are changed to electrical signals when they are moved past a head. The signals are then changed back to sound waves.

Sounds can be recorded on different materials such as vinyl records or metal disks. These materials have changed over time. The early recording disks that copied music or sounds were usually made from soft vulcanized rubber. These disks flattened over time and caused loss of sound quality. Different types of recording bases produce sounds of different quality.

Records made of a shellac compound were harder than rubber ones. Shellac records had good molding qualities and they were hard enough to withstand many playings with steel needles. Vinyl disks were later produced. This meant that diamond needles were needed to translate the recorded sound. The newer materials have a smoother, quieter surface. This creates less sound distortion. Digital sound recordings have little distortion. This type of recording is made without any physical contact with the surface of the disk.

LABEL: record materials

POINTS: - type of materials affect sound quality

- older records-- rough surface, more distortion, used steel needles
- newer records-- smoother surface, better sound, use diamond needles
- digital recording -- no physical contact, little distortion

SUMMARY: The materials used in making records affect the sound quality, and older records that used steel needles had rougher surfaces and more distortion. Newer records have smoother surfaces and better sound but need diamond needles. Digital recordings have little distortion because of little physical contact.

## Appendix D

Sample Recall Test Items for Training in Summarization

1. What types of energy fields were used to record/code sounds onto tape?
2. What kinds of needles were used to produce a smoother surface and better sound onto vinyl disks?
3. What sorts of recordings are least distorted?

## Appendix E

Sample Man Sentences used for Training in Elaborative Interrogation

1. The tall man bought the crackers.

   Why did the man do that?

2. The hungry man got into the car.

   Why did the man do that?

3. The strong man helped the woman.

   Why did the man do that?

4. The brave man ran into the house.

   Why did the man do that?

## Appendix F

Sample Items from Recall Test for Man Sentences

1. Which man bought the crackers?
2. Which man got into the car?
3. Which man helped the woman?
4. Which man ran into the house?

## Appendix G

Target Passages for Summarization and Repetition Control Conditions (Study 1)

We will begin this passage by discussing the Little Brown Bat. This bat is commonly known. Although different kinds of bats are found in many parts of the country, the Little Brown Bat lives in eastern Canada. People do not like being around bats. Perhaps this is due to the fact that bats are usually found in eerie places. For example, the Little Brown Bat lives in dark places like caves, attics, and abandoned houses. The fact that we do not encounter bats frequently, might contribute to our dislike of them. When we do encounter them, we observe that the Little Brown Bat lives with a few to several hundred other bats. Also, popular stories like "Dracula" might be the source of stereotypical beliefs that bats are evil and dangerous creatures. However, it is less commonly known that bats benefit us by eating many insects. Therefore, they contribute to our comfort and safety. The Little Brown Bat's favourite food is flying insects. In addition to studying the preferred diets and habitats of bats, scientists have investigated the daily cycles of bats. An interesting observation is that the Little Brown Bat sleeps all winter. Also, the resiliency of bats is impressive. Members of the species can survive in such diverse environments as desert, tundra, forests, and swamps. Clearly, there are few threats to the existence of bats. Indeed, there are few dangers for the Little Brown Bat except for the weather.

Whales also are fascinating creatures. Although there are many kinds of whales, the following information is about the Blue Whale. The Blue Whale lives in the Arctic and Antarctic Oceans. Over the course of evolution, species adapt to certain external environments which become known as their habitats. A habitat is defined as the place where a species prefers to live. Most of the time, the Blue Whale prefers to be near the surface of the water. Whereas a habitat is a preferred place of living, a

niche is defined as the animal's status in their community with respect to enemies and food. With regard to eating habits, the Blue Whale only eats about three months of the year. Due to the work of many scientists, we have information on the preferred diet of the Blue Whale. When the Blue Whale does eat, it likes ocean plants and small shrimp-like creatures. We tend to view whales as threatening animals. Perhaps their massive size contributes to such perceptions. In actuality, whales face many dangers, and the worst danger for the Blue Whale is being caught under the ice. There are some unusual characteristics about the Blue Whale. When oddities are discovered in a species, many scientists attempt to specify the evolutionary importance of such behaviours. A puzzling behaviour observed in the Blue Whale is that the Blue Whale sleeps by resting only half of its brain at a time.

The House Mouse is another animal that is familiar to most of us. Mice are widely distributed creatures. Many of us have encountered a mouse at some time. The House Mouse lives in Southern Canada and throughout the United States. There are many different kinds of mice. They exist in a variety of colours and sizes. Also, they differ in terms of their habitats and life styles. For example, the House Mouse likes to live in warm, dry areas. Mice have been known to humans for many generations. Consequently, much has been learned about them in terms of breeding and preferred diets. For example, we know that the House Mouse has a rapid rate of reproduction. Most people are familiar with this idea that mice reproduce at a rapid rate. What is probably less commonly known is that the female House Mouse does not have babies if their population grows too large. In terms of the eating habits of mice, we know that mice eat a variety of foods. Typically, the House Mouse eats nuts, vegetables, fruits, and grains. Mice have become so familiar to us that we have created expressions about them. These expressions are based on the habits of mice as we see them. An example of such

an expression is "quiet as a mouse." We typically view mice as shy, timid, and defenceless creatures. Indeed the House Mouse has many dangers like owls and snakes.

In the next few passages, we will describe some animals that are not as commonly known as the ones you just read about. For example, consider the American Pika. Pikas are not commonly known animals. Although the word pika is derived from a Mongolian word, the American Pika is only found in British Columbia. The habitats of pikas are quite diverse and variable. Some species of pikas prefer habitats that are not very rocky, while other species prefer to live in the prairies. The American Pika likes to live in and around rock piles. The natural habitat of the American Pika is quite unique. An interesting feature about the preferred habitat of the American Pika is that it lives so high up in the rocky mountains that trees can't grow. Pikas belong to the genus "Ochotona." Fourteen species of pikas are known. Although there are many differences among these species, they have similar diets. The American Pika eats grasses and flowering plants. Scientists have devoted much time to the study of pikas. A topic of research has been the different patterns of activities exhibited by pikas. For example, the American Pika sleeps during the night. Although the pika is not extinct, predation is sometimes a problem. There are some European and African species of pika that are no longer in existence. Pikas are threatened by many animals. The most dangerous animals for the American Pika are birds and weasels.

The Pronghorn is another animal that is perhaps unfamiliar to most individuals. In terms of the habitat of this animal, the Pronghorn prefers the prairies and plains of North America. The North American prairie stretches from the province of Alberta in Canada to the United States, and south to the Gulf of

Mexico, and, west from the Mississippi River Valley to the Rocky Mountains. The Pronghorn especially likes to live in open areas. In 1922, many wildlife groups were becoming concerned about the possible extinction of the Pronghorn. The United States government introduced some laws to protect the species. Presently, the Pronghorn has very few dangers except for fences and other man-made barriers. These efforts to ensure the continued existence of Pronghorns provides evidence that threats to wildlife can be overcome if prompt action is taken. Thanks to the efforts of animal rights groups and governments, the Pronghorn continues to occupy its natural habitat. Regarding the diets of Pronghorns, it is known that the Pronghorn eats herbs. An interesting aspect pertaining to the social organization of the Pronghorn in terms of offspring has been observed. Specifically, the Pronghorn usually has twins that always sleep apart. Finally, the Pronghorn exhibits yet another unique behaviour. The Pronghorn has a white rump patch that is covered with hair. A common observation is that the Pronghorn's hairs on its white rump patch are raised if alarmed.

Now we will present information about another animal that might be unfamiliar to you. It is the Collared Peccary. The Collared Peccary lives in Southwestern United States. The Collared Peccary has a choice of many possible habitats in this part of the world. Habitats usually refer to descriptions of important features in the environment that might be occupied by a given species. Although there are many places where peccaries can live, the Collared Peccary often rests in bushes or under large boulders. Many scientists have investigated the social organization of animals, which might be defined as the relationships that exist among group members of a species. Social organizations might involve highly structured dominance relationships, or less structured systems. The Collared Peccary has no obvious leaders among its males and females. Predation is a problem for most animals. Predation is

defined as a relationship in which one animal benefits and the prey is effected adversely. Like most animals, the Collared Peccary must be concerned about predators. The Collared Peccary's biggest dangers are the jaguar and the mountain lion. Finally, some interesting aspects about the eating habits of the Peccary will be described. The Collared Peccary has an unusual diet. The Collared Peccary eats roots and cactus. An interesting feature of the anatomy of the Peccary has become apparent to researchers who study this animal. Specifically, scientists have discovered that the Collared Peccary's stomach has two sections.

Appendix H

Readability Data (Study 1)

Readability data on all Six Passages about Familiar and Unfamiliar Animals

readability grades:
(Kincaid) 8.8 (auto) 8.3 (Coleman-Liau) 10.8 (Flesch) 10.8 (55.8)
sentence info:
no. sent 107 no. wds. 1422
av sent leng 13.3 av word leng 4.90
no. questions 0 no. imperatives 0
no. nonfunc wds 819 57.6% av leng 6.33
short sent (<8) 14% (15) long sent (>23) 5% (5)
longest sent 34 wds at sent 77; shortest sent 5 wds at sent 2
sentence types:
simple 57% (61) complex 39% (42)
compound 3% (3) compound-complex 1% (1)
word usage:
verb types as % of total verbs
tobe 43% (73) aux 18% (30) inf 8% (13)
passives as % of non-inf verbs 17% (27)
types as % of total
prep 12.8% (182) conj 2.3% (32) adv. 4.4% (62)
noun 28.2% (401) adj 15.9% (226) pron 4.6% (65)
nominalizations 2% (23)
sentence beginnings:
subject opener: noun (16) pron (7) pos (0) adj (8) art (30) tot 57%
prep 13% (14) adv 17% (18)
verb 0% (0) sub conj 9% (10) conj 0% (0)
expletives 4% (4)

Readability data on all Three Passages about Familiar Animals

readability grades:
(Kincaid) 8.0 (auto) 7.2 (Coleman-Liau) 9.5 (Flesch) 8.9 (61.2)
sentence info:
no. sent 54 no. wds. 715
av sent leng 13.2 av word leng 4.68
no. questions 0 no. imperatives 0
no. nonfunc wds 402 56.2% av leng 6.05
short sent (<8) 11% (6) long sent (>23) 4% (2)
longest sent 26 wds at sent 25; shortest sent 5 wds at sent 2
sentence types:
simple 57% (31) complex 41% (22)
compound 2% (1) compound-complex 0% (0)
word usage:
verb types as % of total verbs
tobe 41% (35) aux 16% (14) inf 7% (6)
passives as % of non-inf verbs 14% (11)
types as % of total
prep 14% (100) conj 2.2% (16) adv. 4.1% (29)
noun 28.1% (201) adj 15% (107) pron 5.7% (41)
nominalizations 1% (10)
sentence beginnings:
subject opener: noun (7) pron (7) pos (0) adj (3) art (9) tot 48%
prep 15% (8) adv 22% (12)
verb 0% (0) sub conj 11% (6) conj 0% (0)
expletives 4% (2)

Readability data on all Three Passages about Unfamiliar Animals

readability grades:
(Kincaid) 9.6 (auto) 9.4 (Coleman-Liau) 12.1 (Flesch) 11.9 (50.3)
sentence info:
no. sent 53 no. wds. 707
av sent leng 13.3 av word leng 5.12
no. questions 0 no. imperatives 0
no. nonfunc wds 417 59.0% av leng 6.61
short sent (<8) 17% (9) long sent (>23) 6% (3)
longest sent 34 wds at sent 23; shortest sent 5 wds at sent 37
sentence types:
simple 57% (30) complex 38% (20)
compound 4% (2) compound-complex 2% (1)
word usage:
verb types as % of total verbs
tobe 45% (38) aux 19% (16) inf 8% (7)
passives as % of non-inf verbs 21% (16)
types as % of total
prep 11.6% (82) conj 2.3% (16) adv. 4.7% (33)
noun 28.3% (200) adj 16.8% (119) pron 3.4% (24)
nominalizations 2% (13)
sentence beginnings:
subject opener: noun (9) pron (0) pos (0) adj (5) art (21) tot 66%
prep 11% (6) adv 11% (6)
verb 0% (0) sub conj 8% (4) conj 0% (0)
expletives 4% (2)

Readability data on the Little Brown Bat

readability grades:
(Kincaid) 7.1 (auto) 7.7 (Coleman-Liau) 10.1 (Flesch) 8.2 (68.2)
sentence info:
no. sent 18 no. wds. 240
av sent leng 13.3 av word leng 4.78
no. questions 0 no. imperatives 0
no. nonfunc wds 139 57.9% av leng 6.10
short sent (<8) 17% (3) long sent (>23) 0% (0)
longest sent 21 wds at sent 3; shortest sent 5 wds at sent 2
sentence types:
simple 61% (11) complex 39% (7)
compound 0% (0) compound-complex 0% (0)
word usage:
verb types as % of total verbs
tobe 48% (13) aux 26% (7) inf 0% (0)
passives as % of non-inf verbs 11.3% (3)
types as % of total
prep 13.3% (32) conj 2.1% (5) adv. 5.8% (14)
noun 27.9% (67) adj 16.7% (40) pron 5.8% (14)
nominalizations 1% (2)
sentence beginnings:
subject opener: noun (1) pron (1) pos (0) adj (1) art (3) tot 39%
prep 11% (2) adv 39% (7)
verb 0% (0) sub conj 11% (2) conj 0% (0)
expletives 0% (0)

Readability data on the Blue Whale

readability grades:
(Kincaid) 9.1 (auto) 8.4 (Coleman-Liau) 10.2 (Flesch) 10.8 (55.9)
sentence info:
no. sent 16 no. wds. 237
av sent leng 14.8 av word leng 4.76
no. questions 0 no. imperatives 0
no. nonfunc wds 131 55.3% av leng 6.24
short sent (<10) 25% (4) long sent (>25) 1% (1)
longest sent 26 wds at sent 7; shortest sent 5 wds at sent 1
sentence types:
simple 50% (8) complex 50% (8)
compound 0% (0) compound-complex 0% (0)
word usage:
verb types as % of total verbs
tobe 39% (11) aux 4% (1) inf 18% (5)
passives as % of non-inf verbs 17% (4)
types as % of total
prep 14.3% (34) conj 1.7% (4) adv. 1.7% (4)
noun 28.7% (68) adj 15.2% (36) pron 3.0% (7)
nominalizations 1% (2)
sentence beginnings:
subject opener: noun (2) pron (2) pos (0) adj (0) art (3) tot 44%
prep 19% (3) adv 6% (1)
verb 0% (0) sub conj 25% (4) conj 0% (0)
expletives 6% (1)

Readability data on the House Mouse

readability grades:
(Kincaid) 8.0 (auto) 5.7 (Coleman-Liau) 8.2 (Flesch) 10.2 (59.2)
sentence info:
no. sent 20 no. wds. 238
av sent leng 11.9 av word leng 4.50
no. questions 0 no. imperatives 0
no. nonfunc wds 132 55.0% av leng 5.80
short sent (<7) 5% (1) long sent (>22) 0% (0)
longest sent 22 wds at sent 12; shortest sent 5 wds at sent 2
sentence types:
simple 60% (12) complex 35% (7)
compound 5% (1) compound-complex 0% (0)
word usage:
verb types as % of total verbs
tobe 35% (11) aux 19% (6) inf 3% (1)
passives as % of non-inf verbs 13% (4)
types as % of total
prep 14.3% (34) conj 2.9% (7) adv. 4.6% (11)
noun 27.7% (66) adj 13.0% (31) pron 8.4% (20)
nominalizations 3% (6)
sentence beginnings:
subject opener: noun (3) pron (4) pos (0) adj (2) art (3) tot 60%
prep 15% (3) adv 20% (4)
verb 0% (0) sub conj 0% (0) conj 0% (0)
expletives 5% (1)

Readability data on the American Pika

readability grades:
(Kincaid) 8.6 (auto) 7.0 (Coleman-Liau) 9.8 (Flesch) 11.0 (54.8)
sentence info:
no. sent 20 no. wds. 240
av sent leng 12 av word leng 4.77
no. questions 0 no. imperatives 0
no. nonfunc wds 142 59.2% av leng 5.95
short sent (<7) 25% (5) long sent (>22) 10% (2)
longest sent 27 wds at sent 9; shortest sent 6 wds at sent 2
sentence types:
simple 60% (12) complex 35% (7)
compound 0% (0) compound-complex 5% (1)
word usage:
verb types as % of total verbs
tobe 57% (17) aux 13% (4) inf 7% (2)
passives as % of non-inf verbs 18% (5)
types as % of total
prep 11.3% (27) conj 2.1% (5) adv. 6.7% (16)
noun 27.9% (67) adj 17.1% (41) pron 4.2% (10)
nominalizations 1% (2)
sentence beginnings:
subject opener: noun (4) pron (0) pos (0) adj (2) art (7) tot 65%
prep 15% (3) adv 0% (0)
verb 0% (0) sub conj 15% (3) conj 0% (0)
expletives 5% (1)

Readability data on the Pronghorn

readability grades:
(Kincaid) 9.3 (auto) 10.8 (Coleman-Liau) 12.9 (Flesch) 10.8 (56.0)
sentence info:
no. sent 15 no. wds. 232
av sent leng 15.5 av word leng 5.20
no. questions 0 no. imperatives 0
no. nonfunc wds 140 60.3% av leng 6.80
short sent (<10) 13% (2) long sent (>25) 7% (1)
longest sent 34 wds at sent 3; shortest sent 8 wds at sent 13
sentence types:
simple 53% (8) complex 40% (6)
compound 7% (1) compound-complex 0% (0)
word usage:
verb types as % of total verbs
tobe 37% (10) aux 4% (1) inf 19% (5)
passives as % of non-inf verbs 23% (5)
types as % of total
prep 12.1% (28) conj 2.2% (5) adv. 4.3% (10)
noun 29.3% (68) adj 16.4% (38) pron 1.7% (4)
nominalizations 2% (4)
sentence beginnings:
subject opener: noun (2) pron (0) pos (0) adj (1) art (7) tot 67%
prep 13% (2) adv 20% (3)
verb 0% (0) sub conj 0% (0) conj 0% (0)
expletives 0% (0)

Readability data on the Collared Peccary

readability grades:
(Kincaid) 11.0 (auto) 10.6 (Coleman-Liau) 13.8 (Flesch) 14.5 (39.7)
sentence info:
no. sent 18 no. wds. 235
av sent leng 13.1 av word leng 5.41
no. questions 0 no. imperatives 0
no. nonfunc wds 135 57.4% av leng 7.10
short sent (<8) 22% (4) long sent (>23) 6% (1)
longest sent 24 wds at sent 7; shortest sent 5 wds at sent 2
sentence types:
simple 56% (10) complex 39% (7)
compound 6% (1) compound-complex 0% (0)
word usage:
verb types as % of total verbs
tobe 39% (11) aux 49% (11) inf 0% (0)
passives as % of non-inf verbs 21% (6)
types as % of total
prep 11.5% (27) conj 2.6% (6) adv. 3.0% (7)
noun 27.7% (65) adj 17.0% (40) pron 4.3% (10)
nominalizations 3% (7)
sentence beginnings:
subject opener: noun (3) pron (0) pos (0) adj (2) art (7) tot 67%
prep 6% (1) adv 17% (3)
verb 0% (0) sub conj 6% (1) conj 0% (0)
expletives 6% (1)

Appendix I

The Metropolitan Achievement Test (Instructions & Sample Reading Comprehension Items (from Prescott, Balow, Hogan & Farr, 1986).

What To Do. **Look** at each story. In a box at the top of each story there is a purpose question. **Read** the purpose. It will help you when reading the story. **Next**, read the story. Then answer each question that follows the story. **Mark** the letter for that answer. **Now** look at the sample.

Sample: **How did the old neighborhood look to Bill?**

Bill walked around the block where he had lived as a boy. His friends' houses didn't seem so far away from his anymore. The lot where he had played ball looked smaller. Even the hill by the lot wasn't so big after all. But somehow the tree by his house looked just as tall as it had been before.

A. To Bill, the lot and hill looked--

a. taller

b. older

c. smaller

d. newer

B. What still looked big to Bill?

a. The tree

b. The lot

c. The hill

d. His house

## Appendix J

Recall Test Items for Target Passage (Study 1)

1. (34) Which animal's biggest dangers are the jaguar and the mountain lion?
2. (21) Which animal lives so high up in the Rocky Mountains that trees can't grow?
3. (10) Which animal likes ocean plants and small shrimp-like creatures?
4. (27) Which animal has few dangers except for fences and other man-made barriers?
5. ( 2) Which animal lives in dark places like caves, attics, and abandoned houses?
6. (36) Which animal's stomach has two sections?
7. ( 7) Which animal lives in the Arctic and Antarctic Oceans?
8. (14) Which animal lives in warm, dry areas?
9. (29) Which animal usually has twins that always sleep apart?
10. (11) Which animal's worst danger is being caught under the ice?
11. (31) Which animal lives in Southwestern United States?
12. ( 3) Which animal lives with a few to several hundred other animals?
13. ( 9) Which animal only eats about three months of the year?
14. (19) Which animal is only found in British Columbia?
15. ( 6) Which animal has few dangers except for the weather?
16. (16) Which animal does not have babies if their population grows too large?
17. (26) Which animal especially likes to live in open areas?
18. (22) Which animal eats grasses and flowering plants?
19. (33) Which animal has no obvious leaders among its males and females?
20. (13) Which animal lives in southern Canada and throughout the United States?

21. ( 8) Which animal prefers to be near the surface of the water?

22. ( 1) Which animal lives in Eastern Canada?

23. (18) Which animal has many dangers like owls and snakes.

24. (20) Which animal lives in and around rock piles?

25. (28) Which animal eats herbs?

26. (15) Which animal has a rapid rate of reproduction?

27. (32) Which animal often rests in bushes or under large boulders?

28. (25) Which animal prefers the prairies and plains of North America?

29. ( 4) Which animal's favourite food is flying insects?

30. (23) Which animal sleeps during the night?

31. (30) Which animal's hairs on its white rump patch are raised if alarmed?

32. (17) Which animal eats nuts, vegetables, fruits, and grains?

33. ( 5) Which animal sleeps all winter?

34. (35) Which animal eats roots and cactus?

35. (12) Which animal sleeps by resting only half of its brain at a time?

36. (24) Which animal's biggest dangers are birds and weasels?

## Appendix K

Target Passages for Elaborative Interrogation Condition (Study 1)

We will begin this passage by discussing the Little Brown Bat. This bat is commonly known. Although different kinds of bats are found in many parts of the country, the Little Brown Bat lives in eastern Canada.

People do not like being around bats. Perhaps this is due to the fact that bats are usually found in eerie places. For example, the Little Brown Bat lives in dark places like caves, attics, and abandoned houses.

The fact that we do not encounter bats frequently, might contribute to our dislike of them. When we do encounter them, we observe that the Little Brown Bat lives with a few to several hundred other bats.

Also, popular stories like "Dracula" might be the source of stereotypical beliefs that bats are evil and dangerous creatures. However, it is less commonly known that bats benefit us by eating many insects. Therefore, they contribute to our comfort and safety. The Little Brown Bat's favourite food is flying insects.

In addition to studying the preferred diets and habitats of bats, scientists have investigated the daily cycles of bats. An interesting observation is that the Little Brown Bat sleeps all winter.

Also, the resiliency of bats is impressive. Members of the species can survive in such diverse

environments as desert, tundra, forests, and swamps. Clearly, there are few threats to the existence of bats. Indeed, there are few dangers for the Little Brown Bat except for the weather.

Whales also are fascinating creatures. Although there are many kinds of whales, the following information is about the Blue Whale. The Blue Whale lives in the Arctic and Antarctic Oceans.

Over the course of evolution, species adapt to certain external environments which become known as their habitats. A habitat is defined as the place where a species prefers to live. Most of the time, the Blue Whale prefers to be near the surface of the water.

Whereas a habitat is a preferred place of living, a niche is defined as the animal's status in their community with respect to enemies and food. With regard to eating habits, the Blue Whale only eats about three months of the year.

Due to the work of many scientists, we have information on the preferred diet of the Blue Whale. When the Blue Whale does eat, it likes ocean plants and small shrimp-like creatures.

We tend to view whales as threatening animals. Perhaps their massive size contributes to such perceptions. In actuality, whales face many dangers, and the worst danger for the Blue Whale is being caught under the ice.

There are some unusual characteristics about the Blue Whale. When oddities are discovered in a

species, many scientists attempt to specify the evolutionary importance of such behaviours. A puzzling behaviour observed in the Blue Whale is that the Blue Whale sleeps by resting only half of its brain at a time.

The House Mouse is another animal that is familiar to most of us. Mice are widely distributed creatures. Many of us have encountered a mouse at some time. The House Mouse lives in Southern Canada and throughout the United States.

There are many different kinds of mice. They exist in a variety of colours and sizes. Also, they differ in terms of their habitats and life styles. For example, the House Mouse likes to live in warm, dry areas.

Mice have been known to humans for many generations. Consequently, much has been learned about them in terms of breeding and preferred diets. For example, we know that the House Mouse has a rapid rate of reproduction.

Most people are familiar with this idea that mice reproduce at a rapid rate. What is probably less commonly known is that the female House Mouse does not have babies if their population grows too large.

In terms of the eating habits of mice, we know that mice eat a variety of foods. Typically, the House Mouse eats nuts, vegetables, fruits, and grains.

Mice have become so familiar to us that we have created expressions about them. These expressions are based on the habits of mice as we see them. An example of such an expression is "quiet as a mouse." We typically view mice as shy, timid, and defenceless creatures. Indeed the House Mouse has many dangers like owls and snakes.

In the next few passages, we will describe some animals that are not as commonly known as the ones you just read about. For example, consider the American Pika. Pikas are not commonly known animals. Although the word pika is derived from a Mongolian word, the American Pika is only found in British Columbia.

The habitats of pikas are quite diverse and variable. Some species of pikas prefer habitats that are not very rocky, while other species prefer to live in the prairies. The American Pika likes to live in and around rock piles.

The natural habitat of the American Pika is quite unique. An interesting feature about the preferred habitat of the American Pika is that it lives so high up in the rocky mountains that trees can't grow.

Pikas belong to the genus "Ochotona." Fourteen species of pikas are known. Although there are many differences among these species, they have similar diets. The American Pika eats grasses and flowering plants.

Scientists have devoted much time to the study of pikas. A topic of research has been the different

patterns of activities exhibited by pikas. For example, the American Pika sleeps during the night.

Although the pika is not extinct, predation is sometimes a problem. There are some European and African species of pika that are no longer in existence. Pikas are threatened by many animals. The most dangerous animals for the American Pika are birds and weasels.

The Pronghorn is another animal that is perhaps unfamiliar to most individuals. In terms of the habitat of this animal, the Pronghorn prefers the prairies and plains of North America.

The North American prairie stretches from the province of Alberta in Canada to the United States, and south to the Gulf of Mexico, and, west from the Mississippi River Valley to the Rocky Mountains. The Pronghorn especially likes to live in open areas.

In 1922, many wildlife groups were becoming concerned about the possible extinction of the Pronghorn. The United States government introduced some laws to protect the species. Presently, the Pronghorn has very few dangers except for fences and other man-made barriers.

These efforts to ensure the continued existence of Pronghorns provides evidence that threats to wildlife can be overcome if prompt action is taken. Thanks to the efforts of animal rights groups and governments, the Pronghorn continues to occupy its natural habitat. Regarding the diets of Pronghorns, it is known that the Pronghorn eats herbs.

An interesting aspect pertaining to the social organization of the Pronghorn in terms of offspring has been observed. Specifically, the Pronghorn usually has twins that always sleep apart.

Finally, the Pronghorn exhibits yet another unique behaviour. The Pronghorn has a white rump patch that is covered with hair. A common observation is that the Pronghorn's hairs on its white rump patch are raised if alarmed.

Now, we will present information about another animal that might be unfamiliar to you. It is the Collared Peccary. The Collared Peccary lives in Southwestern United States.

The Collared Peccary has a choice of many possible habitats in this part of the world. Habitats usually refer to descriptions of important features in the environment that might be occupied by a given species. Although there are many places where peccaries can live, the Collared Peccary often rests in bushes or under large boulders.

Many scientists have investigated the social organization of animals, which might be defined as the relationships that exist among group members of a species. Social organizations might involve highly structured dominance relationships, or less structured systems. The Collared Peccary has no obvious leaders among its males and females.

Predation is a problem for most animals. Predation is defined as a relationship in which one animal benefits and the prey is effected adversely. Like most animals, the Collared Peccary must be

concerned about predators. The Collared Peccary's biggest dangers are the jaguar and the mountain lion.

Finally, some interesting aspects about the eating habits of the Peccary will be described. The Collared Peccary has an unusual diet. The Collared Peccary eats roots and cactus.

An interesting feature of the anatomy of the Peccary has become apparent to researchers who study this animal. Specifically, scientists have discovered that the Collared Peccary's stomach has two sections.

## Appendix L

### Readability Data (Studies 2 & 3)

#### Readability data on all Ten Passages about Familiar and Unfamiliar Animals

readability grades:
(Kincaid) 9.3 (auto) 8.6 (Coleman-Liau) 11.0 (Flesch) 11.4 (53.1)
sentence info:
no. sent 173 no. wds. 2377
av sent leng 13.7 av word leng 4.92
no. questions 0 no. imperatives 0
no. nonfunc wds 1360 57.2% av leng 6.39
short sent (<9) 20% (35) long sent (>24) 4% (7)
longest sent 34 wds at sent 111; shortest sent 5 wds at sent 2
sentence types:
simple 56% (97) complex 39% (68)
compound 2% (4) compound-complex 2% (4)
word usage:
verb types as % of total verbs
tobe 44% (124) aux 19% (54) inf 9% (26)
passives as % of non-inf verbs 16% (40)
types as % of total
prep 12.5% (298) conj 2.1% (49) adv. 4.6% (109)
noun 28.2% (671) adj 15.7% (374) pron 4.5% (107)
nominalizations 2% (36)
sentence beginnings:
subject opener: noun (25) pron (11) pos (0) adj (20) art (43) tot 57%
prep 14% (25) adv 17% (29)
verb 1% (1) sub conj 8% (13) conj 0% (0)
expletives 3% (6)

Readability data on all Five Passages about Familiar Animals

readability grades:
(Kincaid) 8.6 (auto) 7.9 (Coleman-Liau) 10.2 (Flesch) 10.5 (57.5)
sentence info:
no. sent 88 no. wds. 1193
av sent leng 13.6 av word leng 4.78
no. questions 0 no. imperatives 0
no. nonfunc wds 682 57.2% av leng 6.18
short sent (<9) 19% (17) long sent (>24) 3% (3)
longest sent 28 wds at sent 84; shortest sent 5 wds at sent 2
sentence types:
simple 57% (50) complex 40% (35)
compound 2% (2) compound-complex 1% (1)
word usage:
verb types as % of total verbs
tobe 43% (62) aux 20% (28) inf 9% (13)
passives as % of non-inf verbs 14% (18)
types as % of total
prep 13% (155) conj 2.1% (25) adv. 4.9% (58)
noun 27.7% (330) adj 15.8% (189) pron 5.4% (64)
nominalizations 1% (14)
sentence beginnings:
subject opener: noun (13) pron (9) pos (0) adj (10) art (16) tot 55%
prep 15% (13) adv 19% (17)
verb 0% (0) sub conj 8% (7) conj 0% (0)
expletives 3% (3)

Readability data on all Five Passages about Unfamiliar Animals

readability grades:
(Kincaid) 9.9 (auto) 9.4 (Coleman-Liau) 11.9 (Flesch) 13.2 (48.6)
sentence info:
no. sent 85 no. wds. 1184
av sent leng 13.9 av word leng 5.06
no. questions 0 no. imperatives 0
no. nonfunc wds 678 57.3% av leng 6.60
short sent (<9) 21% (18) long sent (>24) 5% (4)
longest sent 34 wds at sent 23; shortest sent 5 wds at sent 37
sentence types:
simple 55% (47) complex 39% (33)
compound 2% (2) compound-complex 4% (3)
word usage:
verb types as % of total verbs
tobe 45% (62) aux 19% (26) inf 9% (13)
passives as % of non-inf verbs 18% (22)
types as % of total
prep 12.1% (143) conj 2.0% (24) adv. 4.3% (51)
noun 28.8% (341) adj 15.6% (185) pron 3.6% (43)
nominalizations 2% (22)
sentence beginnings:
subject opener: noun (12) pron (2) pos (0) adj (0) art (27) tot 60%
prep 14% (12) adv 14% (12)
verb 1% (1) sub conj 7% (6) conj 0% (0)
expletives 4% (3)

Readability data on the Little Brown Bat

readability grades:
(Kincaid) 7.1 (auto) 7.7 (Coleman-Liau) 10.1 (Flesch) 8.2 (68.2)
sentence info:
no. sent 18 no. wds. 240
av sent leng 13.3 av word leng 4.78
no. questions 0 no. imperatives 0
no. nonfunc wds 139 57.9% av leng 6.10
short sent (<8) 17% (3) long sent (>23) 0% (0)
longest sent 21 wds at sent 3; shortest sent 5 wds at sent 2
sentence types:
simple 61% (11) complex 39% (7)
compound 0% (0) compound-complex 0% (0)
word usage:
verb types as % of total verbs
tobe 48% (13) aux 26% (7) inf 0% (0)
passives as % of non-inf verbs 11.3% (3)
types as % of total
prep 13.3% (32) conj 2.1% (5) adv. 5.8% (14)
noun 27.9% (67) adj 16.7% (40) pron 5.8% (14)
nominalizations 1% (2)
sentence beginnings:
subject opener: noun (1) pron (1) pos (0) adj (1) art (3) tot 39%
prep 11% (2) adv 39% (7)
verb 0% (0) sub conj 11% (2) conj 0% (0)
expletives 0% (0)

Readability data on the Blue Whale

readability grades:
(Kincaid) 9.1 (auto) 8.4 (Coleman-Liau) 10.2 (Flesch) 10.8 (55.9)
sentence info:
no. sent 16 no. wds. 237
av sent leng 14.8 av word leng 4.76
no. questions 0 no. imperatives 0
no. nonfunc wds 131 55.3% av leng 6.24
short sent (<10) 25% (4) long sent (>25) 1% (1)
longest sent 26 wds at sent 7; shortest sent 5 wds at sent 1
sentence types:
simple 50% (8) complex 50% (8)
compound 0% (0) compound-complex 0% (0)
word usage:
verb types as % of total verbs
tobe 39% (11) aux 4% (1) inf 18% (5)
passives as % of non-inf verbs 17% (4)
types as % of total
prep 14.3% (34) conj 1.7% (4) adv. 1.7% (4)
noun 28.7% (68) adj 15.2% (36) pron 3.0% (7)
nominalizations 1% (2)
sentence beginnings:
subject opener: noun (2) pron (2) pos (0) adj (0) art (3) tot 44%
prep 19% (3) adv 6% (1)
verb 0% (0) sub conj 25% (4) conj 0% (0)
expletives 6% (1)

Readability data on the House Mouse

readability grades:
(Kincaid) 8.0 (auto) 5.7 (Coleman-Liau) 8.2 (Flesch) 10.2 (59.2)
sentence info:
no. sent 20 no. wds. 238
av sent leng 11.9 av word leng 4.50
no. questions 0 no. imperatives 0
no. nonfunc wds 132 55.0% av leng 5.80
short sent (<7) 5% (1) long sent (>22) 0% (0)
longest sent 22 wds at sent 12; shortest sent 5 wds at sent 2
sentence types:
simple 60% (12) complex 35% (7)
compound 5% (1) compound-complex 0% (0)
word usage:
verb types as % of total verbs
tobe 35% (11) aux 19% (6) inf 3% (1)
passives as % of non-inf verbs 13% (4)
types as % of total
prep 14.3% (34) conj 2.9% (7) adv. 4.6% (11)
noun 27.7% (66) adj 13.0% (31) pron 8.4% (20)
nominalizations 3% (6)
sentence beginnings:
subject opener: noun (3) pron (4) pos (0) adj (2) art (3) tot 60%
prep 15% (3) adv 20% (4)
verb 0% (0) sub conj 0% (0) conj 0% (0)
expletives 5% (1)

Readability data on the Emperor Penguin

readability grades:
(Kincaid) 9.7 (auto) 8.5 (Coleman-Liau) 11.0 (Flesch) 13.1 (49.2)
sentence info:
no. sent 18 no. wds. 241
av sent leng 13.4 av word leng 4.93
no. questions 0 no. imperatives 0
no. nonfunc wds 143 59.3% av leng 6.41
short sent (<8) 22% (4) long sent (>23) 6% (1)
longest sent 25 wds at sent 13; shortest sent 6 wds at sent 1
sentence types:
simple 61% (11) complex 28% (5)
compound 6% (1) compound-complex 6% (1)
word usage:
verb types as % of total verbs
tobe 44% (12) aux 26% (7) inf 7% (2)
passives as % of non-inf verbs 12% (3)
types as % of total
prep 12.4% (30) conj 2.1% (5) adv. 5.4% (13)
noun 27.4% (66) adj 18.7% (45) pron 3.7% (9)
nominalizations 1% (3)
sentence beginnings:
subject opener: noun (3) pron (1) pos (0) adj (5) art (3) tot 67%
prep 22% (4) adv 11% (2)
verb 0% (0) sub conj 0% (0) conj 0% (0)
expletives 0% (0)

Readability data on the Townsend Mole

readability grades:
(Kincaid) 9.3 (auto) 9.3 (Coleman-Liau) 11.3 (Flesch) 11.0 (54.8)
sentence info:
no. sent 16 no. wds. 237
av sent leng 14.8 av word leng 4.95
no. questions 0 no. imperatives 0
no. nonfunc wds 137 57.8% av leng 6.34
short sent (<10) 19% (3) long sent (>25) 6% (1)
longest sent 28 wds at sent 12; shortest sent 5 wds at sent 15
sentence types:
simple 50% (8) complex 50% (8)
compound 0% (0) compound-complex 0% (0)
word usage:
verb types as % of total verbs
tobe 50% (15) aux 23% (7) inf 17% (5)
passives as % of non-inf verbs 16% (4)
types as % of total
prep 10.5% (25) conj 1.7% (4) adv. 6.8% (16)
noun 26.6% (63) adj 15.6% (37) pron 5.9% (14)
nominalizations 0% (1)
sentence beginnings:
subject opener: noun (3) pron (1) pos (0) adj (2) art (4) tot 63%
prep 6% (1) adv 19% (3)
verb 0% (0) sub conj 6% (1) conj 0% (0)
expletives 6% (1)

Readability data on the American Pika

readability grades:
(Kincaid) 8.6 (auto) 7.0 (Coleman-Liau) 9.8 (Flesch) 11.0 (54.8)
sentence info:
no. sent 20 no. wds. 240
av sent leng 12 av word leng 4.77
no. questions 0 no. imperatives 0
no. nonfunc wds 142 59.2% av leng 5.95
short sent (<7) 25% (5) long sent (>22) 10% (2)
longest sent 27 wds at sent 9; shortest sent 6 wds at sent 2
sentence types:
simple 60% (12) complex 35% (7)
compound 0% (0) compound-complex 5% (1)
word usage:
verb types as % of total verbs
tobe 57% (17) aux 13% (4) inf 7% (2)
passives as % of non-inf verbs 18% (5)
types as % of total
prep 11.3% (27) conj 2.1% (5) adv. 6.7% (16)
noun 27.9% (67) adj 17.1% (41) pron 4.2% (10)
nominalizations 1% (2)
sentence beginnings:
subject opener: noun (4) pron (0) pos (0) adj (2) art (7) tot 65%
prep 15% (3) adv 0% (0)
verb 0% (0) sub conj 15% (3) conj 0% (0)
expletives 5% (1)

Readability data on the Pronghorn

readability grades:
(Kincaid) 9.3 (auto) 10.8 (Coleman-Liau) 12.9 (Flesch) 10.8 (56.0)
sentence info:
no. sent 15 no. wds. 232
av sent leng 15.5 av word leng 5.20
no. questions 0 no. imperatives 0
no. nonfunc wds 140 60.3% av leng 6.80
short sent (<10) 13% (2) long sent (>25) 7% (1)
longest sent 34 wds at sent 3; shortest sent 8 wds at sent 13
sentence types:
simple 53% (8) complex 40% (6)
compound 7% (1) compound-complex 0% (0)
word usage:
verb types as % of total verbs
tobe 37% (10) aux 4% (1) inf 19% (5)
passives as % of non-inf verbs 23% (5)
types as % of total
prep 12.1% (28) conj 2.2% (5) adv. 4.3% (10)
noun 29.3% (68) adj 16.4% (38) pron 1.7% (4)
nominalizations 2% (4)
sentence beginnings:
subject opener: noun (2) pron (0) pos (0) adj (1) art (7) tot 67%
prep 13% (2) adv 20% (3)
verb 0% (0) sub conj 0% (0) conj 0% (0)
expletives 0% (0)

Readability data on the Collared Peccary

readability grades:
(Kincaid) 11.0 (auto) 10.6 (Coleman-Liau) 13.8 (Flesch) 14.5 (39.7)
sentence info:
no. sent 18 no. wds. 235
av sent leng 13.1 av word leng 5.41
no. questions 0 no. imperatives 0
no. nonfunc wds 135 57.4% av leng 7.10
short sent (<8) 22% (4) long sent (>23) 6% (1)
longest sent 24 wds at sent 7; shortest sent 5 wds at sent 2
sentence types:
simple 56% (10) complex 39% (7)
compound 6% (1) compound-complex 0% (0)
word usage:
verb types as % of total verbs
tobe 39% (11) aux 49% (11) inf 0% (0)
passives as % of non-inf verbs 21% (6)
types as % of total
prep 11.5% (27) conj 2.6% (6) adv. 3.0% (7)
noun 27.7% (65) adj 17.0% (40) pron 4.3% (10)
nominalizations 3% (7)
sentence beginnings:
subject opener: noun (3) pron (0) pos (0) adj (2) art (7) tot 67%
prep 6% (1) adv 17% (3)
verb 0% (0) sub conj 6% (1) conj 0% (0)
expletives 6% (1)

Readability data on the Chickaree

readability grades:
(Kincaid) 10.9 (auto) 10.2 (Coleman-Liau) 11.8 (Flesch) 13.7 (45.4)
sentence info:
no. sent 15 no. wds. 241
av sent leng 16.1 av word leng 5.00
no. questions 0 no. imperatives 0
no. nonfunc wds 126 52.3% av leng 6.77
short sent (<11) 33% (5) long sent (>26) 13% (2)
longest sent 28 wds at sent 6; shortest sent 7 wds at sent 1
sentence types:
simple 47% (7) complex 40% (6)
compound 7% (1) compound-complex 7% (1)
word usage:
verb types as % of total verbs
tobe 43% (12) aux 14% (4) inf 14% (4)
passives as % of non-inf verbs 13% (3)
types as % of total
prep 14.9% (36) conj 2.1% (5) adv. 2.9% (7)
noun 30.3% (73) adj 11.2% (27) pron 3.3% (8)
nominalizations 1% (3)
sentence beginnings:
subject opener: noun (1) pron (0) pos (0) adj (3) art (4) tot 53%
prep 20% (3) adv 20% (3)
verb 0% (0) sub conj 7% (1) conj 0% (0)
expletives 0% (0)

Readability data on the Coati

readability grades:
(Kincaid) 10.3 (auto) 8.8 (Coleman-Liau) 11.2 (Flesch) 13.6 (46.1)
sentence info:
no. sent 17 no. wds. 236
av sent leng 13.9 av word leng 4.95
no. questions 0 no. imperatives 0
no. nonfunc wds 135 57.2% av leng 6.40
short sent (<9) 18% (3) long sent (>24) 0% (0)
longest sent 22 wds at sent 9; shortest sent 5 wds at sent 5
sentence types:
simple 53% (9) complex 41% (7)
compound 0% (0) compound-complex 6% (1)
word usage:
verb types as % of total verbs
tobe 46% (12) aux 23% (6) inf 8% (2)
passives as % of non-inf verbs 13% (3)
types as % of total
prep 10.6% (25) conj 1.3% (3) adv. 4.7% (11)
noun 28.4% (67) adj 16.5% (39) pron 4.7% (11)
nominalizations 3% (6)
sentence beginnings:
subject opener: noun (2) pron (2) pos (0) adj (2) art (2) tot 47%
prep 18% (3) adv 18% (3)
verb 6% (1) sub conj 6% (1) conj 0% (0)
expletives 6% (1)

## Appendix M

Passages About Familiar and Unfamiliar Animals (Study 2: Summarization and Repetition Conditions)

We will begin this passage by discussing the Little Brown Bat. This bat is commonly known. Although different kinds of bats are found in many parts of the country, the Little Brown Bat lives in eastern Canada. People do not like being around bats. Perhaps this is due to the fact that bats are usually found in eerie places. For example, the Little Brown Bat lives in dark places like caves, attics, and abandoned houses. The fact that we do not encounter bats frequently, might contribute to our dislike of them. When we do encounter them, we observe that the Little Brown Bat lives with a few to several hundred other bats. Also, popular stories like "Dracula" might be the source of stereotypical beliefs that bats are evil and dangerous creatures. However, it is less commonly known that bats benefit us by eating many insects. Therefore, they contribute to our comfort and safety. The Little Brown Bat's favourite food is flying insects. In addition to studying the preferred diets and habitats of bats, scientists have investigated the daily cycles of bats. An interesting observation is that the Little Brown Bat sleeps all winter. Also, the resiliency of bats is impressive. Members of the species can survive in such diverse environments as desert, tundra, forests, and swamps. Clearly, there are few threats to the existence of bats. Indeed, there are few dangers for the Little Brown Bat except for the weather.

Whales also are fascinating creatures. Although there are many kinds of whales, the following information is about the Blue Whale. The Blue Whale lives in the Arctic and Antarctic Oceans. Over the course of evolution, species adapt to certain external environments which become known as their habitats. A habitat is defined as the place where a species prefers to live. Most of the time, the Blue Whale prefers to be near the surface of the water. Whereas a habitat is a preferred place of living, a

niche is defined as the animal's status in their community with respect to enemies and food. With regard to eating habits, the Blue Whale only eats about three months of the year. Due to the work of many scientists, we have information on the preferred diet of the Blue Whale. When the Blue Whale does eat, it likes ocean plants and small shrimp-like creatures. We tend to view whales as threatening animals. Perhaps their massive size contributes to such perceptions. In actuality, whales face many dangers, and the worst danger for the Blue Whale is being caught under the ice. There are some unusual characteristics about the Blue Whale. When oddities are discovered in a species, many scientists attempt to specify the evolutionary importance of such behaviours. A puzzling behaviour observed in the Blue Whale is that the Blue Whale sleeps by resting only half of its brain at a time.

The House Mouse is another animal that is familiar to most of us. Mice are widely distributed creatures. Many of us have encountered a mouse at some time. The House Mouse lives in Southern Canada and throughout the United States. There are many different kinds of mice. They exist in a variety of colours and sizes. Also, they differ in terms of their habitats and life styles. For example, the House Mouse likes to live in warm, dry areas. Mice have been known to humans for many generations. Consequently, much has been learned about them in terms of breeding and preferred diets. For example, we know that the House Mouse has a rapid rate of reproduction. Most people are familiar with this idea that mice reproduce at a rapid rate. What is probably less commonly known is that the female House Mouse does not have babies if their population grows too large. In terms of the eating habits of mice, we know that mice eat a variety of foods. Typically, the House Mouse eats nuts, vegetables, fruits, and grains. Mice have become so familiar to us that we have created expressions about them. These expressions are based on the habits of mice as we see them. An example of such

an expression is "quiet as a mouse." We typically view mice as shy, timid, and defenceless creatures. Indeed the House Mouse has many dangers like owls and snakes.

Another familiar animal is the penguin. This animal is quite peculiar in appearance, and has provided the source of many humourous comments directed at individuals wearing tuxedos. Of course penguins are not wearing tuxedos. That would be awkward since the Emperor Penguin likes to live in the sea for a few weeks at a time. Some people might be familiar with the famous "Penguin" from the movie Batman. What a character! In real life, however, penguins do not speak, and it is certain that they do not live in the underground of Gotham City. The Emperor Penguin lives only in Antarctica. Contrary to what was portrayed in the movie, Batman is not the main danger for penguins. In fact, Emperor Penguins face many real dangers. One real danger for the Emperor Penguin is the Leopard Seal. Scientists have devoted much time to the study of the Emperor Penguin. Observing penguins requires intense dedication and endurance of extremely severe weather conditions. In their pursuits, scientists have discovered that although Antarctica is cold all of the time, the Emperor Penguin sleeps longer when it gets really cold. Sometimes oddities are discovered in a species that make one realize the shear complexity of nature. Consider, for example, an interesting aspect pertaining to the environment of the Emperor Penguin. The Emperor Penguin never makes a nest or home to hide in. Finally, much is known about the preferred diets of Penguins. The Emperor Penguin eats squid and fish.

The Townsend Mole is another animal that is part of the wildlife scene and, therefore, merits discussion. Regarding geographic location, the Townsend Mole prefers the Pacific Coast. Wildlife experts find it particularly fascinating to observe moles because moles are difficult to find due to the

remote location of their homes. The Townsend Mole lives in tunnels. Most novice observers of wildlife would say that it is not very intriguing to watch moles. Perhaps this is due to the fact that moles perform their more interesting activities in the privacy of their underground homes. It could also be due to the fact that we do not encounter moles very frequently since the Townsend Mole naps throughout the day. There are many other interesting features in moles. Experts who study moles have made discoveries regarding various aspects of their preferred diets and habitats. In regards to preferred diets, it has been discovered that the Townsend Mole eats insects and grubs. Moles can be found in many parts of the world. While there are many interesting features of the preferred habitat of moles, it has been observed that the Townsend Mole especially likes to live in warm, humid areas. Finally, few animals are lucky enough to live free of dangers. The lives of animals and, consequently, the future of our wildlife is constantly threatened. The mole is no exception. However, there are few dangers for the mole except for snakes.

In the next few passages, we will describe some animals that are not as commonly known as the ones you just read about. For example, consider the American Pika. Pikas are not commonly known animals. Although the word pika is derived from a Mongolian word, the American Pika is only found in British Columbia. The habitats of pikas are quite diverse and variable. Some species of pikas prefer habitats that are not very rocky, while other species prefer to live in the prairies. The American Pika likes to live in and around rock piles. The natural habitat of the American Pika is quite unique. An interesting feature about the preferred habitat of the American Pika is that it lives so high up in the rocky mountains that trees can't grow. Pikas belong to the genus "Ochotona." Fourteen species of pikas are known. Although there are many differences among these species, they have similar diets.

The American Pika eats grasses and flowering plants. Scientists have devoted much time to the study of pikas. A topic of research has been the different patterns of activities exhibited by pikas. For example, the American Pika sleeps during the night. Although the pika is not extinct, predation is sometimes a problem. There are some European and African species of pika that are no longer in existence. Pikas are threatened by many animals. The most dangerous animals for the American Pika are birds and weasels.

The Pronghorn is another animal that is perhaps unfamiliar to most individuals. In terms of the habitat of this animal, the Pronghorn prefers the prairies and plains of North America. The North American prairie stretches from the province of Alberta in Canada to the United States, and south to the Gulf of Mexico, and, west from the Mississippi River Valley to the Rocky Mountains. The Pronghorn especially likes to live in open areas. In 1922, many wildlife groups were becoming concerned about the possible extinction of the Pronghorn. The United States government introduced some laws to protect the species. Presently, the Pronghorn has very few dangers except for fences and other man-made barriers. These efforts to ensure the continued existence of Pronghorns provides evidence that threats to wildlife can be overcome if prompt action is taken. Thanks to the efforts of animal rights groups and governments, the Pronghorn continues to occupy its natural habitat. Regarding the diets of Pronghorns, it is known that the Pronghorn eats herbs. An interesting aspect pertaining to the social organization of the Pronghorn in terms of offspring has been observed. Specifically, the Pronghorn usually has twins that always sleep apart. Finally, the Pronghorn exhibits yet another unique behaviour. The Pronghorn has a white rump patch that is covered with hair. A common observation is that the Pronghorn's hairs on its white rump patch are raised if alarmed.

Now we will present information about another animal that might be unfamiliar to you. It is the Collared Peccary. The Collared Peccary lives in Southwestern United States. The Collared Peccary has a choice of many possible habitats in this part of the world. Habitats usually refer to descriptions of important features in the environment that might be occupied by a given species. Although there are many places where peccaries can live, the Collared Peccary often rests in bushes or under large boulders. Many scientists have investigated the social organization of animals, which might be defined as the relationships that exist among group members of a species. Social organizations might involve highly structured dominance relationships, or less structured systems. The Collared Peccary has no obvious leaders among its males and females. Predation is a problem for most animals. Predation is defined as a relationship in which one animal benefits and the prey is effected adversely. Like most animals, the Collared Peccary must be concerned about predators. The Collared Peccary's biggest dangers are the jaguar and the mountain lion. Finally, some interesting aspects about the eating habits of the Peccary will be described. The Collared Peccary has an unusual diet. The Collared Peccary eats roots and cactus. An interesting feature of the anatomy of the Peccary has become apparent to researchers who study this animal. Specifically, scientists have discovered that the Collared Peccary's stomach has two sections.

Now consider another unfamiliar animal, the Chickaree. Although there are many places in the world that the Chickaree can choose to live, the Chickaree prefers to live in Western Canada. The Chickaree is quite a unique animal that has commanded the attention of many avid observers of wildlife. Perhaps this is due to the fact that the Chickaree has a large number of vocal calls. Another interesting feature of the Chickaree pertains to their diet. In reading these passages about animals, you might have

noticed that there is quite a diversity in their preferred diets, and the Chickaree's diet contributes to this diversity. For example, the Chickaree eats mushrooms and seeds from evergreen trees. Remember that habitats were defined previously as descriptions of important features in the environment that might be occupied by a given species. In the case of the Chickaree, the Chickaree likes to live in dense forests. A concern that speaks to the issue of habitat is the interesting behaviour manifested by animals in defense of their homes. Many animals go to great lengths to secure the regions they occupy, and the Chickaree is no exception. The Chickaree is highly protective of its living space. Previously, we offered a distinction between the terms habitat and niche, where niche was defined as an animal's status in their community with respect to enemies and food. One aspect of the Chickaree's niche are enemies. The Chickaree is in danger from Martens.

Finally, consider another unfamiliar animal, the Coati. This animal can be found dwelling in several American states in North America. In general, the Coati's home is usually found south of Arizona. There are many places where the Coati can find a suitable habitat in these states. Among them are the canyons. Indeed, the Coati lives in rocky, wooded canyons. As is the case with several of the animals discussed here, the Coati faces many dangers. An exhaustive list of things that threaten the existence of the Coati will not be presented. For the purpose of this review, it would be sufficient to point out that the Coati's biggest dangers are eagles and cats. We previously explained the term social organization by defining it as the relationships that exist among group members of a species. Remember that social organizations might involve highly structured dominance relationships, or less structured systems. A unique feature of the Coati is that the Coati female is superior to the male. Another unique, maybe even peculiar behaviour of this animal pertains to their treatment of prey. To

be more specific, the Coati rolls its prey under the thick soles of its front feet. Considering the bizarreness of such a behaviour, it is surprising that the Coati's diet is quite variable. Although the Coati can eat many things, it has certain preferences. Specifically, the Coati eats many things, but fruits are its favourite food.

## Appendix N

Learning and Study Strategies Inventory (LASSI): Sample Items

1. I am able to distinguish between more important and less important information during a lecture.
2. After class, I review my notes to help me understand the information.
3. I try to think through a topic and decide what I am supposed to learn from it rather than just read it over when studying.
4. Even when study materials are dull and uninteresting, I manage to keep working until I finish.
5. When preparing for an exam, I create questions that I think might be included.

## Appendix O

Recall Test Questions (Studies 2 & 3)

1. (19) Which animal likes to live in the sea for a few weeks at a time?
2. (25) Which animal prefers the Pacific Coast?
3. (46) Which animal's biggest dangers are the jaguar and the mountain lion?
4. (33) Which animal lives so high up in the Rocky Mountains that trees can't grow?
5. (10) Which animal likes ocean plants and small shrimp-like creatures?
6. (49) Which animal prefers to live in Western Canada?
7. (39) Which animal has few dangers except for fences and other man-made barriers?
8. ( 2) Which animal lives in dark places like caves, attics, and abandoned houses?
9. (50) Which animal has a large number of vocal calls?
10. (48) Which animal's stomach has two sections?
11. (21) Which animal's biggest danger is the Leopard Seal?
12. (56) Which animal lives in rocky, wooded canyons?
13. ( 7) Which animal lives in the Arctic and Antarctic Oceans?
14. (14) Which animal lives in warm, dry areas?
15. (41) Which animal usually has twins that always sleep apart?
16. (11) Which animal's worst danger is being caught under the ice?
17. (51) Which animal eats mushrooms and seeds from evergreen trees?
18. (43) Which animal lives in Southwestern United States?
19. (26) Which animal lives in tunnels?
20. ( 3) Which animal lives with a few to several hundred other animals?

21. (57) Which animal's biggest dangers are eagles and cats?

22. ( 9) Which animal only eats about three months of the year?

23. (31) Which animal is only found in British Columbia?

24. (52) Which animal likes to live in dense forests?

25. ( 6) Which animal has few dangers except for the weather?

26. (16) Which animal does not have babies if their population grows too large?

27. (22) Which animal sleeps longer when it gets really cold?

28. (20) Which animal lives only in Antarctica?

29. (58) Which animal's female is superior to the male?

30. (38) Which animal especially likes to live in open areas?

31. (34) Which animal eats grasses and flowering plants?

32. (27) Which animal naps throughout the day?

33. (53) Which animal is highly protective of its living space?

34. (45) Which animal has no obvious leaders among its males and females?

35. (23) Which animal never makes a nest or home to hide in?

36. (13) Which animal lives in southern Canada and throughout the United States?

37. ( 8) Which animal prefers to be near the surface of the water?

38. ( 1) Which animal lives in Eastern Canada?

39. (18) Which animal has many dangers like owls and snakes.

40. (28) Which animal eats insects and grubs?

41. (32) Which animal lives in and around rock piles?

42. (59) Which animal rolls its prey under the thick soles of its front feet?

43. (54) Which animal is in danger from Martens?

44. (40) Which animal eats herbs?

45. (15) Which animal has a rapid rate of reproduction?

46. (44) Which animal often rests in bushes or under large boulders?

47. (37) Which animal prefers the prairies and plains of North America?

48. (55) Which animal's home is usually found south of Arizona?

49. ( 4) Which animal's favourite food is flying insects?

50. (35) Which animal sleeps during the night?

51. (60) Which animal's favourite food are fruits?

52. (42) Which animal's hairs on its white rump patch are raised if alarmed?

53. (29) Which animal especially likes to live in warm, humid areas?

54. (17) Which animal eats nuts, vegetables, fruits, and grains?

55. ( 5) Which animal sleeps all winter?

56. (47) Which animal eats roots and cactus?

57. (24) Which animal eats squid and fish?

58. (12) Which animal sleeps by resting only half of its brain at a time?

59. (36) Which animal's biggest dangers are birds and weasels?

60. (30) Which animal has few dangers except for snakes?

## Appendix P

Passages About Familiar and Unfamiliar Animals (Study 2; Elaborative Interrogation Condition)

We will begin this passage by discussing the Little Brown Bat. This bat is commonly known. Although different kinds of bats are found in many parts of the country, the Little Brown Bat lives in eastern Canada.

People do not like being around bats. Perhaps this is due to the fact that bats are usually found in eerie places. For example, the Little Brown Bat lives in dark places like caves, attics, and abandoned houses.

The fact that we do not encounter bats frequently, might contribute to our dislike of them. When we do encounter them, we observe that the Little Brown Bat lives with a few to several hundred other bats.

Also, popular stories like "Dracula" might be the source of stereotypical beliefs that bats are evil and dangerous creatures. However, it is less commonly known that bats benefit us by eating many insects. Therefore, they contribute to our comfort and safety. The Little Brown Bat's favourite food is flying insects.

In addition to studying the preferred diets and habitats of bats, scientists have investigated the daily cycles of bats. An interesting observation is that the Little Brown Bat sleeps all winter.

Also, the resiliency of bats is impressive. Members of the species can survive in such diverse

environments as desert, tundra, forests, and swamps. Clearly, there are few threats to the existence of bats. Indeed, there are few dangers for the Little Brown Bat except for the weather.

Whales also are fascinating creatures. Although there are many kinds of whales, the following information is about the Blue Whale. The Blue Whale lives in the Arctic and Antarctic Oceans.

Over the course of evolution, species adapt to certain external environments which become known as their habitats. A habitat is defined as the place where a species prefers to live. Most of the time, the Blue Whale prefers to be near the surface of the water.

Whereas a habitat is a preferred place of living, a niche is defined as the animal's status in their community with respect to enemies and food. With regard to eating habits, the Blue Whale only eats about three months of the year.

Due to the work of many scientists, we have information on the preferred diet of the Blue Whale. When the Blue Whale does eat, it likes ocean plants and small shrimp-like creatures.

We tend to view whales as threatening animals. Perhaps their massive size contributes to such perceptions. In actuality, whales face many dangers, and the worst danger for the Blue Whale is being caught under the ice.

There are some unusual characteristics about the Blue Whale. When oddities are discovered in a species, many scientists attempt to specify the evolutionary importance of such behaviours. A puzzling

behaviour observed in the Blue Whale is that the Blue Whale sleeps by resting only half of its brain at a time.

The House Mouse is another animal that is familiar to most of us. Mice are widely distributed creatures. Many of us have encountered a mouse at some time. The House Mouse lives in Southern Canada and throughout the United States.

There are many different kinds of mice. They exist in a variety of colours and sizes. Also, they differ in terms of their habitats and life styles. For example, the House Mouse likes to live in warm, dry areas.

Mice have been known to humans for many generations. Consequently, much has been learned about them in terms of breeding and preferred diets. For example, we know that the House Mouse has a rapid rate of reproduction.

Most people are familiar with this idea that mice reproduce at a rapid rate. What is probably less commonly known is that the female House Mouse does not have babies if their population grows too large.

In terms of the eating habits of mice, we know that mice eat a variety of foods. Typically, the House Mouse eats nuts, vegetables, fruits, and grains.

Mice have become so familiar to us that we have created expressions about them. These expressions are based on the habits of mice as we see them. An example of such an expression is "quiet as a mouse." We typically view mice as shy, timid, and defenceless creatures. Indeed the House Mouse has many dangers like owls and snakes.

Another familiar animal is the penguin. This animal is quite peculiar in appearance, and has provided the source of many humourous comments directed at individuals wearing tuxedos. Of course penguins are not wearing tuxedos. That would be awkward since the Emperor Penguin likes to live in the sea for a few weeks at a time.

Some people might be familiar with the famous "Penguin" from the movie Batman. What a character! In real life, however, penguins do not speak, and it is certain that they do not live in the underground of Gotham City. The Emperor Penguin lives only in Antarctica.

Contrary to what was portrayed in the movie, Batman is not the main danger for penguins. In fact, Emperor Penguins face many real dangers. One real danger for the Emperor Penguin is the Leopard Seal.

Scientists have devoted much time to the study of the Emperor Penguin. Observing penguins requires intense dedication and endurance of extremely severe weather conditions. In their pursuits, scientists have discovered that although Antarctica is cold all of the time, the Emperor Penguin sleeps longer when it gets really cold.

Sometimes oddities are discovered in a species that make one realize the shear complexity of nature. Consider, for example, an interesting aspect pertaining to the environment of the Emperor Penguin. The Emperor Penguin never makes a nest or home to hide in.

Finally, much is known about the preferred diets of Penguins. The Emperor Penguin eats squid and fish.

The Townsend Mole is another animal that is part of the wildlife scene and, therefore, merits discussion. Regarding geographic location, the Townsend Mole prefers the Pacific Coast.

Wildlife experts find it particularly fascinating to observe moles because moles are difficult to find due to the remote location of their homes. The Townsend Mole lives in tunnels.

Most novice observers of wildlife would say that it is not very intriguing to watch moles. Perhaps this is due to the fact that moles perform their more interesting activities in the privacy of their underground homes. It could also be due to the fact that we do not encounter moles very frequently since the Townsend Mole naps throughout the day.

There are many other interesting features in moles. Experts who study moles have made discoveries regarding various aspects of their preferred diets and habitats. In regards to preferred diets, it has been discovered that the Townsend Mole eats insects and grubs.

Moles can be found in many parts of the world. While there are many interesting features of the preferred habitat of moles, it has been observed that the Townsend Mole especially likes to live in warm, humid areas.

Finally, few animals are lucky enough to live free of dangers. The lives of animals and, consequently, the future of our wildlife is constantly threatened. The mole is no exception. However, there are few dangers for the mole except for snakes.

In the next few passages, we will describe some animals that are not as commonly known as the ones you just read about. For example, consider the American Pika. Pikas are not commonly known animals. Although the word pika is derived from a Mongolian word, the American Pika is only found in British Columbia.

The habitats of pikas are quite diverse and variable. Some species of pikas prefer habitats that are not very rocky, while other species prefer to live in the prairies. The American Pika likes to live in and around rock piles.

The natural habitat of the American Pika is quite unique. An interesting feature about the preferred habitat of the American Pika is that it lives so high up in the rocky mountains that trees can't grow.

Pikas belong to the genus "Ochotona." Fourteen species of pikas are known. Although there are many differences among these species, they have similar diets. The American Pika eats grasses and

flowering plants.

Scientists have devoted much time to the study of pikas. A topic of research has been the different patterns of activities exhibited by pikas. For example, the American Pika sleeps during the night.

Although the pika is not extinct, predation is sometimes a problem. There are some European and African species of pika that are no longer in existence. Pikas are threatened by many animals. The most dangerous animals for the American Pika are birds and weasels.

The Pronghorn is another animal that is perhaps unfamiliar to most individuals. In terms of the habitat of this animal, the Pronghorn prefers the prairies and plains of North America.

The North American prairie stretches from the province of Alberta in Canada to the United States, and south to the Gulf of Mexico, and, west from the Mississippi River Valley to the Rocky Mountains. The Pronghorn especially likes to live in open areas.

In 1922, many wildlife groups were becoming concerned about the possible extinction of the Pronghorn. The United States government introduced some laws to protect the species. Presently, the Pronghorn has very few dangers except for fences and other man-made barriers.

These efforts to ensure the continued existence of Pronghorns provides evidence that threats to wildlife can be overcome if prompt action is taken. Thanks to the efforts of animal rights groups and

governments, the Pronghorn continues to occupy its natural habitat. Regarding the diets of Pronghorns, it is known that the Pronghorn eats herbs.

An interesting aspect pertaining to the social organization of the Pronghorn in terms of offspring has been observed. Specifically, the Pronghorn usually has twins that always sleep apart.

Finally, the Pronghorn exhibits yet another unique behaviour. The Pronghorn has a white rump patch that is covered with hair. A common observation is that the Pronghorn's hairs on its white rump patch are raised if alarmed.

Now, we will present information about another animal that might be unfamiliar to you. It is the Collared Peccary. The Collared Peccary lives in Southwestern United States.

The Collared Peccary has a choice of many possible habitats in this part of the world. Habitats usually refer to descriptions of important features in the environment that might be occupied by a given species. Although there are many places where peccaries can live, the Collared Peccary often rests in bushes or under large boulders.

Many scientists have investigated the social organization of animals, which might be defined as the relationships that exist among group members of a species. Social organizations might involve highly structured dominance relationships, or less structured systems. The Collared Peccary has no obvious leaders among its males and females.

Predation is a problem for most animals. Predation is defined as a relationship in which one animal benefits and the prey is effected adversely. Like most animals, the Collared Peccary must be concerned about predators. The Collared Peccary's biggest dangers are the jaguar and the mountain lion.

Finally, some interesting aspects about the eating habits of the Peccary will be described. The Collared Peccary has an unusual diet. The Collared Peccary eats roots and cactus.

An interesting feature of the anatomy of the Peccary has become apparent to researchers who study this animal. Specifically, scientists have discovered that the Collared Peccary's stomach has two sections.

Now consider another unfamiliar animal, the Chickaree. Although there are many places in the world that the Chickaree can choose to live, the Chickaree prefers to live in Western Canada.

The Chickaree is quite a unique animal that has commanded the attention of many avid observers of wildlife. Perhaps this is due to the fact that the Chickaree has a large number of vocal calls.

Another interesting feature of the Chickaree pertains to their diet. In reading these passages about animals, you might have noticed that there is quite a diversity in their preferred diets, and the Chickaree's diet contributes to this diversity. For example, the Chickaree eats mushrooms and seeds from evergreen trees.

Remember that habitats were defined previously as descriptions of important features in the environment that might be occupied by a given species. In the case of the Chickaree, the Chickaree likes to live in dense forests.

A concern that speaks to the issue of habitat is the interesting behaviour manifested by animals in defense of their homes. Many animals go to great lengths to secure the regions they occupy, and the Chickaree is no exception. The Chickaree is highly protective of its living space.

Previously, we offered a distinction between the terms habitat and niche, where niche was defined as an animal's status in their community with respect to enemies and food. One aspect of the Chickaree's niche are enemies. The Chickaree is in danger from Martens.

Finally, consider another unfamiliar animal, the Coati. This animal can be found dwelling in several American states in North America. In general, the Coati's home is usually found south of Arizona.

There are many places where the Coati can find a suitable habitat in these states. Among them are the canyons. Indeed, the Coati lives in rocky, wooded canyons.

As is the case with several of the animals discussed here, the Coati faces many dangers. An exhaustive list of things that threaten the existence of the Coati will not be presented. For the purpose of this review, it would be sufficient to point out that the Coati's biggest dangers are eagles and cats.

We previously explained the term social organization by defining it as the relationships that exist among group members of a species. Remember that social organizations might involve highly structured dominance relationships, or less structured systems. A unique feature of the Coati is that the Coati female is superior to the male.

Another unique, maybe even peculiar behaviour of this animal pertains to their treatment of prey. To be more specific, the Coati rolls its prey under the thick soles of its front feet.

Considering the bizarreness of such a behaviour, it is surprising that the Coati's diet is quite variable. Although the Coati can eat many things, it has certain preferences. Specifically, the Coati eats many things, but fruits are its favourite food.

## Appendix Q

Passages About Familiar and Unfamiliar Animals (Study 3)

Whales are fascinating creatures. Although there are many kinds of whales, the following information is about the Blue Whale. The Blue Whale lives in the Arctic and Antarctic Oceans. Over the course of evolution, species adapt to certain external environments which become known as their habitats. A habitat is defined as the place where a species prefers to live. Most of the time, the Blue Whale prefers to be near the surface of the water. Whereas a habitat is a preferred place of living, a niche is defined as the animal's status in their community with respect to enemies and food. With regard to eating habits, the Blue Whale only eats about three months of the year. Due to the work of many scientists, we have information on the preferred diet of the Blue Whale. When the Blue Whale does eat, it likes ocean plants and small shrimp-like creatures. We tend to view whales as threatening animals. Perhaps their massive size contributes to such perceptions. In actuality, whales face many dangers, and the worst danger for the Blue Whale is being caught under the ice. There are some unusual characteristics about the Blue Whale. When oddities are discovered in a species, many scientists attempt to specify the evolutionary importance of such behaviours. A puzzling behaviour observed in the Blue Whale is that the Blue Whale sleeps by resting only half of its brain at a time.

The Pronghorn is an animal that is perhaps unfamiliar to most individuals. In terms of the habitat of this animal, the Pronghorn prefers the prairies and plains of North America. The North American prairie stretches from the province of Alberta in Canada to the United States, and south to the Gulf of Mexico, and, west from the Mississippi River Valley to the Rocky Mountains. The Pronghorn especially likes to live in open areas. In 1922, many wildlife groups were becoming concerned about the possible

extinction of the Pronghorn. The United States government introduced some laws to protect the species. Presently, the Pronghorn has very few dangers except for fences and other man-made barriers. These efforts to ensure the continued existence of Pronghorns provides evidence that threats to wildlife can be overcome if prompt action is taken. Thanks to the efforts of animal rights groups and governments, the Pronghorn continues to occupy its natural habitat. Regarding the diets of Pronghorns, it is known that the Pronghorn eats herbs. An interesting aspect pertaining to the social organization of the Pronghorn in terms of offspring has been observed. Specifically, the Pronghorn usually has twins that always sleep apart. Finally, the Pronghorn exhibits yet another unique behaviour. The Pronghorn has a white rump patch that is covered with hair. A common observation is that the Pronghorn's hairs on its white rump patch are raised if alarmed.

The House Mouse is an animal that is familiar to most of us. Mice are widely distributed creatures. Many of us have encountered a mouse at some time. The House Mouse lives in Southern Canada and throughout the United States. There are many different kinds of mice. They exist in a variety of colours and sizes. Also, they differ in terms of their habitats and life styles. For example, the House Mouse likes to live in warm, dry areas. Mice have been known to humans for many generations. Consequently, much has been learned about them in terms of breeding and preferred diets. For example, we know that the House Mouse has a rapid rate of reproduction. Most people are familiar with this idea that mice reproduce at a rapid rate. What is probably less commonly known is that the female House Mouse does not have babies if their population grows too large. In terms of the eating habits of mice, we know that mice eat a variety of foods. Typically, the House Mouse eats nuts, vegetables, fruits, and grains. Mice have become so familiar to us that we have created expressions

about them. These expressions are based on the habits of mice as we see them. An example of such an expression is "quiet as a mouse." We typically view mice as shy, timid, and defenceless creatures. Indeed the House Mouse has many dangers like owls and snakes.

We will continue this passage by discussing the Little Brown Bat. This bat is commonly known. Although different kinds of bats are found in many parts of the country, the Little Brown Bat lives in eastern Canada. People do not like being around bats. Perhaps this is due to the fact that bats are usually found in eerie places. For example, the Little Brown Bat lives in dark places like caves, attics, and abandoned houses. The fact that we do not encounter bats frequently, might contribute to our dislike of them. When we do encounter them, we observe that the Little Brown Bat lives with a few to several hundred other bats. Also, popular stories like "Dracula" might be the source of stereotypical beliefs that bats are evil and dangerous creatures. However, it is less commonly known that bats benefit us by eating many insects. Therefore, they contribute to our comfort and safety. The Little Brown Bat's favourite food is flying insects. In addition to studying the preferred diets and habitats of bats, scientists have investigated the daily cycles of bats. An interesting observation is that the Little Brown Bat sleeps all winter. Also, the resiliency of bats is impressive. Members of the species can survive in such diverse environments as desert, tundra, forests, and swamps. Clearly, there are few threats to the existence of bats. Indeed, there are few dangers for the Little Brown Bat except for the weather.

Now consider another unfamiliar animal, the Chickaree. Although there are many places in the world that the Chickaree can choose to live, the Chickaree prefers to live in Western Canada. The Chickaree

is quite a unique animal that has commanded the attention of many avid observers of wildlife. Perhaps this is due to the fact that the Chickaree has a large number of vocal calls. Another interesting feature of the Chickaree pertains to their diet. In reading these passages about animals, you might have noticed that there is quite a diversity in their preferred diets, and the Chickaree's diet contributes to this diversity. For example, the Chickaree eats mushrooms and seeds from evergreen trees. Remember that habitats were defined previously as descriptions of important features in the environment that might be occupied by a given species. In the case of the Chickaree, the Chickaree likes to live in dense forests. A concern that speaks to the issue of habitat is the interesting behaviour manifested by animals in defense of their homes. Many animals go to great lengths to secure the regions they occupy, and the Chickaree is no exception. The Chickaree is highly protective of its living space. Previously, we offered a distinction between the terms habitat and niche, where niche was defined as an animal's status in their community with respect to enemies and food. One aspect of the Chickaree's niche are enemies. The Chickaree is in danger from Martens.

The Townsend Mole is another animal that is part of the wildlife scene and, therefore, merits discussion. Regarding geographic location, the Townsend Mole prefers the Pacific Coast. Wildlife experts find it particularly fascinating to observe moles because moles are difficult to find due to the remote location of their homes. The Townsend Mole lives in tunnels. Most novice observers of wildlife would say that it is not very intriguing to watch moles. Perhaps this is due to the fact that moles perform their more interesting activities in the privacy of their underground homes. It could also be due to the fact that we do not encounter moles very frequently since the Townsend Mole naps throughout the day. There are many other interesting features in moles. Experts who study moles have made

discoveries regarding various aspects of their preferred diets and habitats. In regards to preferred diets, it has been discovered that the Townsend Mole eats insects and grubs. Moles can be found in many parts of the world. While there are many interesting features of the preferred habitat of moles, it has been observed that the Townsend Mole especially likes to live in warm, humid areas. Finally, few animals are lucky enough to live free of dangers. The lives of animals and, consequently, the future of our wildlife is constantly threatened. The mole is no exception. However, there are few dangers for the mole except for snakes.

Now, we will present information about another animal that might be unfamiliar to you. It is the Collared Peccary. The Collared Peccary lives in Southwestern United States. The Collared Peccary has a choice of many possible habitats in this part of the world. Habitats usually refer to descriptions of important features in the environment that might be occupied by a given species. Although there are many places where peccaries can live, the Collared Peccary often rests in bushes or under large boulders. Many scientists have investigated the social organization of animals, which might be defined as the relationships that exist among group members of a species. Social organizations might involve highly structured dominance relationships, or less structured systems. The Collared Peccary has no obvious leaders among its males and females. Predation is a problem for most animals. Predation is defined as a relationship in which one animal benefits and the prey is effected adversely. Like most animals, the Collared Peccary must be concerned about predators. The Collared Peccary's biggest dangers are the jaguar and the mountain lion. Finally, some interesting aspects about the eating habits of the Peccary will be described. The Collared Peccary has an unusual diet. The Collared Peccary eats roots and cactus. An interesting feature of the anatomy of the Peccary has become apparent to

researchers who study this animal. Specifically, scientists have discovered that the Collared Peccary's stomach has two sections.

Now, consider another unfamiliar animal, the Coati. This animal can be found dwelling in several American states in North America. In general, the Coati's home is usually found south of Arizona. There are many places where the Coati can find a suitable habitat in these states. Among them are the canyons. Indeed, the Coati lives in rocky, wooded canyons. As is the case with several of the animals discussed here, the Coati faces many dangers. An exhaustive list of things that threaten the existence of the Coati will not be presented. For the purpose of this review, it would be sufficient to point out that the Coati's biggest dangers are eagles and cats. We previously explained the term social organization by defining it as the relationships that exist among group members of a species. Remember that social organizations might involve highly structured dominance relationships, or less structured systems. A unique feature of the Coati is that the Coati female is superior to the male. Another unique, maybe even peculiar behaviour of this animal pertains to their treatment of prey. To be more specific, the Coati rolls its prey under the thick soles of its front feet. Considering the bizarreness of such a behaviour, it is surprising that the Coati's diet is quite variable. Although the Coati can eat many things, it has certain preferences. Specifically, the Coati eats many things, but fruits are its favourite food.

Another familiar animal is the penguin. This animal is quite peculiar in appearance, and has provided the source of many humourous comments directed at individuals wearing tuxedos. Of course penguins are not wearing tuxedos. That would be awkward since the Emperor Penguin likes to live in the sea

for a few weeks at a time. Some people might be familiar with the famous "Penguin" from the movie Batman. What a character! In real life, however, penguins do not speak, and it is certain that they do not live in the underground of Gotham City. The Emperor Penguin lives only in Antarctica. Contrary to what was portrayed in the movie, Batman is not the main danger for penguins. In fact, Emperor Penguins face many real dangers. One real danger for the Emperor Penguin is the Leopard Seal. Scientists have devoted much time to the study of the Emperor Penguin. Observing penguins requires intense dedication and endurance of extremely severe weather conditions. In their pursuits, scientists have discovered that although Antarctica is cold all of the time, the Emperor Penguin sleeps longer when it gets really cold. Sometimes oddities are discovered in a species that make one realize the shear complexity of nature. Consider, for example, an interesting aspect pertaining to the environment of the Emperor Penguin. The Emperor Penguin never makes a nest or home to hide in. Finally, much is known about the preferred diets of Penguins. The Emperor Penguin eats squid and fish.

In this passage we will describe an animal that is not as commonly known as some of the ones you just read about. It is the American Pika. Pikas are not commonly known animals. Although the word pika is derived from a Mongolian word, the American Pika is only found in British Columbia. The habitats of pikas are quite diverse and variable. Some species of pikas prefer habitats that are not very rocky, while other species prefer to live in the prairies. The American Pika likes to live in and around rock piles. The natural habitat of the American Pika is quite unique. An interesting feature about the preferred habitat of the American Pika is that it lives so high up in the rocky mountains that trees can't grow. Pikas belong to the genus "Ochotona." Fourteen species of pikas are known. Although there are many differences among these species, they have similar diets. The American Pika

eats grasses and flowering plants. Scientists have devoted much time to the study of pikas. A topic of research has been the different patterns of activities exhibited by pikas. For example, the American Pika sleeps during the night. Although the pika is not extinct, predation is sometimes a problem. There are some European and African species of pika that are no longer in existence. Pikas are threatened by many animals. The most dangerous animals for the American Pika are birds and weasels.

## Appendix R

Passages About Familiar and Unfamiliar Animals (Study 3)

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Whereas a habitat is a preferred place of living, a niche is defined as the animal's status in their community with respect to enemies and food. With regard to eating habits, the Blue Whale only eats about three months of the year.

Due to the work of many scientists, we have information on the preferred diet of the Blue Whale. When the Blue Whale does eat, it likes ocean plants and small shrimp-like creatures.

We tend to view whales as threatening animals. Perhaps their massive size contributes to such perceptions. In actuality, whales face many dangers, and the worst danger for the Blue Whale is being caught under the ice.

There are some unusual characteristics about the Blue Whale. When oddities are discovered in a species, many scientists attempt to specify the evolutionary importance of such behaviours. A puzzling

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In 1922, many wildlife groups were becoming concerned about the possible extinction of the Pronghorn. The United States government introduced some laws to protect the species. Presently, the Pronghorn has very few dangers except for fences and other man-made barriers.

These efforts to ensure the continued existence of Pronghorns provides evidence that threats to wildlife can be overcome if prompt action is taken. Thanks to the efforts of animal rights groups and governments, the Pronghorn continues to occupy its natural habitat. Regarding the diets of Pronghorns, it is known that the Pronghorn eats herbs.

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We will continue this passage by discussing the Little Brown Bat. This bat is commonly known. Although different kinds of bats are found in many parts of the country, the Little Brown Bat lives in eastern Canada.

People do not like being around bats. Perhaps this is due to the fact that bats are usually found in eerie places. For example, the Little Brown Bat lives in dark places like caves, attics, and abandoned houses.

The fact that we do not encounter bats frequently, might contribute to our dislike of them. When we do encounter them, we observe that the Little Brown Bat lives with a few to several hundred other bats.

Also, popular stories like "Dracula" might be the source of stereotypical beliefs that bats are evil and dangerous creatures. However, it is less commonly known that bats benefit us by eating many insects. Therefore, they contribute to our comfort and safety. The Little Brown Bat's favourite food is flying insects.

In addition to studying the preferred diets and habitats of bats, scientists have investigated the daily

cycles of bats. An interesting observation is that the Little Brown Bat sleeps all winter.

Also, the resiliency of bats is impressive. Members of the species can survive in such diverse environments as desert, tundra, forests, and swamps. Clearly, there are few threats to the existence of bats. Indeed, there are few dangers for the Little Brown Bat except for the weather.

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Seal.

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