A METACOGNITIVE MODEL TO ASSIST THE DIRECT INSTRUCTION OF STUDY STRATEGIES IN THE NEWFOUNDLAND AND LABRADOR GRADE VI SCIENCE CURRICULUM

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ABSTRACT

The goal of this thesis was to develop a model that would facilitate direct instruction of study skills within the context of the grade VI science curriculum. Development of the model proceeded in three stages. First, the conceptual framework for the model was refined through a review of the research done in the study skills area. Findings from that review supported the development of a model based on a cognitive-strategy approach to study skills instruction. Accordingly, in the second stage of model development, a cognitive-strategy model was developed for direct instruction of study skills in the context of grade VI science. Third, a small school-based pilot study of the model was undertaken. The purpose of the pilot study was to identify any obvious difficulties in using the model in classroom settings; the presence of such difficulties would require modification before the model could be evaluated formally. Limitations in program material and teacher training were identified in the pilot. Overall, findings are discussed in terms of the importance of direct instruction of study skills in the classroom and the challenges associated with that instruction.

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1 INTRODUCTION

"study skills are not something added to the curriculum and your already crowded schedule, but rather they are pathways leading to successful content mastery, a way to teach and learn" (Tonjes & Zintz, 1981, p 364)

Instruction in study skills is a complex topic; therefore, this introductory chapter serves several purposes. First, the purpose and rationale for investigating the need for direct instruction of study skills is established. Second, the objectives to be achieved in this thesis are identified. Third, the nature of the problem of direct instruction in study skills is considered from the Newfoundland and Labrador perspective as well as from a more global, research-based perspective. Fourth, the three most important objectives of this thesis are outlined and explained. Fifth, the concepts which are integral to this work are defined in the context of this thesis. Finally, the organization of the entire report is briefly outlined.

1.1 PURPOSE

The purpose of this thesis was to develop a model for the direct instruction of study skills in the context of grade VI science. The development of the model proceeded in three steps. The first step was to establish through a literature review the rationale and justification for the approach used in the model. Adjunct and necessary to the primary goal of this thesis, developing a model for the direct instruction of study skills, was a review of the educational research and literature related to study skills instruction. The second step was the development of the study skills model ***Learning How to Learn***. This involved searching current literature and research for cognitive strategies suitable to study

skills instruction. Many of these strategies were modified to make them more suitable for students studying the grade VI science curriculum. Three original strategies were also included in the model. The third step in the development of the model was a pilot study involving five interested teachers who were asked to use the model in their classrooms for six weeks. At the end of the pilot study each teacher in an interview aired any difficulties they encountered with using the model in their science classes. These difficulties would, of course, have to addressed before a full scale program evaluation could be conducted.

The model presented in this thesis is intended to be a tool to assist teachers in the integration of study skills instruction into the grade VI science curriculum. The study skills model, developed for this thesis, is based upon a cognitive approach and is designed to introduce teachers and students to a strategy-based method of teaching and learning study skills. The cognitive strategy model was developed with reference to the grade VI science curriculum. The strategies introduced in the model came from three sources. Some strategies originated in the literature, others came from the literature but were modified by the author, and still others were developed by the author. The strategies selected for inclusion in the model were based on three criteria:

1 Students must be able to see the need for the strategy in that the strategy fits a specific need within the curriculum or for the student (Murphy, 1968; Scruggs & Mastropieri, 1992).

2. Knowledge about the strategy is important for transferring the strategy to a new situation (O'Sullivan & Pressley, 1984).

3. Good strategies are ones that students readily understand, retain, and continue to use on a long term basis (Pressley, 1986; Weed, Ryan, & Day, 1990). In his research Michael Pressley found that "Good strategies are composed of the sufficient and

necessary processes for accomplishing their intended goal, consuming as few intellectual resources as are necessary to do so" (1986, p 140)

The primary plan of this thesis was to develop a practical resource to assist teachers in the direct instruction of study skills in the grade VI science curriculum Fulfilling three objectives would achieve this primary plan. The first objective was to review the relevant literature to establish the need for direct instruction of study skills. The second objective was to develop a specific study skills model intended for use with the grade VI science curriculum. The third objective was to identify any problem areas by having a small group of interested teachers use the model in their science classes over a six week period. This pilot study was intended to be a part of program development of the model The teachers were interviewed at the end of the pilot to determine if they had encountered any obvious difficulties while using the model in a classroom setting. These problems would have to be eliminated before a program evaluation study could be undertaken. Testing the effectiveness of the model would require a large scale evaluation study Such a comprehensive study was not attempted in this thesis because it was simply beyond the scope of the program development work conducted here.

It was necessary to justify the need for direct instruction of study skills in content area classrooms through an historical review of commonly held beliefs about study skills and a review of current research and literature in this area. This knowledge was attained by reviewing the history of study skills, determining how these skills fit into the curriculum, looking at the external factors which have an impact on these skills, and evaluating the traditional and non-traditional methods of study skills instruction. This review of literature and research was essential to the development of a model for study skills instruction.

The rationale for developing a study skills model to be used with the grade VI science curriculum grew from three sources:

1. Current literature and research in the area establishes the need for direct instruction of study skills (Forgan & Mangrum, 1989; Rafoth & DeFabo, 1990).

2. The province identifies the need for students to become proficient in the specific skills of studying (Provincial guide on core learnings).

3. The thesis work of graduate students at Memorial University of Newfoundland identifies the need for study skills instruction (Cole, 1977; Mercer, 1986; Mullins, 1986; Rose, 1984; Wilson, 1976).

The author developed a model to be used as a guide for study skills instruction. The model, intended to be a resource for teachers, includes ideas, strategies, and activities that are intended to be easily integrated into grade VI science curriculum.

1.2 NATURE OF THE PROBLEM

In the past four years the author has worked at The Student Resource Centre, a division of the Roman Catholic School Board for St. John's. This centre is designed to assist children who are of average to above average intelligence but are having difficulty academically. The author has observed that many of the students who attend the Student Resource Centre seem to have difficulty with study skills. These observations seem consistent with research findings. For example, three phenomena are well documented in the literature and research relating to study skills. First, many students approach a study task inefficiently (Robinson, 1970). Second, even at the post-secondary level it is reported that many students have inadequate study skills and need instructional programs for improved

study and/or reading skills (Dickinson & O'Connell, 1990; Nist, Simpson & Hogrebe, 1985). Third, there is a need for educators to take responsibility for teaching students how to study (Askov & Kamm, 1982; Thomas & Robinson, 1982) It is common for children to continue to use an inefficient study strategy without monitoring the effectiveness of their approach (Pressley, Goodchild, Fleet, Zajchowski, & Evans, 1989) Students often believe that they have inadequate skills to memorize, organize, or prioritize information for examinations (Grant, 1989; Murphy, 1968). At no grade level are these problems more evident than in upper elementary and junior high, especially in grades VI and VII (Haller, Child, & Walberg, 1988; Rabinowitz, Freeman, & Cohen, 1992) It can be assumed that in these grades students are expected to make the transition from dependency on their teachers' guidance to independence in learning In a review and compilation of twenty quantitative studies Haller et al. (1988) found that metacognitive instruction in the area of comprehension was particularly effective for junior high students

Three important findings from research in the area of study skills are:

1. Students' academic performance improves with direct instruction in the area of study skills (Anderson & Anderson, 1992; Pressley et al., 1989; Robinson, 1970; Simmers-Wolpow, Farrell, & Tonjes, 1991).
2. Study skills instruction is less effective if conducted in isolation from the curriculum (Davis, 1990; Farris, Fuhler, & Ginejko, 1991; Harris, Graham, & Freeman, 1988).
3. Teachers, recognizing that study skills are important, believe that they are ill-equipped to integrate study skills instruction into the curriculum. This problem may occur because teachers see study skills acquisition as something additional, rather than something integral, to the curriculum (Dana, 1989; Hill, 1991, Lloyd & Mitchell, 1989).

Together these findings support the conclusion that instructing students in study skills in content-area classes is important. It follows that if teachers are to instruct study skills in the context of the curriculum, they should be provided with the resources and the skills to accomplish this goal.

1.3 OBJECTIVES

The primary purpose in this work is to develop a model designed to assist teachers in the direct instruction of study skills in their classrooms. The study skills included in the model developed for this thesis are focused within the cognitive domain. The strategies taken from the literature are generally accepted study strategies considered to be useful in many curriculum areas including science (Carman & Adams, 1972; Thomas & Robinson, 1982; Wehrung-Schaffner & Sapona, 1990). Several of these strategies have been modified so as to make them more applicable to the grade VI science curriculum.

Three specific objectives encompassed the primary plan of developing a model for the direct instruction of study skills. The first objective was to establish, through a review of the most current and relevant research and literature, that there is a definitive need for direct instruction of study skills in content areas particularly at the upper elementary level. The second objective was to develop a study skills model that was to be used in conjunction with the grade VI science curriculum. The strategies in this model were intended to be applicable outside this content area but were modified in some cases to increase efficiency and use within the context of grade VI science. The final objective was to gather pilot data in personal semi-structured interviews with teachers who volunteered to use the model in their science classes. The interviews were conducted after the teachers

had had the opportunity to use the study skills model in their science classes for a six week period. The pilot study was intended to be part of program development, not as evaluation of the model. The purpose of the interviews was to allow the teachers to report any difficulties encountered in use of the program. Problems would need to be addressed before a larger scale evaluative study could take place.

1.4 DEFINITIONS

To ensure that there is no misunderstanding in terms of intended meaning, the terminology integral to this work is defined here. The definitions are presented as the terminology was intended to be understood in the context of this thesis. The following terms are defined in this chapter and are subsequently discussed in this thesis and the study skills model:

1. cognitive theory,
2. cognitive strategies,
3. study skills,
4. study tactics, and
5. metacognition.

Cognitive theory Cognitive theory is concerned with the mental processes that take place within the individual. One of the most significant educational implications of this approach is the emphasis upon the learner's taking an active role in his or her own learning (Mulcahy, Marfo, Peat, & Andrews, 1986).

From an educational perspective the knowledge a student brings to a task in addition to the strategies used to acquire and maintain understanding are integral to the cognitive

approach Within the cognitive view more emphasis is placed on the use of strategies than on specific skills (Dole, Duffy, Roehler, & Pearson, 1991). According to cognitive theory the most important variable in the learning process is the active role of the person in processing and understanding information. This active participation is in contrast to the passive reception of stimuli in the environment (Mulcahy et al., 1986; Wong, 1993). It follows that the cognitive approach to learning attempts to take the onus off teachers as mere transmitters of information and places more responsibility on students to become more actively involved in the learning process.

Cognitive strategies, or learning strategies, are defined as "a collection of mental tactics employed by an individual in a particular learning situation to facilitate acquisition of knowledge or skill" (Derry & Murphy, 1986, p. 2). To be most effective, strategies should be personal in nature and should be internalized to the point of being automatic (Weed et al., 1990). Cognitive strategies are designed to help students learn, understand, and remember information. Often, but not exclusively, these strategies are presented as acronyms to assist the student in the retention of the steps of a particular strategy. For example, **SCORER** is a test taking strategy with steps that involve **Scheduling** time, looking for **Clue words**, **Omitting** difficult questions, **Reading** carefully, **Estimating** answers and **Reviewing** the work (Carman & Adams, 1972).

Strategies seem to be effective for most students in that they introduce a more systematic and organized approach to a learning task and that they actively involve students in the learning process (Rafoth & DeFabo, 1990; Thomas & Robinson, 1982). Generally, the students who seem to benefit most from this approach in any classroom are the disorganized and the learning-disabled students (Dana, 1989; Ellis, 1993; Garner, 1992).

To gain the most benefit from this approach, students should be encouraged to modify and develop strategies to meet their personal needs (Garner, 1992).

It is critical that strategies not be confused with skills. Dole et al (1991) proposed four important distinctions between strategies and skills in the understanding of cognitive theory. These four differences involve intentionality, cognitive sophistication, flexibility, and metacognitive awareness. In terms of intentionality, skills are intended to be automatic routines, but strategies are plans that are controlled by the student. Dole et al (1991) argue that the cognitive sophistication involved in using skills encompasses unsophisticated lower levels of thinking while strategies demand a higher level of reasoning and critical thinking. According to Dole et al. (1991), flexibility varies in that specific skills demand rigidity and consistency while strategies call for flexibility. Finally, skills should be used automatically and subconsciously, whereas strategies demand awareness so that the students can self-evaluate their understanding and be capable of modifying the strategies where needed.

Flippo and Caverly (1991b) defined a ***study skill*** as "a strategic approach to reading in which students adjust their comprehending behavior before, during, and after reading much as they do in general reading, but with the purpose of satisfying a specific task that comes from either an internal or an external need. Thus it [studying] differs from general reading in that comprehension is strategically directed toward a specific task, such as gaining knowledge for a future career or passing a course test" (Flippo & Caverly, 1991b, p. 36-87). It follows that many children do not efficiently learn how to acquire and retain information through their reading because they may not know how to read strategically.

One reason for this is that they may never have been formally instructed in strategic reading skills (O'Sullivan, 1993).

The instructional model for teachers, ***Learning How to Learn***, divides study skills into four specific areas of concern. The four areas are chapter attack, organization, test-taking and memory. These areas were selected for inclusion because they recur in the research and current education literature as being important to study skills success (Miller & George, 1992; Robinson, 1970; Spires & Stone, 1989; Weed et al., 1990). To attack a chapter implies strategically approaching a chapter so that one can glean information from that chapter efficiently and focus on the important ideas presented within it (Robinson, 1970). Improving organization is central to improving performance on evaluation (Dickinson & O'Connell, 1990; Miller & George, 1992; Whiteside & Whiteside, 1988). Three points can be considered under the umbrella of organization in study skills:

1. the need to be organized for class (Wehrung-Schaffner & Sapona, 1990),
2. the need to be organized in notetaking (Pauk, 1984; Spires & Stone, 1989), and
3. the need to be organized in developing an overall approach to independent study (Dickinson & O'Connell, 1990).

Test-taking performance is partially a measure of ability to recall information covered in study sessions; however, test performance is also affected by test anxiety (O'Neill & Spielberger, 1979), test wiseness (Rafoth & DeFabo, 1990), the ability to approach a task strategically (Smith, 1988), and an organized approach to test taking (Millman & Pauk, 1969). Research has shown that memory, or the ability to recall information, is affected by self-assessment of memory ability (Wilhite, 1990), learning style (Archambeault, 1992), metamemory or knowledge about memory (Pressley, Borkowski, & O'Sullivan, 1984;

Weed et al., 1990), and the use of strategies in the recall of information (Andreassen & Waters, 1989; Sousa, 1992).

A ***study tactic*** is "an individual skill such as underlining, notetaking, outlining, summarizing, visualizing, or using mnemonic devices" (Wade, Trathen & Schraw, 1990, p. 149). In this thesis the terms tactic and skill were used interchangeably. Maxwell (1979) describes the inefficiency of isolating specific skills to be taught outside the curriculum to enhance study performance. Even though cognitive strategies are the focus of the model presented here it is important to introduce some basic study tactics. Study tactics, or basic study skills, have been integral to study skills instruction for many years (Alley & Deshler, 1979; Maxwell, 1979; Wark & Mogen, 1970) and should not be dismissed as unimportant. In the past, these tactics have generally been taught in isolation; however, today we understand that it is more beneficial to integrate the tactics into a strategic plan (Dole et al., 1991; Wade et al., 1990). The directed use of two or more of these study tactics for a specific purpose is, as previously explained, a cognitive strategy.

In Chapter 2 of the study skills model (see Appendix A) there are three study tactics presented in detail. A tremendous number of study tactics are available in current education literature. Three study tactics which researchers consider important to teach are notetaking (Criscoe & Gee, 1984; Rafoth & DeFabo, 1990), skimming and scanning (Hess, Shafer, & Morreau, 1975; Thomas & Robinson, 1982), and writing summaries (Maxworthy & Barry, 1992; Monahan & Hinson, 1988). These tactics have been chosen for introduction and explanation in the study skills model developed for this study because they have been established as important skills for efficient study. Additionally, these

tactics are useful for the proper execution of particular study strategies included in ***Learning How to Learn***, the model developed for this thesis.

Metacognition is defined as knowledge about and conscious effort to control one's own cognitive processes (Brown & Briggs, 1989). It follows that metacognition, as it relates to study skills, is the development of knowledge about study skills and the ability to personalize the approach to study by self-regulating and manipulating this new found knowledge (Pressley et al., 1989). Introducing students to a cognitive approach for acquiring study skills may help them realize how their own efforts in study can have an impact on their test performance and subsequently increase their metacognitive awareness (Flippo & Caverly, 1991b; Robinson, 1970). The phrase often used in education literature to describe metacognition is learning how to learn (Mulcahy et al., 1986). The model for study skills instruction designed by the author for this thesis is built on the hypothesis that teachers can integrate the cognitive-strategy approach into their instruction of study skills in the context of the curriculum (Ellis, 1993; Hoover, 1989; Scruggs & Mastropieri, 1993).

Metacognitive awareness is achieved when one can actively monitor and regulate the acquisition of instructional information in a strategic way (Dole et al., 1991; Pressley et al., 1984). It can be concluded that students should be guided towards learning how to use and monitor their use of strategies independently. If information is not understood or retained, the metacognitively aware student would know that the strategy choice was incorrect and then make the appropriate adjustment. This metacognitive awareness is considered critical to the autonomous use of strategies so that students can choose and manipulate strategies for a particular need without prompting or assistance (Pressley et al.,

1989). This indicates that teachers need to model the appropriate use of a particular strategy for children to help students achieve autonomy. The critical test of metacognitive awareness is whether or not the student can transfer that strategy to another appropriate situation accurately and regularly without prompting (O'Sullivan & Pressley, 1984).

1.5 ORGANIZATION OF THE REPORT

In this chapter the purpose for the thesis was outlined, the need for a model to assist the instruction of study skills within the curriculum was established, and the development of the model, together with the pilot study used in that development was presented. Chapter 2 of this thesis includes an overview of the most recent and relevant research and literature and justifies the need for direct instruction of study skills in content areas. The third chapter describes the planning and development of the study skills model. The small school-based pilot study executed for this thesis is presented in chapter 4. Presented in chapter 5 are the conclusions from this thesis which are drawn from three sources. The first source is the current literature and research in the area; the second source is the development of the model for direct instruction of study skills (***Learning How to Learn***); and the final source is the information reported by the teachers involved in the pilot study. Of course, the information reported in the pilot study cannot be generalized to form conclusions about the effectiveness of the study skills model when used on a different population..

The model developed for this thesis, intended to be a practical guide for the classroom teacher in the instruction of study skills within the context of the grade VI science curriculum, includes several strategies for teaching study skills. Some of these strategies

have been developed by the author while others come from sources within the education literature as indicated throughout the model.

The following chapter presents an historical overview of research in the area of study skills from the turn of the century to present day. This overview includes the place of study skills in the curriculum, the external factors affecting success of study, the traditionally accepted study tactics, the more current philosophy of metacognition, and the strategy approach with some examples of specific strategies.

2 LITERATURE REVIEW

> *"Years ago many persons were taught to swim by being thrown into the water. After their initial terror they were forced to try to propel themselves toward the shore while still thrashing the water to stay up... Present and possible future study techniques furnish an analogous picture. Students have to learn to study as best they can, but such trial-and-error methods result only in a hodgepodge of inefficient techniques"* (Robinson, 1970, p. 11).

This chapter serves four purposes. First, an overview of historically held beliefs about study skills in education is presented. Second, the current methodology in the area of study skills instruction is considered through a review of the literature and current research. Third, the definitive need for direct instruction of study skills within the context of the curriculum, at an appropriate age of instruction, is established. Fourth, distinction is made between the traditional study tactics or skills and the currently dominant cognitive approach to learning strategies.

2.1 HISTORICAL VIEWS ON STUDY SKILLS

Historically in education the term reading was coupled with the term study so that people often referred to reading and study skills as a single idea (Davis, 1990; Herber, 1965; Simmers-Wolpow et al., 1991). It follows that this marriage of study skills and reading has frequently left the responsibility of study skills instruction with reading teachers. The question of the school's responsibility for, and involvement in, study skills instruction has

been a contentious issue in education (Askov & Kamm, 1982; Rafoth & DeFabo, 1990; Thomas & Robinson, 1982).

Historically, beliefs about study skills were often opinions expressed by educators with no research to support these opinions (Adams, 1917; Kitson, 1926; McMurry, 1909; Sandwick, 1915). An historical review of education writings in the area of study skills indicates that many of the tenets of our pedagogical predecessors are still commonly held beliefs. The belief that there is a need for direct instruction of study skills (Flippo & Caverly, 1991b; Kitson, 1926; Robinson, 1970) and the necessity of establishing learning style (Archambeault, 1992; Hand, 1990; Sandwick, 1915) are two points that have been argued in education literature throughout this century. At the turn of the century, McMurry (1909) expressed the belief that young people did not learn adequate study skills without assistance but required direct instruction in study skills. Although this idea was put forth almost one hundred years ago, study factors identified by McMurry (1909), which include organizing ideas, memorizing information, and providing for individuality are still emphasized today. Although McMurry (1909) acknowledged that the Jesuits were leaders in education for nearly two hundred years, he nevertheless pointed out that due to their influence memorizing and studying became interchangeable ideas in education. In 1915, Sandwick described the idea of learning styles by suggesting that students needed to use more than the sense of sight. Sandwick (1915) proposed visual, auditory, and motor skills, facilitated by reading aloud and writing outlines, to add variety to the time spent studying. The idea that every subject in the curriculum required a different style of study was also maintained in Sandwick's (1915) writing. "Educational leaders", Kitson argued, "are seeing with increasing clearness the necessity of teaching students not only the subject matter of study but also methods of study" (1926, p. 7). It can be concluded

that some of the ideas held and the problems revealed by these turn-of-the-century educators are as relevant today as they were then.

2.2 CURRENT RESEARCH AND VIEWS ON STUDY SKILLS

Around the time of the second World War Francis P. Robinson (1970), breaking new ground in the area of study skills, individualized the approach to studying with diagnostic and prescriptive techniques that addressed particular subject areas. It is interesting to note that higher-level study skills became an important issue during World War II. Soldiers were hand-picked because of their superior intellectual abilities for quick training in highly specialized areas which were critical to the war. Although intelligent, many of the soldiers chosen were found to have inadequate study methods for retaining new information. In an attempt to circumvent this problem, methods of study were introduced to the soldiers. One of the study methods introduced was a cognitive strategy called *SQ3R* devised by Francis P. Robinson (Robinson, 1970). *SQ3R* remains "the oldest and most commonly used study strategy" to date (Ganz & Ganz, 1990, p. 181). Much research in the area of study skills remains focused on *SQ3R* or some modification of that strategy (Bailey, 1988; Burmeister, 1974; Farris et al., 1991; Forgan & Mangrum, 1989; Morgan & Deese, 1957). It follows that SQ3R is considered to be an important and relevant study strategy for instruction today.

In education the significant turning point that has dramatically affected the instruction of study skills is the introduction of cognitive learning strategies and metacognition (Ganz & Ganz, 1990; Robinson, 1970; Maxwell, 1979). Metacognition is defined as one's knowledge about cognition and the regulation of that cognition (Wong, 1985), or thinking

about one's own learning (Ganz & Ganz, 1990). It is commonly accepted that cognitive strategies are pre-planned methods of approaching certain intellectual tasks (Flippo & Caverly, 1991a; Rafoth & DeFabo, 1990). Research demonstrates that students need knowledge about, and understanding of, the strategies they are using for those strategies to be most effective (Haller et al., 1988; Pressley et al., 1989; Pressley et al., 1984). Strategies should be modified to meet the needs of the person or the task with the ultimate objective of metacognitive awareness which is accomplished once a person has achieved a conscious control over a set of strategies. Once this control is reached the person has the ability to monitor and regulate the strategies' usefulness in a given task (Harris et al., 1988; Jacobowitz, 1990; O'Sullivan & Pressley, 1984). From the variety of study strategies individuals should ascertain which ones work best for them. Learning style is important consideration in this choice according to the research of recent years (Archambeault, 1992; Hand, 1990).

The many articles in current education journals addressing ways to improve the ability to memorize information indicate that a good memory is still considered a valuable attribute for students (Breznitz & Share, 1992; Harris et al., 1988; Higbee, 1989; Levin, Rosenheck, & Levin, 1988; Pressley et al., 1984). "Many readers feel", according to Robinson, "that they understand the material as they read; the trouble comes later when they try to remember it... these readers have a nebulous feeling that there is much they have understood but now it is jumbled. Rather than dwell on this discomforting fact, they prefer to say, 'Well that's done! Now for the next lesson.' " (1970, p. 15). It follows that teachers are faced with the difficult task of helping the individual student remember specific information efficiently so that it can be retrieved when required.

At least three major conclusions can be formed from contemporary literature and research findings:

1. Many students have poor study skills (Dickinson & O'Connell, 1990; Grant, 1989, Nist et al., 1985, O'Neill & Spielberger, 1979).
2. Study skills can be taught (Rafoth & DeFabo, 1990; Robinson, 1970; Thomas & Robinson, 1982).
3. Many students benefit academically from study skills instruction (Allington & Strange, 1980; Graham & Robinson, 1992; Hafner, 1974; Robinson, 1970; Ryan, 1989, Thomas & Robinson, 1982).

2.3 STUDY SKILLS IN THE CURRICULUM

Four questions are frequently asked about how study skills fit into the curriculum. The questions deal with:

1. Whether study skills instruction should be the responsibility of teachers (Thomas & Robinson, 1982),
2. Whether this instruction should be separate from or integrated into the content areas (Allington & Strange, 1980; Rafoth & DeFabo, 1990),
3. Whether students could benefit from assistance with study skills (Dickinson & O'Connell, 1990; Robinson, 1970), and
4. Whether students of all ages can benefit from the introduction of cognitive strategies (Ganz & Ganz, 1990; O'Sullivan & Pressley, 1984).

Recognizing that the demands of curriculum instruction are great, Graham and Robinson (1992) argued that it is important to teach content, but it is equally as important to show

how to master that content. Rafoth and DeFabo (1990) argued that teachers should take more responsibility for teaching study skills in their classes. It is essential for study skills to be integrated into the context of the regular classroom and across the curriculum (Rafoth & DeFabo, 1990). Unfortunately the problem remains, as it did more than eighty years ago, when McMurry (1909) purported that teachers had insufficient training in the instruction of study skills. Then, as now, many teachers believe that they are not properly prepared to give instruction in the appropriate methods of study (O'Sullivan, 1993). Askov and Kamm (1982) suggested that unless teachers feel comfortable with teaching study skills, they may either not teach these skills or teach them poorly. The problem with study skills instruction has been alleviated slightly, since some teachers reading current education literature have been exposed to the concepts of metacognition and the strategy approach to instruction (Ellis, 1993; Hoover & Collier, 1992; Serna, 1989). Additionally some curriculum guide books, including the Addison-Wesley Science program used in the model developed for this thesis, introduce teachers to the cognitive strategy approach to study skills instruction. Furthermore, the Provincial Department of Education for Newfoundland and Labrador expects that children acquire the skills of studying within the curriculum (Provincial guide on core learnings). However, most teacher education programs include little focus on cognitive strategies, the instruction of strategies, or metacognition (O'Sullivan, 1993).

Ryan (1989) proposed that a teacher of science should teach content of the science course as well as appropriate ways to study this content. It follows that resource books in content areas serve an important role in independent study because the curriculum demands and the style of writing vary greatly for each content area. Research shows that there will be students, in an average class, who will find the assigned text too difficult to

read (Stevens, 1984; Simons, 1989). Forgan and Mangrum (1989) argue that if teachers intend that students read curriculum materials effectively teachers should instruct the necessary study skills and strategies. Education literature supports the belief that there are specific skills necessary for retaining and comprehending material in particular curriculum areas such as social studies, science, and math (Rafoth & DeFabo, 1990; Thomas & Robinson 1982; Viox, 1968). Study skills are necessary to help the student understand and retain more of the curriculum information while adjusting their personal rate and style of reading according to the purpose of the reading (Forgan & Mangrum, 1989). It can be concluded that teachers should be aware of the specific skills required for reading textbooks in the various curriculum areas. Thomas and Robinson (1982) point out the importance of making students aware of the different skills needed for reading different texts. For example, understanding science instructions often involves numerous steps and interpreting the correct sequence of these steps is critical to success in science reading. Science textbooks often have several concepts presented in one paragraph, and drawings or diagrams may offer important information. When reading mathematics, however, it might be more important to consider re-reading word problems, translating key words into mathematical symbols, reading orally, or estimating the answer before solving the problem. Finally, Thomas and Robinson (1982) argued that students who did not recognize and interpret these text differences would be unlikely to modify their reading skills to the demands of the task.

It can be concluded that a great diversity of skills contributes to success in each content area. In an educational setting perhaps the most appropriate person to isolate those curriculum specific skills is the teacher of that particular curriculum area. Clearly it must be the responsibility of the content area teacher to instruct students regarding which skills

are conducive to success in that particular subject and how students can study independently (Allington & Strange, 1980; Rafoth & DeFabo, 1990; Sandwick, 1915).

Current research and relevant literature lends further reinforcement to the idea that study skills should be taught in content areas:

1. Students need to be introduced to study skills in the context of the curriculum because they do not automatically transfer skills taught in isolation (Alvermann & Swafford, 1989; Rafoth & DeFabo, 1990; Robinson, 1970).
2. To facilitate effective transfer of strategies, students-especially younger children-benefit from knowledge about the strategy (Pressley et al., 1984).
3. When selecting strategies, one needs to consider the curriculum area for which the strategy is required (Hoover, 1989).
4. Research indicates that the ability to transfer strategies to different learning tasks is important for the effective use of strategies (Davis, 1990; O'Sullivan & Pressley, 1984). Independent transfer of strategies to new situations would demonstrate a desired level of metacognitive awareness.

Students at all achievement levels could benefit from study skills instruction (Robinson, 1970). Therefore, it should not be assumed that study skills programs are meant solely for underachieving students. Even at the post-secondary level many colleges report that students have inadequate study skills and need instructional programs for improved study and/or reading skills (Dickinson & O'Connell, 1990; Nist et al., 1985). In recent research with college-aged students, Anderson and Anderson (1992) found that when given a long list of choices, students attributed most of their college success to having study and

communication skills. These findings suggest that students value study skills as an integral part of their academic success.

In designing a study skills program for students, we have to consider the diversity of students in our classes. Montague (1992) described six factors relevant to the student which should be considered in the design of any study skills model:

1. student's age,
2. developmental level,
3. academic achievement in reading and math,
4. background and prior experience,
5. instructional history, and
6. behavioral characteristics like motivation and interest.

It follows that if we can expect study skills instruction to be effective, we must consider the age of our students. The earliest introduction of specific study skills presented within a cognitive strategy domain should take place with students in elementary or early junior high school (Ganz & Ganz, 1990). The age of introduction is especially important when considering the use of strategies (Haller et al., 1988; Heldenbrand & Hixon, 1991; Rabinowitz et al., 1992). Because many younger children do not generalize, they cannot transfer the use of strategies to different learning situations as independently as older children (Andreassen & Waters, 1989). It follows that in the primary grades, students need specific direction about how and when to use a strategy or tactic. However, O'Sullivan and Pressley (1984) found that children as young as five or six years of age can be taught to transfer strategies effectively to new situations if given more instruction and if they have an increased knowledge about the strategy. O'Sullivan and Pressley (1984)

acknowledged in their research that this strategy transfer remains more automatic with older children.

In the Newfoundland and Labrador Provincial Guide on Core Learnings in the Language Arts, prepared by the Department of Education, the study skills recommended for instruction before grade V are task specific. The recommended study skills include such skills as using a dictionary and glossary. As the children advance through the grades, the provincial policy outlines that study skills need to be introduced for the specific content areas. According to the provincial guide, students arriving in grade VI, are expected to know how to skim and scan, outline, summarize, and to a limited degree take notes (Provincial guide on core learnings).

It follows that a few basic study skills could be introduced to the beginning student. By the end of elementary and the beginning of junior high school, specific skills such as summarizing, notetaking, and questioning could be introduced in content area classes. It has been argued that, if trained, most students can benefit from study skills instruction, but many untrained students will use ineffective study methods (Grant, 1989; O'Neill & Spielberger, 1979; Robinson, 1970). Ideally, by the time students graduate from secondary school, they should be well versed in a number of study strategies that are effective for them. Also they should be able to self-regulate the success of their personal strategy use. This level of metacognitive awareness is difficult to attain but is essential if students are to use strategies for independent and successful study (Davis, 1990; O'Sullivan & Pressley, 1984; Pressley, 1986).

2.4 OTHER FACTORS WHICH AFFECT STUDY SUCCESS

Over the years, research has shown consistency in determining the external factors that affect the success of studying. The three factors most commonly identified in education research as influencing success are:

1. motivation to study (Montague, 1992; Morgan & Deese, 1957; Robinson, 1970),
2. physical environment of study (Filippo & Caverly, 1991a; Strang, 1968; Tonjes & Zintz, 1981), and
3. individual learning style (Archambeault, 1992; Hand, 1990; Sandwick, 1915).

Any student's success with a study skills program is affected by factors which are external to the program. Given the preceding three factors it follows that one specific approach in a study skills program could be exceptionally effective for one student and virtually ineffective for another. The success or lack of success in a study skills program may not always be directly related to the chosen method of study.

Motivation is held to be the most prominent factor affecting the mastery of academic material (Estes & Richards, 1985; Ganz & Ganz, 1990; Minnaert & Janssen, 1992; Morgan & Deese, 1957; Robinson, 1970). Motivation is prerequisite to study skills and, therefore, should be the first issue addressed (Serna, 1989). Ganz and Ganz (1990) found that unsuccessful students are often passive in their attempts to learn. The failure that they may experience as a result of this passivity reinforces the feeling of inadequacy. It is critical that students desire and expect to improve and that they realize any improvement is not precipitated by luck or fate. Robinson (1970) showed that students' performance will improve if they believe that their own efforts will make the difference in success. Alley

and Deshler (1979) proposed that poor motivation could be caused by students' unrealistic belief that school tasks should be entertaining or fun.

It can be concluded that, if instruction is to be most effective, students should want to improve and should believe that this improvement is possible for them. It is logical to assume that repeated failure at any task will generally diminish motivation and increase passivity. Students who have never received instruction in study skills and have not learned effective methods independently may become unsuccessful and unmotivated (Ganz & Ganz, 1990). Increased motivation increases one's readiness to learn (Allington & Strange, 1980). Unmotivated students may have learned to be passive and may no longer feel that they can control academic success. Helfeldt and Henk (1990) found that students became more motivated when they were taught strategies that helped them regulate their own learning. It follows that poor motivation may be facilitated by other factors such as passivity, feelings of inadequacy, or unrealistic expectations.

The physical environment of study has been considered from as early as the turn of the century. In 1909 McMurry encouraged parents to provide the proper environment for studying by ensuring that the study space was quiet and had good lighting and a comfortable temperature. Other researchers cautioned students about the effect distractions might have on performance (Flippo & Caverly, 1991b; Robinson, 1970; Strang, 1968). This consideration seems particularly important for those students who prefer to study with the television or stereo on in the background. These students may choose a relatively noisy or distracting environment without giving consideration to how this environment might positively or negatively affect their learning. This is not to say that a quiet environment is better than a noisy environment, rather that consideration must be

given to evaluating which environment works best for the individual The physical environment can greatly contribute to the success or failure of a session of study (Tonjes & Zintz, 1981; Robinson, 1970). Most people who study efficiently have specific preferences about their desired study space. This space may be quiet or have background music; it may be in a public library or a place of solitude. Some people prefer to sit at a desk, others, to lie down. Possibly there are as many variables for the study environment as there are people who study.

It seems important to encourage students to analyze their personal environment to consider which factors most positively affect their study performance. This self-awareness can be achieved through a variety of means including self-report checklists (Burns & Roe, 1976; Smith & Smith, 1988), questionnaires (Robinson, 1970; Thomas & Robinson, 1982), and personal interviews using open-ended questions. It seems critical that students understand how these external factors can be critical to the success or failure of their study sessions. Also important is the realization that the factors which affect study efficiency are individual and varied. Children should be informed that the physical environment can have an impact on study success. This heightened awareness could result in positive, effective adjustments to the study environment. The study skills model, ***Learning How to Learn***, included as Appendix A, contains a questionnaire intended to assist students in their evaluation of personal study environment. It is important to make students aware of the impact that their study surroundings can have on the success of their study sessions. This new awareness should allow them to analyze and choose a study environment that works best for them personally. With guidance students can continue to self-regulate the success they find with the chosen environment.

Learning style, which is individually determined, is an important consideration for any facet of learning (Archambeault, 1992; Hand, 1990). Rafoth and DeFabo (1990) found that students who chose and applied cognitive strategies to help themselves understand, process, and retain information were successful students. Such successful students understand which strategies are most efficient in specific situations and which ones work best for them personally. Flippo and Caverly (1991a) argued that it is important to assist students in choosing appropriate strategies for studying. One can infer that students can benefit from an increased awareness of their personal strengths and weaknesses in learning and then be encouraged to emphasize their strengths. This increased awareness can allow students to act more strategically.

Archambeault (1992) outlined two areas of focus in considering effective instruction of study skills. The two areas included enhancing the students' awareness of the personal factors that comprised their individual study style and increasing the students' ability to select the most effective strategies for various study tasks. It becomes clear that an effective and well chosen strategy should meet the needs of the task as well as the learning style of the student. Students should be encouraged to consider their individual learning style in the learning process (Archambeault, 1992; Hand, 1990). The model, ***Learning How to Learn***, includes a self-report survey which addresses learning style as it relates to studying. (Davis, 1990).

In considering cognitive theory it can be concluded that it would be beneficial for students to become actively involved in what they are learning (Simpson & Nist, 1990; Smith & Tompkins, 1988; Straw & Rudyk, 1989). It follows that identifying and using knowledge of learning style should help facilitate more active involvement in learning. Since learning

style is individual, it cannot be expected that all students will have similar needs in study skills instruction; nor is it possible for all students to require the same degree of effort to achieve similar results (Karlin, 1975).

Anderson-Inman (1989) identified three factors which contribute to success in studying:

1. being actively involved in learning,
2. being able to monitor the study session for success, and
3. feeling personally accountable for the study session.

To accomplish the goals outlined by Anderson-Inman (1989) students should be aware of their individual preferences in learning style. Hand (1990) cautioned that learning style should be seen as a tool for success, never an excuse for failure. Hand (1990) also encouraged teachers to have students share information about their preferred styles of studying so that they could be exposed to other available options.

In summary, it follows that motivation, physical environment, and learning style must be considered in any instructional approach to study skills. If there is a problem with even one of these variables, even the most appropriate study skills program can be rendered inadequate.

2.5 TRADITIONALLY ACCEPTED STUDY TACTICS

Historically the use of the terms study skills and study tactics has indicated the same meaning (Alley & Deshler, 1979; Dole et al., 1991). A study tactic is a specific study technique, which is intended for a specific purpose, such as underlining, notetaking or outlining (Wade et al., 1990). For the past fifty years study skills instruction has involved

more than teaching children study tactics; it has included study strategies as well. Study strategies usually combine several study tactics to achieve a specific end (Robinson, 1970). Because of the broad scope of definition for study skills, it is difficult to succinctly categorize the topic. This section will address the theoretical concept of study skills and discuss what study should achieve for the student as well as consider the specific tactics that predominate study skills instruction.

Reading and thinking are necessary components of studying. There are many theories concerning the use of reading and thinking during the study session. The theories of Herber (1965) and Graham and Robinson (1992) are presented here. Herber (1965) hypothesized that the three general areas included under the umbrella of reading and thinking are receptive, reflective, and expressive skills. Simply put, receptive skills involve being able to read and comprehend the ideas presented. Reflective skills require personal involvement in reading by inferring, interpreting, drawing conclusions, and predicting. Finally, expressive skills incorporate the organization of information gained through the receptive and reflective stages. In the synthesis process of using expressive skills students can apply what they have learned. Graham and Robinson (1992) proposed that the study skills process could be seen in the triad of tasks necessary before reading takes place, while reading is happening, and after a reading assignment has been completed. From these broad theories we can look at the specific tactics that can be instructed in the classroom.

Some research and education literature recommends the use of specific study tactics that are highly product-oriented in terms of helping students do well on a test (Alley & Deshler, 1979; Anderson-Inman, 1989; Hoover, 1989; Zeller & Wells, 1990). Specifically

Hoover (1989) stated that students at every grade level need direct instruction in "how to read an assignment, confront new vocabulary, listen and take notes, take tests, and write reports" (p. 455). Alley and Deshler (1979) asserted that students should be able to locate information, organize their reading through notetaking and outlining, survey to identify main ideas, and eventually achieve long-term storage and retrieval of information. Anderson-Inman (1989) used the computer as a tool to assist students in organizing and summarizing key ideas in self-testing. The five requisite study tactics outlined by Zeller and Wells (1990) were note-taking, text reading, time management, effective test preparation, and test-taking strategies.

The specific skills of study for instruction that are consistently recommended in the literature are: questioning (Robinson, 1978; Santeusano, 1983; Thomas & Robinson, 1982), memorizing (McMurry, 1909; Sousa, 1992; Thomas & Robinson, 1982), underlining (Adams, 1917; Flippo & Caverly, 1991b; Wark & Mogen, 1970), notetaking (Criscoe & Gee, 1984; Rafoth & DeFabo, 1990; Smith & Smith, 1988), summarizing (Burns & Roe, 1976; Maxworthy & Barry, 1992; Monahan & Hinson, 1988), organizing (Dickinson & O'Connell, 1990; Lloyd & Mitchell, 1989; Miller & George, 1992), and skimming and scanning (Hess et al., 1975; Santeusano, 1983; Thomas & Robinson, 1982). It is important to expose students to the variety of study tactics available to them so that these students can make informed choices. Study tactics are individual learning techniques such as underlining, note-taking, or outlining (Wade et al., 1990).

Students who have never received study skills instruction may try to do such things as memorize information, indiscriminately re-read entire sections, or simply look over what they are studying (Simpson & Nist, 1990). By asking students to describe in detail how

they prepared for an exam, Nist et al. (1985) found that many students were ineffectively expanding the information to be studied, rather than effectively condensing it. Specifically the participants increased their workload by doing three things. They re-read entire chapters, equated study with review, and tried to memorize information rather than understand it. It is reasonable to assume that lower achieving students often use and re-use study tactics that have proven to be ineffective to them in their performance on prior evaluation. For example, some students may choose to read the material over and over in an attempt to memorize it, even though the rereading has never proven useful for them. They continue to use inefficient strategies because they aren't familiar with any alternative approaches (Simpson & Nist, 1990). It follows that, if these inefficient strategies are being used by some students, teachers should make a concerted effort to reveal more beneficial study strategies. This increased awareness of study strategies could be attempted through direct instruction and by example.

Teaching students to combine purposefully the use of study techniques and better meet their personal needs is integral to a strategy approach in study skills instruction (Wade et al., 1990). Study tactics are useful techniques which have been the backbone of study skills instruction for many years. Children probably need exposure to a variety of tactics in a variety of situations. With guided practice they can learn how to choose the tactic that best suits their needs in a given situation. Without this exposure and practice students will likely depend on one or two study tactics that may not be effective for them (Nist et al., 1985; Simpson & Nist, 1990).

As previously established, the seven study tactics which dominate the literature and research regarding study skills are questioning, memorizing, underlining, note-taking,

summarizing, skimming and scanning, and organizing. In the education literature on study skills instruction, three general categories encompass the necessary skills for study.

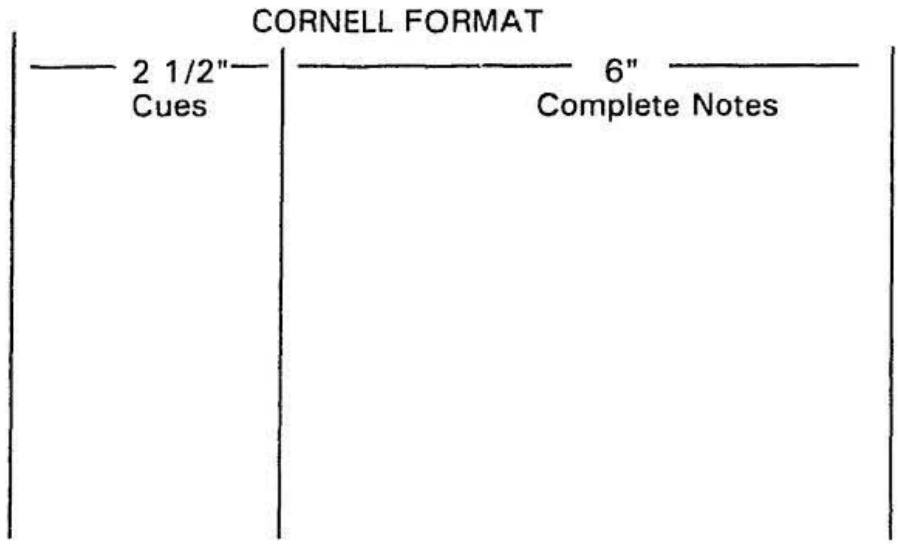
1. product-oriented study skills,
2. skills to enhance memory and comprehension, and
3. a metacognitive approach to thinking and learning.

The third category addresses the important topic of metacognition and is considered at length in the final section of this chapter. The first two categories, product-oriented study skills and memory and comprehension, have some overlapping concepts; however, they have been separated here for ease of understanding.

2.6 PRODUCT-ORIENTED STUDY SKILLS

Product-oriented study skills include underlining, note-taking, as well as skimming and scanning. It is common for study skills texts to include sections on underlining and marking texts (Adams, 1917; Flippo & Caverly, 1991b). Wark and Mogen (1970) argued the importance of underlining in an entire textbook devoted to the topic, Read, Underline, Review: A Method for More Efficient Learning. The authors discuss the importance of understanding how to underline the right amount, completely, consistently, and correctly Note-taking is equally well represented in more general texts on studying (Smith & Smith, 1988; Tonjes & Zintz, 1981). The Cornell Method of note-taking is believed to be an important resource for educators (Santeusano, 1983; Grant, 1989) This note-taking method encourages the student to draw a vertical line on the notetaking page in order to make a two and one half inch margin on the left side, and a six inch margin on the right side of the paper. The student records notes from the lecture or text, on the larger right hand section of his note paper. Following this the student should use the left margin to

highlight one or two important cue words from the corresponding notes on the right hand side.



Processing information quickly is beneficial to efficient studying. Skimming and scanning, as well as purposeful and methodical quick reading are considered relevant considerations in the area of study skills (Askov & Kamm, 1982; Hess et al., 1975). Scanning means to read with a purpose in mind, such as finding a specific word, date or name (Askov & Kamm, 1982). Skimming is a more complex style of reading that involves over-viewing a piece of writing to determine its main points and general purpose (Hess et al., 1975). Morgan and Deese (1957) recommended that we stop talking to ourselves when we read so that we might increase our speed of reading. The ability to speed read or to increase one's rate of reading are valued academic skills (Askov & Kamm, 1982; Breznitz & Share, 1992; Grant, 1989; Pauk, 1984).

In summary, product-oriented study skills such as skimming and scanning and notetaking are especially useful if they work well with an individual learning style. One caution for students in this area is that there can be too much emphasis on the product and not enough on the process. For example, although notetaking is an effective skill, obviously it is not useful or practical to rewrite notes directly from a textbook. Notetaking is meant to be an active process of establishing understanding and condensing information and should not be regurgitation. The Cornell Method of notetaking, sometimes referred to as the split page method of note taking, offers a successful guideline to assist students in productive notetaking (Grant, 1989; Santeusano, 1983).

2.7 MEMORY and COMPREHENSION

The second group of study skills chosen for categorization includes those skills or tactics that enhance memory and comprehension. This category includes questioning, memorizing, summarizing and organizing are discussed.

Thomas and Robinson (1982) argued that the most powerful study technique is self-recitation where a student asks, "What have I just read?" Research by Ganz and Ganz (1990) also stated that self-interrogation is important to students' independent comprehension of what they study. It follows that students should be constantly questioning the effectiveness of their study and then correcting any inefficiencies. Repeatedly assessing understanding is critical to comprehension and learning (Ganz & Ganz, 1990). Questioning can be viewed in several different ways. Some examples of the different approaches to questioning include student-generated questions (Santeusano,

1983), teacher-directed questions (Robinson, 1978), or questioning as part of the SQ3R study strategy (Carman & Adams, 1972).

Higbee (1989) found that instruction in memory improvement did not immediately increase students' grades, but it did enhance their self-perception of their memory skills. Assuming that perception of one's ability to achieve directly affects actual achievement, Higbee's research supports the belief that memory skills should be taught (Higbee, 1989). Knowledge about memory, or metamemory, is an important factor in increasing a student's ability to effectively use memory strategies (Pressley et al., 1984). Research demonstrates a positive correlation exists between metamemory and organization for remembering during study (Andreassen & Waters, 1989). It follows that some children can be taught to plan in advance for more effective retrieval of information. Research also supports the view that when memory strategies are instructed effectively, memory performance improves significantly (Pressley et al., 1984).

Many researchers express concern that students are often expected to know how to summarize efficiently when these students may not have been instructed in how to approach this complicated task (Hayes, 1989; Hill, 1991; Maxworthy & Barry, 1992). It is essential that teachers accept responsibility for teaching summary writing across the curriculum (Hill, 1991; Maxworthy & Barry, 1992). Jeremiah (1988) argued that in summarizing, a student should be able to show all the information or the message from given material in a succinct manner. Writing a summary is a complicated skill which Jeremiah suggested could be simplified by having students practice summarizing television shows. This fun activity is within the ability level of the average student and introduces them to a much more complicated task.

In Dickinson and O'Connell's (1990) investigation of the relationship between study time and test scores, they found that many participants spent a great deal of time studying yet still did poorly on evaluation because they put little time into organizing. Information that is organized can be more successfully recalled (Miller & George, 1992; Whiteside & Whiteside, 1988). To remember the maximum amount of information from textbook reading, students need to re-categorize and re-organize this information so that it works best for their personal recall (Lloyd & Mitchell, 1989). It follows that organization is integral to effectively remembering information.

In summary, literature and research have demonstrated that some of the factors which affect memory and comprehension in study skills are the ability to question, knowledge about memory, instruction in memory improvement, the ability to summarize, and possession of organizational skills.

2.8 METACOGNITION and the STRATEGY APPROACH

Much of the current research and literature in study skills involves metacognition and the strategy approach to instruction (Brown & Briggs, 1989; Weed et al., 1990; Wood, 1991). The remainder of this section is devoted to defining metacognition and establishing its purpose and place in the instruction of study skills. This was accomplished in part by looking at a sample of the strategies developed to improve study methods The original study strategy SQ3R has been analyzed in detail.

Ganz and Ganz (1990) explain metacognition as knowledge and beliefs about thinking, specifically thinking about one's own learning. Metacognitive development, or the

process of developing an awareness of our cognitive abilities and becoming actively involved in controlling these abilities, is at the centre of the strategy approach (Mulcahy et al., 1986). Students with sophisticated metacognitive awareness are far more likely to be able to make the necessary modifications to their own strategies of study and learning when faced with unfamiliar tasks or challenges than students with less sophisticated metacognitive awareness (Ganz & Ganz, 1990). Knowledge about a strategy and the task, as well as the ability to discriminate where, when, and how to use a strategy are integral components for developing metacognitive awareness (Pressley, 1986).

It follows that if students are to use study strategies effectively, it is essential that they become aware of what they don't know and hov they are best able to learn what they need to know. Teachers should help students become strategic learners since strategic students are successful students (Rafoth & DeFabo, 1990). We can help students develop their metacognitive ability by teaching them to question themselves. Self-questioning will help students to monitor personal progress, determine when they are understanding or not understanding, and assist with the integration of new and old information (Ganz & Ganz, 1990). It can be concluded that this active process of identifying problem areas may help the students realize the need for appropriate strategies that may help them overcome their areas of difficulty.

Alley and Deshler defined learning strategies "as techniques, principles or rules that will facilitate the acquisition, manipulation, integration, storage and retrieval of information across situations and settings" (1979, p. 13). Further to this definition, learning strategies can be viewed as a collection of mental tactics used by a person for a particular learning task to facilitate the acquisition of knowledge or a skill (Derry & Murphy, 1986). In

strategy instruction the emphasis is placed upon teaching students how to learn to cope with the content, rather than teaching the content (Alley & Deshler, 1979) Nist et al. (1985) found that students who were instructed in study strategies and began to use them independently could consistently improve their test scores. They did note that students had to be not only taught the strategies but also encouraged to use them. It is also beneficial if students believe that the strategies will be useful for them (Scruggs & Mastropieri, 1992).

There is a positive correlation between knowledge about memory, or metamemory, and the use of organization during study, as opposed to a haphazard memorizing of details (Andreassen & Waters, 1989). Many students have difficulty remembering what they study. Pressley et al. (1984) found that increased knowledge about a strategy positively correlated with effective use of that strategy over time. These findings lend support to the theory that strategies are best taught in the context of a curriculum where their use can be encouraged and reinforced and where the intended purpose of the strategy is obvious to the student.

Research supports the need for the direct instruction of note-taking skills (Tonjes & Zintz, 1981). Text underlining, annotation, or highlighting are study tactics that are often used by students but are rarely taught by teachers, thus minimizing the effectiveness of these tools (Simpson & Nist, 1990). With instruction and teacher guidance on effective annotation skills Simpson and Nist (1990) found that first-year college students were able to improve their performance on pre-test questions and on the actual tests The students improved and used less preparation time. It follows that instruction in cognitive study strategies can improve students' performance on tests. When there was no improvement

after instruction, Andreassen and Waters (1989) found that students had likely omitted the strategies during independent study. Robinson (1970) emphasized that the technique of a strategy should be automatic and simple for it to be most effective. This indicates that students would benefit from plenty of guided practice of any strategy to ensure its mastery and thus its independent use. To be most effective, strategies should not be complicated or time-consuming for the student to use (Pressley, 1986).

It can be postulated that strategies generated by other people can make useful examples of the component skills needed for a certain task. Also, to be effective, students could modify prepared strategies to suit their personal needs. At times, other people's strategies might be appropriate and useful without need for modification. Exposure to prepared strategies is also an important introductory step to developing personalized strategies. Further hypothesized benefits of exposing students to several structured or prepared strategies might be:

1. to raise students' awareness of the existence of strategies;
2. to illustrate that an organized goal-directed and efficient use of learning strategies increases a person's ability to acquire, think about, remember, and express information and ideas; and
3. to facilitate active involvement and interaction with the material to be learned, thereby increasing understanding and memory (Mulcahy et al., 1986).

To better explain a cognitive strategy three examples of strategies are discussed here. A plethora of strategies is available in current education literature (Farris et al., 1991; Rafoth & DeFabo, 1990; Wehrung-Schaffner & Sapona, 1990). The three strategies which follow have been chosen because they represent differing intended purposes. RIDER has

been demonstrated to assist students with reading comprehension (Mulcahy et al., 1986) The SCORER strategy outlines an approach to test taking which can improve overall approach to test taking (Carman & Adams, 1972). SQ3R has been demonstrated to improve overall organization for textbook study (Robinson, 1970). The theory and explanation of each strategy is presented.

RIDER

R READ A SENTENCE

I IMAGINE A PICTURE OF IT

D DESCRIBE THE PICTURE TO YOURSELF

E ELABORATE; CLOTHING, COLORS, MOVEMENT, SETTING

R REPEAT STEPS 1-4, GRADUALLY CHANGING THE ORIGINAL PICTURE AS MORE INFORMATION IS GAINED FROM EACH NEW SENTENCE, (LIKE A MOVIE).

(Mulcahy et al., 1986, p. 160)

RIDER is a visual imagery strategy that is intended to help students remember the details of descriptive writing as found in novels or short stories. In terms of introducing this strategy to a group Mulcahy et al. (1986) suggest that students should be asked to read a passage silently. As the students are reading the teacher asks individuals what they are visualizing as they read. Students may be asked to close their eyes to assist the visualization process. The teacher can prompt students by asking them to include more elaborate details in their description of what they have read. Research has shown this

strategy to be especially effective for learning disabled students who have difficulty with comprehension and retention of the details of their reading (Mulcahy et al., 1986).

SCORER

S SCHEDULE TIME

C LOOK FOR CLUE WORDS

O OMIT THE DIFFICULT QUESTIONS

R READ CAREFULLY

E ESTIMATE ANSWERS

R REVIEW THE WORK

(Carman & Adams, 1972, p. 210)

The SCORER strategy was intended to help students approach test taking in a more systematic way. This strategy can be useful for all students, especially those who are "compulsive, disorganized, or who tend to panic when in a test-taking situation" (Mulcahy et al., 1986, p. 165). Test performance is measured by how well a person recalls information requested on the test. Other skills that can improve test performance include one's ability to read and interpret test questions accurately (Smith, 1988), and an organized approach to tests (Millman & Pauk, 1969). The SCORER strategy introduces students to five skills that could improve their test performance by improving their organization during the test. These skills include scheduling time properly, doing the easier questions at the beginning of the test, and checking over the work at the end. The SCORER strategy is best introduced in a class discussion. Once the need for the strategy

has been established with the students, then the strategy can be practiced in the context of a test.

SQ3R

S SURVEY

Q QUESTION

R READ

R RECITE

R REVIEW

(Robinson, 1970)

Francis P. Robinson is credited with developing the most widely known learning strategy intended to improve the effectiveness of study. His initial purpose was to create a reading strategy that, with practice, would improve reading time, enable the student to pick out the main points in the reading, and help the student retain those main points (Robinson, 1970). The strategy which was originally published in his text Effective Study in 1941, was made famous because of its high profile use with soldiers in the World War II. SQ3R was used successfully to assist soldiers in more quickly and effectively mastering the content of training manuals to fulfill their military duties. Numerous variations to the strategy have appeared since that initial war-time application (Criscoe & Gee, 1984; Farris et al., 1991; Jacobowitz, 1988).

Alley and Deshler (1979) proposed that **SQ3R** should be individualized for every student who uses it. Mulcahy et al. (1986) argued that the strategy would be most useful for

slower readers, as it would help them find the main ideas by gleaning information. It has been determined through research that study strategies such as SQ3R can assist students' learning and performance (Haller et al., 1988; Robinson, 1970). This improvement in learning and performance can only manifest itself if certain criteria are met. Four important considerations for the effective instruction of strategies are:

1. Class time should be allotted for guided practice (Rafoth & DeFabo, 1990).
2. Generally, younger students will not transfer the skills without prompting and guided instruction (Davis, 1990).
3. Knowledge about strategies is important to effective use and successful transfer (Pressley et al., 1984).
4. Strategy use should be automatic to be effective (Robinson, 1970).

It is clear that effective strategy instruction should include knowledge about why and when to use the strategy, and be accompanied by sufficient guided practice so that strategy use will become automatic. Even though the strategy has been taught, younger students cannot necessarily be expected to transfer the use of the strategy to other learning situations independently. If strategy instruction is to be effective, teachers should be aware of the criteria and considerations for instruction and should integrate these considerations into their instruction. Each of the four considerations mentioned here should be realized if a cognitive approach to study skills instruction is initially to succeed, and if that approach is eventually to help students develop metacognitive awareness. Lack of success in an instructional cognitive strategy approach might be linked to some problem with one of the four stated considerations for instruction.

In summary, metacognition and the strategy approach to instruction are integral to the study skills model, ***Learning How to Learn***, which was developed for this thesis. Research and literature, as summarized here, establish that students who develop metacognitive awareness are more likely to be successful students. Knowledge about strategies and direct instruction in how and when to use strategies improve one's ability to use them effectively. Ready-made strategies are useful in that they establish an awareness of the existence and effectiveness of strategies and meet the needs of specific learning tasks. However, students should be guided towards individualizing and modifying strategies to satisfy their personal learning needs. Effective instruction of strategies requires guided practice, students' knowledge about the strategy, effective transfer, and automatic use of the strategy.

2.9 CONCLUSION

Children often need direct instruction in the skills of studying. This instruction should take place in the context of content area curriculum because each subject requires its own skills. These specific reading and study skills may not be as effectively learned in isolation outside the curriculum. Some teachers need to take more responsibility for the teaching of strategies and tactics for study in content area classrooms. Students should be instructed in traditional study tactics at a very early school age and these tactics should be reinforced throughout schooling. Cognitive learning strategies should be introduced at the grade VI or VII level to ensure that children are developmentally ready to transfer the skills of these strategies. Students should be made aware of the factors, outside of their study program, which can affect their personal success with studying. These external factors include motivation, physical environment, and individual learning style.

McMurry (1909) argued that the desire to work needs to come from within and that students must work towards taking more responsibility for their academic achievement. Although McMurry's work is dated, the opinion remains relevant in 1994. Teachers should assist their students in working towards independence in studying by directly instructing the skills students need to study effectively and independently. An effective study skills program should impart to students the necessary skills for independent school achievement in all content areas. The development of study skills is most effective if approached as an ongoing process and an integral part of every student's schooling.

In the next chapter methodology of the planning and development of the study skills model, ***Learning How to Learn,*** is discussed. The outline for the pilot study included in the development of the model is also presented. ***Learning How to Learn*** was designed as an instructional tool to help teachers introduce their students to a strategy approach to acquiring study skills. The model was used as a study skills resource by a group of grade VI science teachers during a six week pilot study that took place from March through to May of 1993. The purpose of the pilot study was to ascertain the participants' opinions regarding any difficulties encountered when using this approach in their grade VI science classes. These problems would need to be addressed before carrying out a formal evaluation of ***Learning How to Learn***.

3 PLANNING AND DEVELOPMENT OF THE STUDY SKILLS MODEL

In this chapter the methodology involved in the planning and developing of the study skills model ***Learning How to Learn*** will be explained. This model, researched and written by the author, is presented in Appendix A. As part of the development phase a small school-based pilot study was conducted. The pilot study was intended to highlight problem areas in the model as reported by classroom teachers. Any necessary modifications would need to be addressed before proceeding to a large scale program evaluation.

3.1 METHODOLOGY and PROGRAM PLAN

Education research and development is designed to bridge the gap between theory-driven research and educational practice (Borg & Gall, 1989). The primary goal of education research and development, according to Borg and Gall (1989), is to "take research knowledge and incorporate it into a product that can be used in the schools" (p. 781). Research is important to educational development but is not always practical in terms of being a resource for teachers. However, research conclusions and findings can provide the knowledge and conceptual framework necessary to develop such a resource.

The primary goal of this thesis was the development a new product, a study skills model, designed to address two separate areas of concern identified in current education research and literature. The model developed for this thesis ***Learning How to Learn***, integrates two relatively new education hypotheses. The first hypothesis is that cognitive strategies can be used to improve learning, and the second is that study skills can be directly instructed in the context of the curriculum.

In this thesis educational findings were used to develop a practical tool for our schools, in accordance with the research and development process described by Borg and Gall (1989) There are four steps in Borg and Gall's (1989) research and development process. The first two steps are addressed in this thesis. "The steps of the R & D process are usually referred to as the R & D cycle, which consists of studying research findings pertinent to the product to be developed, developing the product based on these findings, field testing it in the setting where it will be used eventually, and revising it to correct the deficiencies found in the field testing stage" (Borg & Gall, 1989, p. 782).

The first step of the research and development cycle involves a review of the current research in the area. The review of literature and current research, contained in chapter 2, highlighted the need for a cognitive strategy approach to directly instruct study skills in content area classes. The research findings converged on the following conclusions: Study skills are an integral part of academic success, but many students use ineffective study methods (Robinson, 1970; Ganz & Ganz, 1990; Grant, 1989). Students are commonly expected as they mature to develop study skills with little or no specific guidance or instruction (Dickinson & O'Connell, 1990; Nist et al., 1985). Effective cognitive strategy instruction can improve academic performance (Pressley et al., 1984; Robinson, 1970). There seems to be a need for a practical resource that will assist teachers with the direct instruction of study skills in content areas (Flippo & Caverly, 1991a; Nist et al., 1985; Robinson, 1970).

The second step of Borg and Gall's (1989) research and development cycle dictates that developing the product be based on the findings of the research review. The study skills model presented here integrates the findings of current research and literature as

summarized in chapter 2. The six week pilot study was intended to assist in the development of the study skills model. The opinions of classroom teachers for whom the resource was intended were seen as an essential part of the development of the model

In the pilot study the model was presented to a group of five interested teachers of grade VI science. These teachers were asked to use the model in their science classes for a period of six weeks. Before involvement in the pilot study, teacher participants agreed to a personal interview at the end of the six-week period to state their opinions of problem areas encountered. The results of the interviews are included in this thesis It is intended that future revisions of ***Learning How to Learn*** will incorporate the teachers' suggested modifications.

The third and fourth steps of the research and development cycle involve field testing the product in the setting for which it is intended and then correcting any deficiencies identified in the field testing. These steps require a large scale evaluation study. This type of program evaluation was not attempted here. However, the information collected in the pilot study was intended to highlight obvious difficulties within the development of the model. Modifications based on this data would be of benefit to the subsequent program evaluation.

3.2 DEVELOPMENT of the PRODUCT

The study skills model created for this thesis, ***Learning How to Learn***, was intended to be a practical guide for grade VI science teachers in instructing study tactics and strategies within a cognitive framework. Research consistently and convincingly shows us that most

students need to become proficient in study skills if they can hope to be academically successful (Robinson, 1970; Straw & Rudyk, 1989). It follows that without direct instruction in how to study, many students will become disillusioned about their own ability to study effectively and about the possibility of attaining the academic results they expect and desire (Simpson & Nist, 1990; Straw & Rudyk, 1989).

Learning How to Learn was developed by the author to be used in conjunction with the Newfoundland and Labrador grade VI science curriculum. The justification for this model was based upon a review of the literature and current research on study skills. The short term goals of this thesis were:

1. to demonstrate through a literature review that the direct instruction of study skills is beneficial,
2. to demonstrate through a literature review that a cognitive strategy approach to instruction is an effective approach,
3. to develop a practical model for the direct instruction of study skills which makes use of a cognitive strategy approach, and
4. to detect any problem areas as determined through classroom use of the model ***Learning How to Learn***.

The long term goals are to use the information collected through this thesis to:

1. assist in the implementation of a large scale program evaluation designed to determine the effectiveness of the approach presented in ***Learning How to Learn***, and
2. ultimately develop a practical and effective tool for classroom teachers to use in study skills instruction.

A look at the most current literature in education reveals that the strategy approach to instruction is of primary interest to educators today (Ellis, 1993; Houck, 1993, Scruggs & Mastropieri, 1993; Vauras, Lehtinen, Olkinuora, & Salonen, 1993; Wong, 1993). Helping students work towards increased metacognitive awareness, or understanding how they learn, appears to be the most innovative and encouraging breakthrough in study skills research in recent history. This innovation does not dismiss the usefulness of more traditional study tactics. The study skills model developed for this thesis and presented in Appendix A uses both the tactic and strategy approach to instructing study skills; however, the model emphasizes cognitive strategies.

An abundance of strategies are presently available in education literature, some with greater merit than others. As students gain in metacognitive awareness, it is important that they choose strategies with a discriminating eye rather than invest time in a strategy on the assumption that it will be useful or practical.

The following criteria were adhered to for strategy inclusion in the study skills model ***Learning How to Learn***:

1. Good strategies have a specific intended goal and are not intellectually complex so as to make them complicated or difficult to use (Pressley, 1986).
2. Good strategies strike a balance between being time efficient and being effective in terms of improving performance (Flippo & Caverly, 1991a).
3. Good strategies facilitate ready transfer to other academic tasks, making the strategy most effective for the student (O'Sullivan & Pressley, 1984).

The twenty-three strategies presented in ***Learning How to Learn*** came from three sources. The first group of strategies was found in current academic journals and texts. Generally research demonstrated these strategies to be effective in helping students learn (Rafoth & DeFabo, 1990; Robinson, 1970; Thomas & Robinson, 1982). These strategies were selected based upon their usefulness in study enhancement. Since the reading level of these strategies was not always appropriate for a grade VI student this problem had to be addressed. The second group of strategies included in the model contains modified versions of the first group of strategies. The author has reworded these strategies to make them more appropriate for the curriculum demands and reading level of the average grade VI science class. The modified version of each strategy is intended to maintain the purpose and goal of the original strategy. Finally, three of the strategies included in ***Learning How to Learn*** have been developed by the author in working with individual students to meet specific needs of the students. The strategies in this third group are original.

The model ***Learning How to Learn*** offers specific guidelines for teachers in how to introduce and instruct strategies in the classroom. These guidelines, which seem to be of paramount importance to the success of the metacognitive approach, are based on the research of Francis Robinson (1970) and Carol Dana (1989). If these guidelines for instruction are followed, it is expected that most students who eventually learn to use and self-monitor the effectiveness of strategies will achieve metacognitive awareness.

The prescribed method of strategy instruction in ***Learning How to Learn*** involves four basic steps. The first step is to establish the need for the strategy with the students. This can be accomplished by assisting the students in identifying a problem and determining the

need for a more organized approach to this problem. For example, class results on a recent social studies test may indicate that several students had difficulty remembering all the provinces and capitals. A class discussion regarding this problem may reveal that students had difficulty with the number of provinces and cities to be remembered The second step suggests that teachers model the chosen strategy for students in the context for which it is intended. For example, the first letter mnemonic strategy could be introduced to demonstrate that the provinces and capitals could be more easily recalled by using the first letters to create a simple, meaningful sentence. The third step suggests that teachers provide an opportunity for guided practice in the classroom. This supervised practice is intended to circumvent any potential difficulties the students might encounter when using the strategy independently. For example students could be asked to create their own first letter mnemonic to remember all the continents. This activity could be performed in small mixed-ability groups with the teacher available for guidance. With this guided practice students will be less likely to encounter difficulty when using the strategy independently. Finally, teachers should require independent practice of the strategy in a relevant and meaningful context. For example, students could be asked to use first letter mnemonics to help them remember the parts of a flower for science homework. As always students should be encouraged to modify strategies to meet their individual needs.

Learning How to Learn is intended to be self-explanatory. The study skills model includes a straightforward set of guidelines for the instruction of strategies in the classroom. The model includes a comprehensive table of contents, and its physical layout is intended for easy reference. The model, ***Learning How to Learn***, includes the following topics:

- Study tactics
  - Notetaking
  - Skimming and Scanning
  - Writing Summaries

Study tactics which are individual study techniques are presented in chapter 2 of the model. Although these tactics are individually limited in terms of usefulness, they are necessary skills for developing a strategic plan in studying. Teachers and students need to know these tactics which will help them in using the strategies presented in chapter 4 of ***Learning How to Learn***. These tactics, which recur in the literature as being worthy of teaching, are considered prerequisite skills for using the more complex strategies included in the model.

- Metacognition
  - Cognitive Strategies
  - Instruction of Cognitive Strategies
  - Two Models for Teaching Strategies
  - Achieving Metacognitive Awareness

Cognitive strategies are the central theme of ***Learning How to Learn***. The terms metacognitive awareness and cognitive strategies are defined and put in the context of their use within ***Learning How to Learn***. For each individual strategy some suggestions are presented under the heading Suggestions for Instruction. The two general teaching procedures included in the model are intended to be used as specific guidelines for instructing strategies because they represent an effective approach to strategy instruction (Dana, 1989; Robinson, 1970). During the initial information session teachers involved in the pilot study were introduced to the prescribed instructional approach.

The four categories of cognitive strategies presented in chapter 4 of ***Learning How to Learn*** are:

- Study Strategies Organization
  Chapter Attack
  Remembering
  Test Taking

Within each of the four general strategy areas there are several specific strategies presented in ***Learning How to Learn***. Each strategy and its purpose is described, along with specific suggestions that may assist instruction. There is an overview displaying each strategy as it can be presented to students. Where appropriate, the strategy is also presented in a modified form to make it more practical for a grade VI science student. In most cases the modifications are simply changes to the wording of the strategy so as to make the reading level more appropriate for the average grade VI student. The modified strategy is intended to serve the same general purpose as that of the original strategy. Each strategy is also listed in alphabetical order and presented in that order on an individual page at the back of ***Learning How to Learn***. This will allow the teacher the option of presenting the strategy as a one-page handout for the students.

Most of the strategies included in ***Learning How to Learn*** were demonstrated through research to be effective in helping students achieve improved learning (Carman & Adams, 1972; Dana, 1989; Rafoth & DeFabo, 1990; Robinson, 1970). Several of the strategies found in the literature were modified to meet the specific demands of the Addison-Wesley grade VI science curriculum. The integrity of these strategies remains intact because the intended purpose of the strategies remains the same. In most cases the modifications are solely in the wording of the strategy so as to make them more suitable for an average

grade VI student. The three original strategies which are included were developed by the author to meet the needs of individual students. There are as many as five strategies included in each of the study categories. The number of strategies is intended to provide sufficient options for the classroom teacher in meeting the varied needs of the students.

Included in the model are four appendices which provide further activities for the teacher to use in introducing the concept of study skills with students. Appendix A presents a list of twenty-two vocabulary words commonly encountered on essay type tests. The vocabulary words have precise meanings and many students would benefit from instruction in these words. Appendix B describes three poetic devices to aid memory. Rhyme, rhythm and grouping can be successful memory cues for some students. Appendix C is a self-report survey which addresses personal study environment. Appendix D, the last appendix, is a more general self-report survey to stimulate thought about study habits and learning style.

In the next chapter of this thesis the school-based pilot study is discussed. Specifically the chapter includes information about the purpose, the teachers, the interviews, and the interview responses of the pilot study.

4 SCHOOL-BASED PILOT STUDY

In this chapter the school-based pilot study is presented in five sections. In the first section the purpose of the pilot study, how the study fits into Borg and Gall's (1989) research and development cycle, and the pilot study's limitations are discussed. Next, the organization of the pilot study is briefly outlined. Following this section is information about the teachers who participated in the pilot study and about the reasons they were chosen for inclusion. The final two sections include the interview questions and the responses that were collected.

4.1 PURPOSE

The purpose of this thesis was the development of a practical resource for teaching study skills. Borg and Gall (1989) describe education research and development as the bridge between research knowledge and the development of practical resources for teaching and learning. The four steps of Borg and Gall's (1989) research and development cycle include studying research findings related to the topic, developing a product with these findings, field testing the product, and revising the product to correct deficiencies. The first two steps of the cycle are addressed in this thesis. The small school-based pilot study was included as part of the second step, developing the product. The information gathered in this school-based pilot study will be used to eliminate the difficulties reported by the teachers involved before a large scale evaluation occurs.

The purpose of the pilot study was simply to determine the participants' opinions about the problem areas and strengths of the teaching model ***Learning How to Learn***. In achieving this purpose, teachers were asked to report their opinions on the

appropriateness of using cognitive strategies to directly teach study skills in grade VI science. Teachers were questioned regarding whether or not they believed the strategy approach to instruction was a practical tool for classroom instruction. They were asked about the probability that they would continue to use these ideas in future and about the need for teaching study skills directly in the context of content areas.

The information reported in this school-based pilot study is limited for three reasons. First, a very select sample of five volunteer teachers was involved in the pilot study. These teachers all acknowledged the need to teach study skills. The attitude of this group of teachers may not accurately represent the attitudes of all teachers with regard to the need for study skills instruction. Accordingly, these teachers cannot be considered representative of the population of teachers as a whole. This sample was selected deliberately. It was reasoned that, if a small number of interested volunteers had difficulty instructing the model, major changes would be necessary before a large scale program evaluation with a representative sample of teachers could take place. Second, every participating teacher was instructed in the required method of teaching strategies in their classrooms. Although anecdotal reports of the teachers' classroom instruction were collected there was no direct monitoring of their use of ***Learning How to Learn*** in the classroom. Accordingly, the information reported in the interviews constitutes participants' expressed opinions regarding the difficulties and strengths of the model as they perceived them. No firm conclusions can be drawn regarding the teachers' actual use of the model in their classrooms. The third limitation is that data collection in this pilot study was limited to semi-structured personal interviews. Interviews are subject to bias because of the potential for respondents to be eager to please the interviewer, as well as bias from the interviewer's tendency to seek out answers that support preconceived

notions (Borg & Gall, 1989). In looking at bias, it is important to consider that the pilot study was intended to be informal. All the teachers involved in the pilot were colleagues of the author. One of the reasons they were approached to participate in the study was that they had a positive working relationship with the author. It was reasoned that this group of people would have been willing to offer suggestions for improvements to assist the author in developing the model. Overall, these three limitations in methodology were considered acceptable given that the purpose of the pilot study was simply to identify obvious difficulties with the instruction of ***Learning How to Learn***.

4.2 THE TEACHERS

In February, 1993, thirteen grade VI science teachers from seven schools were asked to be involved in the implementation of ***Learning How to Learn*** in their classes. Initial contact was made with each school's principal by telephone or in person explaining the purpose of the program. This initial contact was augmented by a follow-up letter. Following this contact a letter was forwarded to each of the original thirteen teachers to further explain the project and to allow them to confirm or reject commitment. Permission for teacher involvement was granted by a letter from the Roman Catholic School Board for St. John's, in St. John's, Newfoundland. All the teachers contacted for involvement in the study work with this school board and have at one time been colleagues of the author. The teachers were chosen for inclusion because of their perceived or expressed interest in teaching study skills.

The thirteen teachers who were approached included eight female teachers and five male. Five teachers showed an interest in the program but declined involvement because of

personal or professional commitments. Two teachers did not respond to the request and could not be reached by telephone. Six teachers expressed interest in participating in the program; however, one teacher reversed this decision afterwards. The five teachers who eventually were involved in the school-based pilot study included three women and two men. The five teachers were from three urban schools, one suburb, and one rural school. In terms of teaching experience, the range was from one to twenty-eight years. One male teacher was in his second year of teaching. One female teacher who had five years teaching experience some time ago, had re-entered the profession that year. Two teachers, one male and one female, had more than ten years teaching experience. Finally, one female teacher who was also an administrator, had twenty-eight years of experience. All the teachers involved stated their interest in improving their students' ability to study. Only one of the teachers involved reported any prior knowledge about metacognition or the strategy approach to instruction.

4.3 ORGANIZATION

In March of 1993 the teachers participated in a one-hour information session which dealt with the philosophy and instruction of this model. At that time teachers were given a copy of ***Learning How to Learn***, presented in bound handbook form. The purpose of the one-hour session was to inform teachers about the metacognitive approach to teaching study skills and to explain to them in detail the procedure for introducing strategies in their classrooms. The teachers were also informed that ***Learning How to Learn*** was not intended to be used in isolation, but rather it should be used as a resource for teaching the science curriculum. They were encouraged to use the ideas of the model as a tool for teaching study skills in conjunction with the work of their science classes. During the

information session the teachers were given the author's home and work telephone numbers and they were encouraged to call if there were any problems or questions.

The five teachers were asked to begin using ***Learning How to Learn*** in their classes in March of 1993. All teachers received a letter during each of the six weeks of the pilot encouraging them to contact the author if they had any questions or difficulties. In the three telephone communications received by the author the teachers indicated that they were successfully directing their science lessons towards teaching the study skills outlined in ***Learning How to Learn*** but they wanted to discuss specific concerns. One teacher wanted to use the model for curriculum areas other than science and was concerned that this might not be appropriate to the pilot study. The teacher was encouraged to use the ideas across the curriculum. The second teacher expressed concern that the model contained an overwhelming number of strategies and that after four weeks only two strategies had been introduced to the class. The teacher was reminded that the pilot was only intended to gather teacher opinion and that the strategies should be used at a comfortable pace. The third teacher was concerned because grade VI science was a subject she taught outside her homeroom. This teacher was convinced that her homeroom students in grade VII would benefit more from the use of the model than would her grade VI science students. This teacher was encouraged to continue using the model with the grade VI science students and to try to work with the grade VII students if possible

For the purpose of program development semi-structured, personal interviews were conducted in May of 1993. At this time, the teachers reportedly had been using the program in their science classes for a total of six weeks. The results of the interviews are presented and discussed in detail in the last two sections of this chapter.

4.4 THE INTERVIEWS

At the end of the six-week pilot study, the author interviewed each teacher individually with a set of fourteen questions. Teachers received the questions one week prior to their interview. The primary purpose of these interviews was to have the teachers report the difficulties and strengths of the model as they encountered them in the six week period. The interview questions and the teachers' responses are included in the next section.

Personal interviews are one of several possibilities for gathering information. The author chose to interview because of the three benefits outlined by Borg and Gall (1989):

1. Interviews allow direct verbal interaction with the participants.
2. This interaction allows for immediate feedback and can potentially increase the clarity of the responses.
3. The interview situation can allow for greater depth of response and questioning.

Interviews are limited and have disadvantages as well as advantages. Two primary disadvantages of interviews are that they are an easier tool to use than the administration of a test, consequently, it is tempting to use an interview when another method of gathering information might be more appropriate. Also the interactions between the interviewer and the respondent are subject to bias from both perspectives (Borg & Gall, 1989) As the pilot study was intended to be informal, the cautions about interviewing highlighted by Borg and Gall (1989) were not viewed as significant.

Once the decision was made to use personal interviews, consideration had to be given to the format of and questions for these interviews. Borg and Gall (1989) offered much advice in terms of preparing and conducting an interview. The use of an interview guide

was recommended to organize the questions, the sequence of questions, and opening and closing guidelines for the interviewer. From the suggested structured, semi-structured or unstructured interview framework, the author chose a semi-structured approach for the interviews and the interview questions to attain a reasonable amount of objectivity and get a thorough understanding of the respondents' opinions. The information from the interviews was hand recorded even though this procedure could potentially inhibit communication. The author was concerned that taping the interviews might inhibit the respondents. Video or audio taping can change the interview situation in that respondents may be reluctant to respond freely. As recommended by Borg and Gall (1989) the respondents were informed that their responses would be anonymously reported in group form. The author also considered it important to forward the interview questions one week in advance of the interview to help respondents feel at ease with the questions Finally, on completion of the interview session, each teacher was asked to read the record of his or her interview to ensure accurate recording of the teachers' responses

The semi-structured interviews, each conducted individually, were comprised of fourteen questions. The questions were administered in the following fixed order:

1. Is study skills instruction needed in the classroom?
2. Are you more confident in your ability to instruct study skills after using ***Learning How to Learn***?
3. Is the metacognitive approach a practical and useful tool in the classroom?
4. In general, were grade VI students ready for cognitive strategies?
5. Did students benefit from direct instruction in study skills as presented in ***Learning How to Learn***?
6. Has using this model in science classes:

made teaching more efficient?

made teaching less efficient?

made no difference to progress?

7. Were you able to integrate the ideas of the study skills model into the science curriculum successfully? What problems did you encounter?
8. Would this model be effective if taught outside of the curriculum, that is, taught in isolation?
9. Were modifications to the strategies necessary; if so, were they useful?
10. Are there specific areas of the model that need improvement?
11. Were you satisfied with the quality and amount of inservice provided?
12. Is this approach appropriate outside science classes?
13. Were you satisfied with the organization of ***Learning How to Learn***?
14. Will you continue to use the ideas of this model for study skills instruction in future?

In the next section of this thesis the specific responses of the teachers during the interviews are presented. The teachers' responses are presented verbatim. Also given for each question is a summary of the information reported by the teachers.

4.5 THE RESPONSES

The responses to the interview questions included here represent the verbatim recordings by the author during the interviews with the five teachers. If an idea was unclear as it was recorded in the interview the author added clarifying words to ensure that the intended meaning of each statement was clear. These added words are clearly encased in brackets to separate them from the interview recordings. Each individual teacher is identified by a

letter of the alphabet Specifically the teachers are identified by the letters A, B, C, D, and E. In addition to the individual responses, a summary of these responses is included for each question.

1) Is study skills instruction needed in the classroom?

Teacher A: Yes, these skills will show improvement in all other areas

Teacher B: Of course, we take too much for granted in terms of how children are prepared to study independently. It's just not realistic.

Teacher C: Yes, from grade IV and up. It's [study skills instruction is] probably not appropriate in the primary grades.

Teacher D: Absolutely, no question about it.

Teacher E: Yes, definitely.

The teachers reported that study skills instruction is needed in the classroom.

2) Are you more confident in your ability to teach study skills after using *Learning How to Learn*?

Teacher A: Oh yes, immensely. I had no idea how to study myself until about my 4th year of university. Nobody taught me how to study. So how could I teach others?

Teacher B: This handbook has improved my teaching. We [the class and I] have enjoyed using it, but six weeks wasn't long enough to really get into it.

Teacher C: Definitely, this made me aware that how I was teaching study skills in the past, [it] just wasn't efficient. I need more time to work with these ideas myself.

Teacher D: I feel a little more confident. I would need a longer time to gain confidence with metacognition, it's an intimidating word. You need to be really organized to use a metacognitive approach, and this was difficult with the science program. We [teachers] avoid study skills like the plague - we don't know how to study ourselves or how to teach studying.

Teacher E: This is my first exposure to teaching study skills. I feel better now that I have something to follow, a resource. There is not enough guidance for teaching study skills in the curriculum.

All the teachers reportedly gained some confidence in their ability to teach study skills while using ***Learning How to Learn***.

3) Is the metacognitive approach a practical and useful tool in the classroom?

Teacher A: I think it is practical, and it [the metacognitive approach] goes outside the boundaries of science. You need to teach it [study skills] hand in hand with the content. It really works to integrate study skills into the curriculum.

Teacher B: Definitely at the grade VI level with all the emphasis on co-operative learning - making sure the kids see where they are going, taking ownership and responsibility for their learning. Now *we* are doing the chapter

together instead of *me* teaching *them* the chapter. ***Learning How to Learn*** helps them to become independent learners.

Teacher C: Yes, although it depends on the group of children. It would be great to begin the year with this approach. My expectations would have been higher; I wouldn't have spoon-fed them so much. I didn't give the children enough responsibility earlier in the year, and now it's hard to wean them from this dependency.

Teacher D: It is useful, but not for every student. Bright and average kids benefited, but the slower children needed much more modeling than was reasonable in the classroom. This approach does make all students better organized. It would have been great for me to have known these strategies when I was in school.

Teacher E: I think it's appropriate, especially for the 10-15 students [in my class] who could really grasp the concepts. Kids who have difficulty reading the text can't be expected to be independent with study skills.

In general the teachers considered the metacognitive approach to be a practical and useful tool in the classroom. However, some of the teachers reported that strategies might have limited usefulness for students with below average intelligence or reading ability.

4) In general, were your grade VI students ready for cognitive strategies?

Teacher A: Strategies are definitely age appropriate if taught in conjunction with the curriculum. At grade VI students need concrete examples of how to apply

specific study skills - teachers need to make it concrete or pertinent to what they are doing in class and it will work.

Teacher B: Yes, they were ready. The kids easily transferred what they were learning to do [in study skills] in science to their other subjects. Even younger students would benefit from this approach.

Teacher C: Grade VI students are definitely old enough.

Teacher D: Yes, they're not babies. They are looking for something more challenging. Some aspects of this handbook could even be used in the lower grades- like split-page notetaking.

Teacher E: It would be good to introduce strategies at the grade IV or V level. Kids will do more with more [being] expected of them. We need to foster independence in study and organization - the earlier the better.

Grade VI students were considered old enough to be introduced to cognitive strategies. Some teachers suggested that younger students in the elementary grades might also benefit from this approach.

5) Did students benefit from direct instruction in study skills as presented in *Learning How to Learn*?

Teacher A: They NEED it , not just benefit from it. If you want to go skating, first you have to learn how to skate! We can't expect them to study without teaching them how [to study].

Teacher B: I already knew that they needed it. A lot of what we have been doing at the school board level, at the Department [of Education], and reading in

the current literature advocates more emphasis on helping children to understand the process, not just take in the content.

Teacher C: Definitely yes! The interested students really benefited. It improved my teaching and gave me . . y ideas. I used it [***Learning How to Learn***] in my other subjects as well.

Teacher D: Yes, and this idea should be followed up on in a school-based format as part of resource-based learning. Right now most teachers are not prepared to teach study skills because they don't know what is expected of them.

Teacher E: I think they will benefit over time. Students will still do their own thing, but at least now they have options. The development of study skills has to be an ongoing process. This handbook makes students more aware of the tactics they can use.

Most of the teachers reported that their students needed and/or benefited from direct instruction in study skills as presented in ***Learning How to Learn.*** However, only one teacher elaborated on what these benefits might be.

6) Has using this model in science classes

- **made teaching more efficient?**
- **made teaching less efficient?**
- **made no difference to progress?**

Teacher A: More efficient. I can't keep up with them now! It definitely didn't slow me down; in fact I had to slow myself down. Most of my students are a lesson ahead of me now. By taking their own notes from the text my students

were able to master many of the concepts on their own. Now they have notes that make sense to them. It's great!

Teacher B: More efficient. It helps the teacher become more organized; this helps instruction to be more organized. Some might argue that it takes more time, but it's definitely beneficial.

Teacher C: More efficient. I like this approach. It makes me more aware of how I am teaching. But you really need student co-operation to try something new. My students have a lot of trouble with the science concepts; so it wasn't the best subject for me to introduce something new.

Teacher D: Made teaching less efficient. I saw my teaching really slowing down in an effort to make things more clear. Yet I can see the logic of kids having to learn [to differentiate for themselves] what is important and what's not important. Being speedy is not necessarily being successful.

Teacher E: More efficient. We have more time for class discussion, we can diverge from the book more - the book is not the only tool available.

Most teachers reported that using a metacognitive approach for study skills instruction in science classes made their teaching time more efficient.

7) Were you able to integrate the ideas of *Learning How to Learn* into the science curriculum successfully? What problems did you encounter?

Teacher A: No problems. I modified my teaching. Chapter attack for the beginning of a chapter, SCORER for tests, and students took split page notes on each

section before I taught it. I used these three ideas across the curriculum very smoothly.

Teacher B: Yes; no problem. I know that they have internalized the information because my students seem more aware of how to prepare for a test because of FORCES. They're asking me questions I've never heard from them before, like "What is the format of the test?" and "Are there any sections of the chapter we can leave out?" They are definitely more aware

Teacher C: I used the ideas for social studies more than for science because the science was slower going, and the children had a lot of trouble with the science concepts. Also I found that you couldn't spend too long on chapter attack or the kids would get bored.

Teacher D: Summary writing is a sophisticated, challenging concept for grade VI students. They can do it but you need to monitor what you expect them to summarize. Summary writing in science is too difficult. It would be more appropriate in Language Arts.

Teacher E: My science group wasn't my homeroom class. Science is a subject teaching assignment for me. I could only introduce the concepts to them during the assigned science periods, and this was a problem. I had more success in my own classroom, in other subjects [language arts, social studies, religion] because I used the ideas across the curriculum and I could introduce them more naturally. I think it's really important to be able to use these ideas right across the curriculum, not just in one subject.

All the teachers reported that the strategy approach can be easily integrated into the curriculum, but most considered that science may not be the best subject for this

integration. This is because, according to the teachers, learning the concepts of the science curriculum is difficult for some children and introducing sophisticated strategies to this curriculum may be inappropriate.

8) Would this model be as effective if taught outside of the curriculum, that is, taught in isolation?

Teacher A: No, you have to introduce study skills as students do the content work. Maybe if the kids were older you could teach study skills as a separate course, but not at the grade VI level.

Teacher B: No, study skills instruction can be done, and is most often done, in isolation. But it can't be effective that way. Guidance counselors do study courses all the time; but when instruction isn't practical to students, it doesn't have meaning. When you're helping students do something better, something which they already want to, or have to do, it works. For example if they have a test, they have to study. You introduce them to FORCES and it helps them to study in a better, more organized way. The next time they'll want to use FORCES again. We have to think of ourselves as facilitators rather than teachers.

Teacher C: No, I can't see how that would work at all. Kids would just see it as more work. Kids need to see why they are doing something; they need to see how they will benefit. I used split page notes in giving notes to my class. The notes were better organized for study and kids saw the benefit of this organization.

Teacher D: No, these ideas really have to be part and parcel of your teaching so that students can see the transfer across the curriculum easily If the ideas were presented in isolation they would be less useful You'd have to tie them in with the curriculum somehow.

Teacher E: Yes, it could work if you had one period a cycle for study skills. The skills introduced in that period would have to be integrated across the curriculum, worked into the curriculum somehow.

Most teachers reported that this approach would not be as effective if it were taught in isolation. According to these teachers, for grade VI students to use strategies effectively they need to see the relevance of using a strategy through a concrete example in the context of the curriculum.

9) Were modifications to the strategies necessary; if so, were they useful?

Teacher A: I didn't modify the strategies and the students didn't either.

Teacher B: Student were encouraged to modify to suit themselves. Some student were able to modify and others took the information as verbatim. I felt it best to ensure my students understood that this was a process and they had to make it work for themselves. They [the students] did modify.

Teacher C: There was no need to modify. These strategies were appropriate for use with the science curriculum.

Teacher D: My students were very rigid in using the strategies, very literal in their interpretations. Once they understood why they were using the strategy

they were less pre-occupied with its literal interpretation. Not all students wanted to use the strategies.

Teacher E: No, there was no need to modify further.

According to four out of five teachers, there was no need to modify the strategies presented in ***Learning How to Learn.*** Only one teacher reported that students were encouraged to modify the strategies and apparently did so independently.

10) Are there specific areas of the model that need improvement?

Teacher A: No improvements. It was really organized, easy to read, easy to reference. It was great to have the strategies as one page hand-outs.

Teacher B: No, it was teacher friendly. The format was easy to read, and the appropriate strategies were easy to choose because of the organization. Having so many strategies to choose from was a bonus. I look forward to trying other strategies.

Teacher C: Yes. I would have preferred to have the strategies at the back [of the handbook] organized by category rather than in alphabetical order. Also it would have been better to have those strategies listed at the front instead of the back for easier reference.

Teacher D: Yes, it would have been good to have overheads of each of the strategies. This would make it easier and faster for a teacher to use the strategies in the classroom. I feel the strategies should be displayed in the classroom all the time - maybe on posters.

Teacher E: The handbook was easy to read and use, but it was only a resource for the teacher. It would be great to have a small corresponding handbook for students. This could be used to educate parents in ways that they can help their children at home. Many of these children go home with incomplete notes and may not fully understand the strategy that has been introduced. A handbook would help them recall what has been discussed in class more accurately and would assist their parents in helping them.

The teachers' suggestions for improvements to ***Learning How to Learn*** included improving the referencing of the model, supplying overheads of each of the strategies to assist with introducing them in class and providing a small handbook intended for parents to use with their children at home.

11) Were you satisfied with the amount and quality of the inservice provided?

Teacher A: A longer time to discuss and look at the strategies would have been better - maybe do some work with the text and have time to discuss the individual strategies as a group.

Teacher B: I could have used this book without any inservice. Because of the layout of the handbook, the inservice didn't need to be lengthy. The only benefit of more inservice would be less reading for me afterwards

Teacher C: I wasn't prepared. When teachers left the inservice they should have been ready to use the handbook in their classrooms. It was a lot of material to cover independently. I would have liked to go through a science unit with

the other teachers to see how they would use the handbook in their classrooms.

Teacher D: The handbook was very comprehensive; it could be used independently without any inservice. [A] teacher's time is precious. It's difficult to give up any time for inservice.

Teacher E: I gained an awful lot of information from the inservice. It would have been good to go through a lesson in science and see how you [the author] would have introduced the strategies.

The teachers reported differing needs in terms of the amount and type of information needed to implement the model in their classrooms. Three of the teachers reported that they would have benefited from more guided practice with the strategies as a group. They suggested that it would have been beneficial to cover a science lesson or unit using to ***Learning How Learn*** as a group. Two of the teachers reported that the model was very comprehensive and sufficiently self-explanatory. These teachers reported that the format and length of the information session was suitable.

12) Is this approach appropriate outside your science classes?

Teacher A: Yes, it's appropriate for any subject. It makes you more organized.

Teacher B: Yes, it would be useful in all the content areas especially language arts and math.

Teacher C: Certainly, yes. It [the strategy approach] would work well with any study subject like science or social studies, probably not math though. In the older grades there would probably be more appropriate subjects.

Teacher D: It's probably least appropriate in science and more appropriate in language arts.

Teacher E: These ideas are even better for social studies, language arts and health

The metacognitive approach as presented in ***Learning How to Learn*** was considered appropriate to many curriculum areas.

13) Were you satisfied with the organization of *Learning How to Learn*? Do you have any suggestions for improvement?

Teacher A: Yes, everything was great.

Teacher B: It was a great teacher tool, easy to find information, easy to use the ideas

Teacher C: More cross-referencing would have been useful.

Teacher D: It was easy to read. There was nothing earth-shatteringly new here, but it was put together in such a concise, organized fashion that I could get to the meat of the information quickly.

Teacher E: An index at the back would have helped. I'm usually in a rush, so it's important for me to have things easily referenced.

The teachers reported that the organization of ***Learning How to Learn*** was good but could have been improved by more extensive cross-referencing.

14) Will you continue to use the ideas of this model for study skills instruction in future?

Teacher A: I know I will, and other teachers in my school are interested in using it because the children are talking about the strategies in their other classes.

Teacher B: I look forward to using it further with my students. I know that these ideas are beneficial to my students.

Teacher C: Definitely, it was excellent. I'm already using it myself - for my own notes and study personally and with my children at home. I'm looking forward to starting a new school year with a new group of students.

Teacher D: I'll be really ready for September.

Teacher E: Yes, of course. In thirteen years of teaching, this handbook is the only thing I've been handed about study skills that was substantial.

All the teachers involved in the pilot study reported that they intend to continue using the metacognitive approach to teaching study skills in their classrooms.

In general, the results of the interviews indicate that teachers were, apparently, very positive about teaching study skills in their classrooms using a metacognitive approach, and all five teachers reported that they intend to continue to use the ideas of ***Learning How to Learn*** in future. All teachers involved said that there was some improvement in their own ability to teach study skills after they had used the model. There was a consensus that study skills do need to be taught across the curriculum by grade VI or earlier. Only two teachers reported that the metacognitive model, ***Learning How to Learn***, was entirely appropriate for the science curriculum. However, there were no

problems encountered with the implementation of the metacognitive approach but there were problems with using th's approach with the science curriculum Although the model was intended to be self-explanatory, two teachers said that the one-hour inservice was not sufficient to prepare them to use the model in their classrooms. Some degree of modeling of the strategies was suggested as a possible improvement for the information session There were also suggestions for improving the model's referencing, adding a student handbook, and including overheads of each of the strategies presented. One teacher commented that metacognition was an intimidating word, but all the teachers involved seemed to understand the process of instructing cognitive strategies. One teacher noted that in thirteen years of teaching, ***Learning How to Learn*** was the only substantial resource tool she had been given in the area of study skills. It is also interesting that three of the teachers communicated their personal feelings of inadequacy in the area of studying and commented on how useful this model would have been to them personally when they were students themselves.

5 CONCLUSIONS

In keeping with the steps of Borg and Gall's (1989) education research and development cycle, conclusions are drawn from three sources. The first group of conclusions is based on the review of current literature and research, the second set is based on the development of the study skills model, and the third set is based on the pilot study which was conducted as part of the development of the model

The following conclusions are based on the review of current literature and research, presented in chapter 2. The primary conclusion from the literature reviewed in this thesis is that the cognitive-strategy approach seems to be an effective and practical tool for instruction. The second conclusion is that there seems to be a need for the direct instruction of study skills in the context of the curriculum, and that this instruction appears to be the responsibility of every teacher in every classroom. Third, many teachers recognize the need to instruct study skills; however, they may not be teaching these skills because they may lack knowledge in the area and may not have the necessary resources. Thus, teacher education programs should place more emphasis on cognition and metacognition as well as their instruction.

Conclusions can also be drawn from the development of the study skills model ***Learning How to Learn***. The first conclusion is that there is a plethora of strategies currently available in education texts and journals that are readily accessible to most teachers. These strategies seem suitable for many areas including enhancing study skills. The second conclusion from the development of the model is that the strategies found in current literature needed modification to ensure that they meet the needs and the reading level appropriate for grade VI science. These modifications are easily executed. Third,

not all strategies have been demonstrated through research to facilitate learning. Furthermore, not all strategies are appropriate or useful in the classroom, often, however, this caution is not contained in the literature for teachers. Thus, teachers will probably need guidance in selecting and modifying strategies that are most likely to have an impact on learning in the classroom.

The third set of conclusions can be drawn from the school-based pilot study included as part of the development of the study skills model. First, the model might be improved by more extensive cross-referencing and by including overhead transparencies of the strategies. This arrangement might allow teachers to present the strategies to their classes with greater ease and efficiency. Also a small complementary handbook could be developed for students to use at home. This handbook might allow parents to assist their children with using the cognitive strategies introduced in the classroom. Second, some teachers might benefit from more extensive inservicing before using the model in their classes. The initial information session might be improved by covering the instruction of a chapter or unit of science so that teachers could have the opportunity to apply some of the strategies from ***Learning How to Learn***. Finally, science may not be the most appropriate curriculum area for instructing the strategies of ***Learning How to Learn***. Learning sophisticated strategies in the context of the relatively difficult science curriculum may be actually too difficult for some students or perceived as being too difficult by some teachers.

In summary, the information gathered in this thesis is a promising first step towards the development of a metacognitive model to assist the direct instruction of study strategies in the context of curriculum. The next challenge is to modify the study skills model,

Learning How to Learn, based on the teacher feedback gathered in the pilot study Once this has been accomplished a large scale program evaluation could be undertaken.

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APPENDICES

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March 9th, 1993

St. Pius X Junior High
c/o R.C. School Board for St. John's
Belvedere, Bonaventure Avenue
St. John's, Newfoundland
A1C 3Z4

Dear Ms. Moakler,

I am working on a study skills package that I feel will benefit the grade VI students of your school. In partial completion of a Masters of Education degree at M.U.N. I am preparing a thesis titled, A MODEL TO ASSIST THE DIRECT INSTRUCTION OF STUDY STRATEGIES IN THE NEWFOUNDLAND AND LABRADOR GRADE VI SCIENCE CURRICULUM. I hope to inservice your school's grade VI science teachers, and I would ask that you approach these teachers to determine their interest in being involved.

To become involved the teachers would need to commit to the following;

INSERVICE will involve approximately one hour, after school, Thursday, March 25th.

INSTRUCTION Teachers will instruct the relevant strategies of the package, in their science classes for about one month.

EVALUATION I will interview each teacher individually to find out what they thought of the package.

The details of the inservice and evaluation are outlined for the teachers in the enclosed letter. Please give the letter to those teachers who are interested in participating. For the purposes of my thesis work I have focused on the grade VI science curriculum, however the teachers involved will find the strategies introduced to be useful across the curriculum. I will call you on Thursday March 18th, to confirm the names of the interested teachers. Thanks for your help.

Sincerely,

Cathy

Catherine Nolan Wells

TELEPHONE (709) 753-8530

FAX (709) 753-8407

Roman Catholic School Board for St. John's

BELVEDERE
BONAVENTURE AVENUE
ST. JOHN'S, NEWFOUNDLAND
A1C 3Z4

1993 03 16

Ms. Catherine Nolan Wells
51 Monkstown Road
St. John's
Newfoundland
Canada
A1C 3T4

Dear Cathy,

This is in reply to your letter of March 9, 1993.

Approval is granted for you to contact Grade six teachers and invite them to participate in the study for your Masters thesis.

This sounds like a very interesting study. I look forward to learning more about your work when we meet later this month.

Best wishes for success in your work.

Yours truly,

Geraldine Roe
Associate Superintendent
Curriculum/Instruction

/msc

Catherine Nolan Wells
51 Monkstown Road, St. John's, Newfoundland, Canada A1C 3T4
(709)722-7873 fax 722-6723

March 11th, 1993

St.Pius X Junior High School
c/o R.C. School Board for St. John's
Belvedere, Bonaventure Avenue
St. John's, Newfoundland
A1C 3Z4

Dear Margie,

I have prepared a study skills package that I feel will benefit your grade VI science students. The package is part of my thesis, towards a Masters of Education degree. I hope that the package will be useful to you, in helping your students acquire effective and efficient strategies for study, should you decide to participate.

I know that you are very busy at school so I want to outline for you exactly what your participation would involve.

INSERVICE *Thursday, March 25th.*
3:30 to 4:30 P.M.
Student Resource Centre on 40 Alexander Street

INSTRUCTION *You will instruct the strategies of the package, which you feel are relevant to the topic and to the students' needs, in your science classes for about one month.*

EVALUATION *At the end of the instruction time I will come to your school to interview you about what you thought of the package and any suggestions you might have regarding its improvement.*

For the purposes of my thesis work I have focused on the grade VI science curriculum, however you will find the strategies introduced to be useful across the curriculum. When you have decided if you want to participate or not please fill out the attached form and return it to me through the school board mail next Thursday.

Thanks,

Cathy

Cathy Nolan Wells

Catherine Nolan Wells
51 Monkstown Road, St. John's, Newfoundland, Canada A1C 3T4
(709)722-7873 fax 722-6723

DO YOU WANT TO PARTICIPATE IN THE IMPLEMENTATION OF THIS STUDY SKILLS PACKAGE?

_____ YES, I WISH TO PARTICIPATE

_____ NO, I DO NOT WISH TO PARTICIPATE

ARE YOU ABLE TO ATTEND THE INSERVICE ON 40 ALEXANDER STREET AT 3:30 P.M. ON THURSDAY, MARCH 25th?

_____ YES, I CAN ATTEND THE INSERVICE

_____ NO, I CAN NOT ATTEND THE INSERVICE

NAME _____

SCHOOL _____

IF YOU HAVE ANY QUESTIONS OR CONCERNS YOU CAN REACH ME AT HOME OR AT THE STUDENT RESOURCE CENTRE (722-8531). I HOPE TO TAKE CARE OF ALL THE INSERVICING ON MARCH 25th SO THAT I CAN MEET THE IMPOSED DEADLINES FOR MY THESIS. IF YOU CAN'T MAKE IT ON THE 25th, BUT WOULD LIKE TO PARTICIPATE PLEASE GET IN TOUCH WITH ME.

Wednesday, April 28th, 1993

Dear Cathy,

I hope all is going well with the study skills package. If there are any problems or concerns please call me at home (722-7873) or at the Student Resource Centre (722-8531). The evaluation will take place the week of May 17th to the 21st. I'll send the questions to you a week ahead of time. The evaluation will involve an interview where we will discuss the specific questions. I'll call you to arrange a convenient time for the interview.

In the event of a strike, I'd really like to conduct the evaluation beforehand. I will be in touch if that situation arises.

Thanks again for your help with this.

Cathy

Catherine Nolan Wells
51 Monkstown Road, St. John's, Newfoundland, Canada A1C 3T4
(709)722-7873 fax 722-6723

March 6th, 1993

R.C. School Board for St. John's
Belvedere, Bonaventure Avenue
St. John's, Newfoundland
A1C 3Z4

Dear Ms. Roe,

I am pleased to inform you that I am working on a thesis that I feel will benefit the students of our school board. In partial completion of a Masters of Education degree at Memorial University, I am preparing a thesis titled, A MODEL TO ASSIST THE DIRECT INSTRUCTION OF STUDY STRATEGIES IN THE NEWFOUNDLAND AND LABRADOR GRADE VI SCIENCE CURRICULUM. In the implementation of this study skills package I hope to inservice a small group of grade VI teachers, within the R.C. School Board for St. John's. The teachers would use this model to directly instruct study skills in their grade VI science classes.

A direct benefit to the teachers and students involved is the acquisition of the most current and relevant knowledge in the area of study skills. The evaluation will involve structured interviews with each of the teachers involved.

Inservice of the study skills package would take place after school time, as would the evaluation. I would like to inservice the teachers during the last week of March. If you can forsee any problems with my procedure, or if you require further information please let me know.

Sincerely,

Cathy

Catherine Nolan Wells

LEARNING HOW TO LEARN

A STRATEGY APPROACH TO STUDY SKILLS

Catherine Nolan Wells

March 1993

LEARNING HOW TO LEARN

A STRATEGY APPROACH TO STUDY SKILLS

BY

CATHERINE NOLAN WELLS

PREFACE

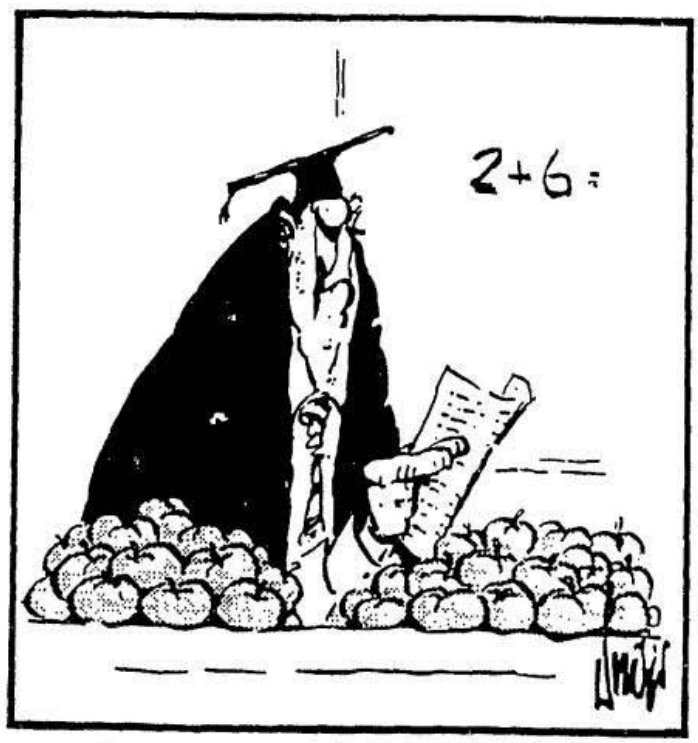
Learning How To Learn is about teaching children how to take ownership of what they learn. As educators, our primary goal is for students to become independent and effective learners. Most students do not acquire by osmosis those skills necessary to achieve independence and need direct instruction so that they can strategically adopt an active role in the learning process.

Study skills are integral to academic success, but they are not a prescribed part of the school curriculum. Students are expected to attain these skills as they mature In many situations teachers do not have the resources or the training necessary to integrate study skills into their teaching. This handbook addresses these areas of need

The inservicing of ***Learning How To Learn*** will introduce teachers to metacognition and the strategy approach to instruction as it relates to study skills. The handbook is intended to be a resource for teachers in implementing effective study strategies. This particular handbook is a companion for the grade VI science curriculum but has use universally Students will benefit from the exposure to new and innovative approaches to study.

TABLE OF CONTENTS

1. INTRODUCTION



"OK, here are your exam results."

(Unger, 1986)

HANDBOOK OVERVIEW

In the development of this handbook for study skills instruction the purpose was to create a practical guide for study skills instruction. The strategy approach is emphasized because it represents the most up-to-date, innovative, and encouraging breakthrough for study skills research. Research consistently and convincingly shows us that most students need to become proficient in study skills. Without direct study skills instruction many students doubt the positive impact of study upon their school success.

The handbook introduces four areas of strategy instruction:

- attacking a chapter,
- organization,
- test-taking, and
- memory.

Some strategies will prove to be more useful and practical for classroom instruction than others. It is important, however, to make an effort to touch on each of the areas of strategy instruction outlined so that students benefit from a well-balanced approach that fully prepares them for the difficulties they might encounter. Keep in mind that the strategies, presented as guidelines rather than directives, are meant to be modified and manipulated so as to make them most effective for the individual student.

The overall goal is to improve study skills. You can use any of the ideas and strategies from this handbook that you feel will most benefit your students. Metacognitive awareness will guide the students towards becoming independent and efficient learners.

This handbook includes practical ideas and strategies that will be useful in any classroom. In some cases the strategies have been modified for use with the grade VI science curriculum.

THE PROBLEM

In a study conducted by Stanley Straw and Barbara Rudyk (1989), to investigate the poor performance and high drop-out rate of a particular group of students, four major weaknesses were identified:

1. Students did not study the textbook and were frustrated because of the difficulty and complexity of the text materials,
2. Students assumed a passive role in class, and only rarely participated actively by asking questions or responding to materials presented in class,
3. Students did not take notes independently, either from the text or from work covered in class,
4. Students did not seem to study effectively for tests and, consequently did poorly on them (Straw & Rudyk, 1989).

These four problem areas are represented in most classes. The purpose of ***Learning How To Learn*** is to outline ways that we can assist all students, whatever their ability level, in overcoming the obstacles stated by Straw and Rudyk (1989). We must teach all students how to study more effectively so they can realize the benefits of their academic efforts. Teachers are encouraged to introduce the concepts of this handbook to their students, while reminding them to choose only those methods which work best for them. Requiring all students to adopt a particular strategy will be ineffective; a tremendous tool for one student might be a time-consuming hindrance for another. After the strategies are introduced in the group context, students should spend some time working with each strategy to evaluate the merits of the strategies best suited to them.

SPECIFIC GOALS OF THE MODEL

The goals of presenting a strategic approach for direct instruction of study skills are:

- to raise teacher and student awareness of cognitive strategies,
- to provide a practical tool for classroom teachers,
- to demonstrate that an organized, strategic approach to study skills is beneficial,
- to allow students a practical context to learn and internalize a strategy approach, and
- to expose students to accepted study tactics.

The goals of presenting this approach in handbook form are:

- to ascertain if this particular model is suitable for direct instruction of study skills in the context of the grade VI science curriculum,
- to introduce teachers to an effective method for study skills instruction, and
- to complement the grade VI science curriculum.

2. STUDY TACTICS

STUDY TACTICS

Study tactics have been the backbone of study skills instruction for many years. A study tactic is an individual technique like notetaking or underlining. Tactics are often used in isolation but are much less effective that way. These tactics are more beneficial as part of a cognitive strategy

Often students depend on study tactics alone. Their success rate is no better than if they passively read and re-read the text. This is not to say there are no good study tactics available, rather that students need to view a tactic in terms of what they want to accomplish overall. Research shows that students must gather study tactics together in a purposeful way to achieve academic goals. This directed accumulation of tactics is called a strategy. With exposure to a variety of tactics and guided practice in strategy use, students can choose the study method that best suits their needs in a given situation.

There are a tremendous number of study tactics available. Most are fairly straightforward and require little introduction. Three effective tactics that recur in the education literature as being effective are introduced in this section with usage tips for students and instructional tips for teachers. The tactics are notetaking, skimming/scanning, and summarizing.

NOTETAKING

Students need to learn effective notetaking because it is one of the best ways to become an **active listener or reader**. Students need to **re-organize**, not rewrite, the **notes they receive in class**, as well as re-organizing the **information from the text** through notetaking. Students need to be instructed in these skills, and the skills must be reinforced in the classroom. Some tips for teachers and students with regard to notetaking may prove useful.

HOW TO TEACH NOTETAKING

1. Notetaking must be time efficient. Introduce the idea of **abbreviations** or personal shorthand. Students may know words that are commonly abbreviated like S.S. for social studies. To ensure that this skill has transferred to notetaking, demonstrate some examples in class:

   Common abbreviations and shorthand notes:

equal	=	number	#
with	w/	and	&
at	@	geography	geog.
therefore	∴	science	sci.

   Sample Abbreviations from Addison-Wesley *Science*:

population	pop.	barometer	bar.
atmospheric pressure	a.p.	mountain	mtn.
glacier	glac.	lunar eclipse	l.e.

2. **Encourage students to use their own words** when they take notes from the text. This will make their notes much more meaningful and the notetaking process will be

active. If students can put an idea into their own words, then they have attained understanding.

3. **Set a good example** of notetaking skills in every subject in the classroom. Students can learn about notetaking by following the teacher's example. Even when not directly teaching notetaking, the teacher can set a good example of notetaking with the notes presented to the class in content areas.

4. For **direct instruction** use the ***Students Tips for Notetaking*** and have students go through some guided practice. Choose a content-filled page of text that includes three or more key points with supporting details. Read the full page with the students then use the chalkboard to guide them through the writing of **split page notes,** as detailed in Chapter 3 of this handbook. Emphasize the idea of key points and supporting details and have the students complete a second page independently. Discuss the results.

STUDENTS' TIPS FOR NOTETAKING FROM THE TEXT

whole section	**read the whole section** before you make any notes
own words	**write notes in your own words** so you will remember them
split page	make **split page notes** with key points and details
highlighters	use **highlighters** to accentuate key words, but don't get color-crazy
concise	don't rewrite the chapter; **be concise**
jot notes	don't write in full sentences; make **jot notes**
abbr.	**abbreviate** when possible, but make sure you'll remember the abbreviations later.
re-organize	simply re-writing notes wastes time; re-write only to **re-organize key points**

page number	for easy reference write the **page #** for each note
regularly	make notes from your text **regularly (once a week);** don't leave all the notetaking until the last minute

The preceding list of pointers is presented as a handout on page 101. As students are introduced to these concepts, keep in mind that many novice note-takers need a significant amount of guidance.

Simpson and Nist (1990) found three recurring problems that needed to be considered when teaching notetaking:

- Students **write too much**. These students need to be taught to look for key points. This could be accomplished by pairing them with a concise note-taker or having them recite the key points they have retained from reading a paragraph.
- Students **do not write enough**. This may happen because the students do not believe in notetaking or because they are passive in their reading style. Effective notetaking requires an active involvement; and students must be convinced, willing, and able to become actively involved.
- Students cannot **can't precisely state a key idea**. In split page notes these students would have equal amounts of information in the right and left column. These students need to be more specific in their analysis of what they read. They may benefit from referring to their class notes to help them focus on key ideas.

SKIMMING AND SCANNING

Speed of reading should be determined by the purpose of the reading and its level of difficulty for the reader. Skimming and scanning are two methods of purposeful and methodical quick reading. **Scanning is reading with a purpose in mind**, like finding a specific word, date, or name. People often scan indices and tables of contents of books. **Skimming**, a more complex style of reading, involves overviewing a piece of writing **to determine its main points and general purpose**. Skimming rarely takes place alone. In general, it is used as an advance organizer or as a review for a more thorough reading. Below are pointers that will be useful in instructing the technique of skimming.

HOW TO SKIM A TEXTBOOK CHAPTER

- Check to see how long the chapter is. If it cannot be read in one sitting, you may want to mark a place to stop.
- Read the title, the opening paragraph, and the summary.
- If there are questions at the end of the chapter, read them and scan for the answers.
- Find the major idea related to each heading or subheading of the chapter (Adams, 1977).

WHEN TO SKIM A TEXTBOOK CHAPTER

- In getting ready to read, use skimming as an advance organizer.
- Use skimming to review what has already been read thoroughly.
- Skimming can help the reader to find the main ideas and the purpose of the chapter.
- Skimming can raise reading effectiveness by allowing readers to focus concentration, activate prior knowledge, and form expectations.

- Skimming aids efficient reading by making the in-depth reading faster, easier and clearer.

Think about...

- the first two lines of each major paragraph;
- words in italics, boldface, and headings; and
- the introduction and summary of the chapter.

Remember...

- skimming assists thorough reading, but it does not replace it.

IDEAS FOR TEACHING SKIMMING IN THE CLASSROOM

Burmeister (1974) outline three ideas for teaching skimming:

1. Have students open their textbooks to the beginning of a chapter. Together read the title. Ask them to formulate a purpose or purposes for reading. Together read the main headings of the chapter and the summary. Ask them to **help you write an outline of the chapter on the board.**

2. Have students open their textbooks to the beginning of a chapter. Tell them they will have three to five minutes to **preview** the title, **formulate a purpose** or purposes for reading, and **grasp the main ideas** so that they will be able to write an outline or summary. When time is up, have them close their books and then **write the title, purposes for reading, and the outline or summary**. Either discuss the result or collect the papers and grade them. Repeat this activity often.

3. **After students have read a chapter**, ask them to review it in a survey fashion, as suggested above. Ask them to **write a summary or outline**. If they previewed the

chapter before reading it, ask them to compare their initial summary or outline with their final one (Burmeister, 1974).

In addition to the three ideas proposed by Burmeister (1974), there is another useful idea:

4. **Warm-up for reading**. Discourage students from falling into the trap of passively reading material because it has been assigned. Opening the book and diving into the reading without any mental preparation is an ineffective way to read. They wouldn't go into an athletic event without a warm-up; the same rule applies in reading. have students warm-up their knowledge about the topic and try to determine the main points by skimming.

WRITING SUMMARIES

"**Summarizing** text is one of the best ways to construct the **main idea** of the selection because it requires that the reader realize the superordinate, or **important, ideas** in the text. Additionally, summarizing involves **classification of ideas** into categories, thus **reducing the amount of information** to be stored and retrieved from long-term memory" (Jacobwitz, 1988, p. 130).

Writing a good summary is complex and formidable. At the grade VI level many students may find summarizing text challenging or even frustrating. Students need direct instruction and a considerable amount of guided practice. In general, the easiest text to summarize is a narrative paragraph that is sequentially ordered. As students gain confidence, writing summaries of more difficult materials should be introduced.

RULES OF SUMMARIZING

- Pin point main ideas only.
- Put the ideas into your own words.
- Translate any difficult words into something more meaningful.
- Find the topic sentence.
- Summaries should be no longer than one third of the original text.
- Delete unimportant information.
- Delete information that is repeated.
- Delete information that is repeated.
- Be concise.

WHY SUMMARIZE?

Summaries help:

- to improve retention,
- to ensure comprehension,
- to consolidate what has to be remembered, and
- to differentiate between main ideas and supporting details.

IDEAS FOR TEACHING SUMMARY WRITING

- Jeremiah (1988) suggests introducing verbs and nouns that allow students to express their ideas succinctly. Certain key words are introduced to help students know the demands of a question:

argue	claim	describe	discuss	investigate
show	categories	effects	factors	ideas

- Use a sequentially ordered paragraph to allow students straightforward practice.
- Introduce the concept with narrative text, as it is easier to summarize.
- Have students verbally summarize popular television shows. The group can discuss and analyze the parts of the show important enough to be included in a summary.
- Have students prepare written summaries of assigned reading in the content areas.

3. METACOGNITION - LEARNING HOW TO LEARN

INTRODUCTION

As teachers we remind our students to study for their tests - with the assumption that they know how to study. Studying involves an intricate and involved system of organizing, planning and then retrieving information in a re-organized manner. These are high expectations for students who receive little or no instruction in the area. This section is devoted to relaying the current instructional development that educational research has to offer in the area of study skills: cognitive strategies. Study skills are most effectively instructed in the content area classrooms. Teachers are more aware of the needs of their individual students in each subject; therefore, teachers are more qualified to ascertain which strategies will be most useful in the content area classes. To understand how strategies apply in the area of study skills instruction, the concept of metacognition and metacognitive strategies will be introduced. Our goal is to heighten students' awareness of how they can best acquire information and how they can execute control over their own learning. The recommended pattern of strategy instruction is outlined and there are suggested modifications to some of the strategies. For ease of referencing, each strategy is presented in alphabetical order in Chapter 5.

METACOGNITION

Metacognition is "a knowledge of and a conscious attempt to control one's own cognitive processes" (Flavell, cited in Brown & Briggs, 1989, p. 33). Learning how to learn is the phrase often used to describe metacognition. Many students feel that they have little or no control over the success of their studying. Metacognition, as it relates to study skills, is the development of knowledge about how to personalize the approach to study and how to self-regulate and manipulate this new found knowledge. By introducing students to a metacognitive approach to acquiring study skills, we can help them realize the impact that their own efforts will make on their test performance. As teachers, it is our responsibility to help students become more metacognitively aware, so that they can be guided towards learning more efficiently on their own.

Wade and Reynolds (1989) emphasize the importance of developing students' metacognitive awareness. In teaching students to learn how they learn, we must consider the following:

- **Task Awareness** - Ensure that students can distinguish the important from the unimportant when they study.
- **Strategy Awareness** - Never train students for one study method and then require its use. Make them aware of other available strategies. If you require students to use one particular method, you may counteract what they are already doing effectively. Instruction and guided practice are essential if students are to become aware of available strategies.
- **Performance Awareness** - Many students cannot predict if they will remember information they have just read or studied. Students need help to develop ways to monitor their retention and comprehension.

COGNITIVE STRATEGIES

A cognitive strategy is a procedure that is intended to help students learn, understand, or memorize information. Strategies are effective for all students in that they introduce a more systematic way to approach any learning task and actively involve students in the learning process. Often, but not exclusively, these strategies are presented as acronyms to assist the student in the retention of the steps of a particular strategy. For example, **SCORER** is a test taking strategy with its first three steps being **Scheduling** your time, looking for **Clue words**, and **Omitting** difficult questions. Generally the students who will benefit most from the strategy approach in any classroom are those students who are disorganized.

Cognitive strategies can be useful in any learning situation. In ***Learning How to Learn*** strategies have been chosen specifically for their usefulness in the area of study skills. Strategies have been chosen in the four areas of, organization, chapter attack, memory, and test taking.

In order for strategies to be effective the following criteria must be met:

- Students must believe that they can actively effect a change in their learning ability.
- Strategies must be internalized to the point of being automatic.
- The purpose of the strategy must be perceived to be personally useful.
- Strategies should not be seen as being more work than they are worth.

Age and developmental level of students are important considerations in the strategy approach. Generally children in upper elementary grades are developmentally ready to internalize and transfer strategies with guided instruction and practice. Younger children are not developmentally ready for metacognition. In their research, Heldenbrand and Hixon (1991) found that sixth graders were much better able to self-assess their readiness

for a test than second graders, and that the older students independently used more cognitive strategies. By the elementary grades, children are advancing cognitively from the concrete-operational stage to the formal stage, where they are able to exert more control over their own learning. It is interesting to note that successful students will independently develop strategies while lower achieving, and younger students are unable able to do this.

Although the next chapter offers many strategy suggestions, if students are expected to gain the most benefit from the strategy approach, they should be encouraged to modify and develop strategies to meet their personal needs. Students who are able to choose and modify strategies to meet the demands of a task have achieved metacognitive awareness.

METACOGNITIVE AWARENESS

Metacognition is the ability to determine where and when to use a strategy to improve the effectiveness of learning. Metacognition as it relates to study skills is the development of knowledge about how to personalize the approach to study and how to self-regulate and manipulate this new-found knowledge. By introducing students to a cognitive approach to acquiring study skills, we can help them realize the impact that their own efforts in study will make on their test performance, and subsequently increase their metacognitive awareness The phrase often used to describe metacognition is *learning how to learn*. This model uses the cognitive approach in working towards helping students develop metacognitive awareness.

Metacognitive awareness is achieved when one can actively monitor and self-regulate the effectiveness of a particular approach in a strategic way. From an instructional view, students should be guided towards learning how to use and monitor the effectiveness of strategies independently. If information is not understood or retained, the metacognitively aware student will know that the strategy chosen is incorrect and then will make the appropriate adjustment. This metacognitive awareness, critical to the autonomous use of strategies, empowers students to choose and manipulate strategies for a particular need without prompting or assistance. As teachers it is important that we model for children the appropriate use of a particular strategy; however, the critical test is whether or not the student can transfer that knowledge to another appropriate situation successfully.

Metacognitive development offers a host of benefits to the student and the teacher, including the following:

- Students are actively involved in the learning process.
- Students can self-evaluate problem areas.
- Students are more independent.
- Strategic learners are successful students.
- Students are aware of their own cognitive abilities.
- Students are able to develop and modify strategies independently.
- Students feel a sense of control in their own learning.

The instruction guidelines which accompany each individual strategy explained in chapter three and the general guidelines for introducing strategies which follow this section are essential components of ***Learning How to Learn***. Introducing students to cognitive strategies is only the preliminary step in assisting them to develop metacognitive awareness. Our role as educators is a critical one. We must guide our students towards this higher level of understanding by increasing their knowledge about the strategies, providing them with time to practice using the strategies so that their use becomes automatic, encouraging them to modify the strategies to meet their personal needs, and finally instructing them towards developing their own personal strategies.

INSTRUCTION OF STRATEGIES

There are many ready-made strategies to address numerous academic challenges. The purpose of these strategies is to help students approach the tasks in a more organized and productive way. Francis Robinson (1970), an expert in the field of strategy instruction, suggested some guidelines for effective instruction of study skills:

- Strategies must meet the individual needs of the students.
- Instruction must include repeated guided practice until the skill is mastered by and useful to the student.
- Instruction has to take place in the context of the curriculum; if not, the student will see the activities as busy work, unrelated to his own studies.
- Students have to believe that their own efforts in improving study skills can make a difference to their success.

Carol Dana (1989) offers some excellent guidelines for improved strategy instruction. Her four step plan begins with ***introducing the strategy*** or choosing a strategy to meet the students' needs. Discuss why the strategy is useful and where and when to use it. Dana's next step involves ***modeling the strategy***, or the teacher demonstrating how the strategy would be effectively used. Providing ***guided practice*** is the third step. It is important to talk students through the steps of the strategy so as to ensure that all students in the class have understood how it works. The final step involves allowing for ***independent practice.*** Teachers need to promote and encourage students in the use of the strategy to ensure its transfer to other learning situations. At this point, students should be encouraged to personalize the strategy or make any modification that will improve the strategy for them. The idea of modifications will be discussed with examples later. This approach works well for the strategies introduced in this handbook.

DANA'S MODEL FOR TEACHING STRATEGIES:

- INTRODUCE THE STRATEGY
- MODEL THE STRATEGY
- PROVIDE GUIDED PRACTICE
- REQUIRE INDEPENDENT PRACTICE

Research has shown this model for instruction to be effective; however, personal teaching style and individual needs within the class will determine how it should be best implemented. Dana (1989) proposes that this straightforward teaching procedure should be preceded by an introduction of the strategies to the class and some discussion on their usefulness. In my experience it is important to have students modify every strategy to meet their particular needs and learning style.

GORDON'S MODEL FOR TEACHING STRATEGIES:

- MODELING
- GUIDED PRACTICE (TEACHER CENTRED)
- GUIDED PRACTICE (STUDENT CENTRED)
- PRACTICE / APPLICATION
- STUDENT CONTROL

Gordon's model (cited in Monahan & Hinson, 1985) encourages that teachers involved in direct instruction model or demonstrate each step of the strategy. There is an emphasis on making sure that the student has attained an ownership which is accomplished through established need and repeated guided practice. The teacher gradually transfers responsibility for learning to the students once they are ready.

4. STUDY STRATEGIES

CATEGORIES OF STRATEGIES

For the purposes of strategy instruction, the very broad topic of study skills can be divided into four categories:

- organization,
- chapter attack,
- memorization, and
- test-taking.

In each of these categories, specific strategies have been chosen for possible instruction. Depending on the needs of the students and the particular demands of the chapter, students can receive instruction in all or some of these strategies. At least one strategy from each category should be chosen, as each of the four topics is essential to effective study skills.

ORGANIZATION	*CHAPTER ATTACK*	*MEMORY*	*TEST-TAKING*
PREPARE / PREP	SQ3R	MNEMONICS	PRAISE
NOTETAKING	OK4R	SOUSA	SMARTS
FORCE	RESPONSE	SELF-RECITING	SCORER
FORCES	RESPONSE-MOD.	EEEZ	SLOWER

Although each category of strategies is distinct in its importance, there will be overlap in instruction. While many of the strategies presented may be useful in their present state, it is wise to encourage students to modify the strategies to meet their exact needs. A one page hand-out of each strategy is included in chapter five, which begins on page 64. ***Learning How to Learn*** is intended to be a guide to help teachers and students gain exposure in the area of study strategies so that they can discern what will be useful for

them. There are four important considerations for success with strategy instruction and development:

- The ultimate goal of all strategy instruction must be to increase students' metacognitive knowledge. All instruction must be focused on helping students gain independence and efficiency in using strategies.
- Secondly, students must feel that the strategy is not itself a chore. In other words, the use of the strategy cannot be laborious or time-consuming.
- Thirdly, the strategy must be automatic. This facility can only happen if the student has internalized the strategy. The easiest way to ensure the student has internalized the strategy is to have them modify it to suit their needs. In this process the student takes ownership of the strategy and the process involved in carrying it out. Simple modifications to a given strategy can enhance the instruction in a group situation. Everyone will not have exactly the same strategy, but their strategies will be similar. Most importantly, the strategy that the student has modified is his or her own creation.
- The final criterion for success is that the strategy must be reinforced in a meaningful context. Using the strategies in your science classes will allow students the guided practice necessary towards mastery of the strategy and metacognitive understanding. It will also increase the likelihood that the students will transfer the strategy to other learning situations.

There is an overview of each strategy, as well as its purpose and suggestions for instruction. These guidelines are important to fostering metacognitive awareness. Individual students in your class can be introduced to certain strategies that may not be appropriate for the whole class.

ORGANIZATION

Being organized is an important key to doing well in school. Students spending time on the organization of study will perform better on evaluation (Dickinson & O'Connell, 1990; Miller & George, 1992; Whiteside & Whiteside, 1988). Information stored in a library, a filing cabinet or a dictionary is all organized for quick retrieval. It is obvious that students have to organize the information studied if they ever hope to retrieve it efficiently. In research most students, when asked to assess the areas they need to improve in their study skills, responded that organization and planning were of primary importance.

The five strategies introduced in this section address different concerns within the area of organization. **PREPARE** and **PREP** are designed to help students come to class prepared to learn, as well as organize the physical gathering of materials necessary to be ready for class. The **SPLIT PAGE METHOD** deals with the organization of notetaking - often the backbone of independent study. Finally, **FORCE** and **FORCES** demonstrate a more organized overall approach to independent study.

PREPARE

It is very common to hear teachers discussing the frustration of having students who are chronically unprepared for class. Getting them back on track can waste valuable instruction time, and the constant reminders do not seem to make any difference for next time. For many students, the art of being organized is an elusive one. Rafoth and DeFabo (1990) developed the **PREPARE** strategy to help students come to class more prepared and more organized to learn.

Purpose This strategy is designed to help students become more organized and prepared for class.

Suggestions for Instruction This strategy could be introduced to the whole class or it might be more useful for selected students. The idea and importance of organization would first be discussed; students must be convinced that organization has an impact on school success. Once this link is established, the steps of **PREPARE** could be introduced. Not all the steps of this strategy will be useful or equally important, and some modification will likely be needed.

Overview of PREPARE

P Plan locker visits

R Reflect on what you need

E Erase personal needs

P Psych yourself up for class

A Ask yourself "What is going on in class today?"

R Review your notes and study guides

E Explore the meaning of the class introduction

(Rafoth & DeFabo, 1990, p.16)

The modified version of the **PREPARE** strategy which may be more appropriate for the grade VI science class is the **PREP** strategy. The main purpose of **PREP** is to focus students on what they need to prepare for class and how they can mentally ready themselves to tune in during class.

P Plan what I need: pencils, text, exercise, lab book.

R Review my notes the night before.

E Explore ideas in class, ask questions.

P Predict the outcome of experiments.

For a strategy to be most effective, students should be given the time and guidance to personally modify it to meet their needs.

NOTETAKING

Students need to be taught how to organize the ideas which they come across in their studies. Teaching children how to take notes in an organized manner will contribute to their preparation for the higher grades. The most important consideration in notetaking is that we cannot assume that all students will automatically learn how to take good notes. Effective notetaking is central to success in studying and is worthy of instruction time in every content area. To be organized, a student must be able to take notes from the text and co-ordinate these with his class notes. The combined format should suit the student's needs.

Burns and Roe (1976) believe that children should be taught notetaking skills in the classroom setting. Children should be given directed practice and instruction in the following skills:

- to include words and phrases in their notes,

- to include enough of the context to make the notes understandable after a period of time has elapsed,
- to include bibliographical references (sources) for each note,
- to copy direct quotations exactly, and
- to indicate carefully which notes are direct quotations and which are reworded.

If we are to encourage children to take notes from their reading, we should instruct them to keep a separate exercise for personal notetaking. Children need direct instruction and practice in deciphering the main idea of a paragraph and summarizing the information.

SPLIT PAGE METHOD OF NOTETAKING

Notetaking has been the topic of much research. Some people purport that notetaking is itself valuable, while others contend that it is the review of these notes that helps our retention. Spires and Stone (1989) believe that a metacognitive approach to notetaking would allow the student to become more involved in the notetaking process. One of the directed notetaking activities that is particularly useful for organizing notes is the **SPLIT PAGE METHOD**. A very similar method is the Cornell Method of notetaking which was developed by Walter Pauk in 1984. The **SPLIT PAGE METHOD** directs the student to highlight key points and supporting details. **SPLIT PAGE METHOD** gives students a format for self-testing. If reviewing notes is key to retaining the information, then it is important that students use a format that allows them to self-test. Self-recitation or self-testing is considered to be the most powerful means of retaining information. This method of notetaking works well in the *Concentrate* step of the **FORCE** strategy, which is discussed next.

Purpose The split page format helps students organize their notes more clearly into key points and details and provides an excellent design for self-testing. Students use the

right hand column to record complete notes from class or from their reading; the left column is reserved for key words from the complete notes. To test themselves, students can cover the information on the right side while they use the key words on the left side as cues to recall the covered information.

Suggestions for Instruction Have students go through a guided practice of the **SPLIT PAGE METHOD**. Use a page or more of text from their science books and have the students record from the board the key points and the important details. Once the concept has been introduced and students have a model to follow, allow some time for guided practice in the classroom using another page of text. Most students will need repeated practice in determining the key points. The following is an example of the **SPLIT PAGE METHOD**:

2 1/2" Cues	6" Complete Notes
spectrum (p.101)	- band of colours - sources: gems, diamonds, glass, prisms - when white light gets broken into colours

FORCE

The **FORCE** strategy was introduced as a test preparation strategy by Wehrung-Schaffner, and Sapona (1990). It is included here in a section on organization because it deals with organizing for effective studying.

Purpose **FORCE** is a structured, organized way to approach study tasks. It takes students through the steps of organizing and gathering materials needed for study.

Suggestions for Instruction This strategy is self-explanatory. The idea of organization for study should be introduced to the class. Students must be convinced that being organized is critical to doing well in school before they will consider the **FORCE** strategy as something useful. As with every strategy, modifying or personalizing the strategy is recommended.

Overview of FORCE

F	**FIND OUT**	Your teacher announces a test. If you don't receive all of the information that you need, ask questions, for example "What will the test cover?", "What types of questions will be used?"
O	**ORGANIZE**	Collect all necessary materials for taking the test, for example; notes, old tests, books, etc.
R	**REVIEW**	Do the general review necessary to study for this test. For example; skim chapters, charts, maps, summaries, questions, or vocabulary. Highlight notes, review old tests and assignments.
C	**CONCENTRATE**	Make a study sheet (cue sheet) by putting important information into question/answer format.

E **EARLY EXAM** Practice the test by pre-testing. For example take turns asking questions with a partner (study buddy); have your parents or other adults help you drill from your study sheet; take your own test from your study sheet. Now review those weak spots until you are certain of what you know. There may be a few items you want to review right before the test.

(Wehrung-Schaffner & Sapona, 1990, p.293)

For the grade VI age and comprehension level, as well as the demands of the science curriculum, the **FORCE** strategy is very complex. If a strategy is to be useful, students must not feel that the strategy itself is a great deal of work. A modification to the **FORCE** strategy follows. However, as always, for any strategy to be effective and to meet individual needs, students should be encouraged to make their own modifications. Students will need to be introduced to the **SPLIT PAGE METHOD** of notetaking before they can use **FORCES**.

FORCES

F **FIND OUT** Find out what pages the test will cover.

Can any pages be left out?

O **ORGANIZATION** Do I have all the class notes and lesson tests from the unit?

Make a study sheet of all the words in *italics*, with words on the left and definitions on the right.

R **REVIEW** Read the chapter, notes, study sheets, lesson tests.

Put an asterisk (*) next to anything that is important or difficult to understand or remember.

Try the *Ideas for Review*, and *Test for Understanding*.

C	**CONCENTRATE**	Add any ideas or words that have * to the study sheet.
		Review these ideas to understand and remember them.
E	**EARLY EXAM**	Use a cover card to self-test.
		Discuss any important or difficult ideas with someone.
S	**STRATEGIES**	Use memory strategies to remember difficult points.

CHAPTER ATTACK

A textbook is often the most practical study resource a student possesses. Generally, a student's approach to studying a text has been developed independently. For the student with weak reading skills, a science text can be intimidating because of the technical vocabulary. Introducing every student to the parts of the text is critical to ensuring the student is able to make the most efficient use of the text. There is a great variance from one text to another in terms of how well the information is organized. Addison-Wesley Science uses several tactics to help students organize themselves for study. These tactics include:

- headings and sub-headings,
- important words written in italics,
- visuals used to augment information,
- a review page and sample test for each chapter, and
- a glossary and index at the back of the text.

Some of the organizational components this text lacks are:

- a solid introduction and summary for each chapter,
- advanced organizers, and
- adequate information to help students answer questions independently.

The four strategies introduced in this section focus on specific tasks. Strategies you chosen will depend upon the individual needs of the class. **SQ3R**, the oldest and most widely used study strategy breaks down the study of a textbook chapter. The first version of **SQ3R** included here is the original one and the second version of the strategy is modified with the grade VI science textbook in mind. **OK4R**, similar to **SQ3R** in that it is developed for use with a textbook chapter, is particularly useful for science study; it introduces the idea of reflection, or asking questions about what you have learned. Also

included is a version of **OK4R** modified with the grade VI science textbook in mind. Finally, **RESPONSE** is an interactive study strategy that requires the student and the teacher to work together. It allows students to have specific questions answered as a result of a question sheet that is completed during reading assignments. A completed **RESPONSE** sheet is included to serve as a guide for instruction of the strategy. This strategy would be especially useful for students who are hesitant to ask questions in class. The strategy is also presented in a modified form that is intended to be more practical in the classroom setting.

SQ3R

The **SQ3R** strategy, as already mentioned, is the original and most widely used strategy in study skills programs today. Virtually every How-To-Study text includes **SQ3R** or some modification of it. **SQ3R** was developed by Francis P. Robinson (1970) and became famous for its use in World War II when a group of soldiers were hand-picked to be quickly trained for highly specialized positions. The soldiers were selected because of their high intelligence and excellent academic records. However, they were found to have extremely inefficient study habits and could not master the material fast enough. To enhance progress, the soldiers were taught higher level study methods, including the **SQ3R** strategy.

Purpose This strategy used to guide students in gleaning information from a chapter, helps students focus on the important ideas. It could be used with the **SPLIT PAGE METHOD** of notetaking.

Suggestions for Instruction **SQ3R** is best introduced with a new chapter or unit of information. Before students begin their work on the chapter, they can use the

strategy to focus on what the chapter emphasizes as well as what they can expect to learn. Students should also find this strategy useful when they are beginning to study for a chapter or unit test. **SQ3R** will help them focus on the important ideas of the text.

Overview The following **SQ3R** version is the original from Francis P. Robinson.

SURVEY Glance over the headings in the chapter to see the few big points that will be developed. Also read the final summary paragraph if the chapter has one. This survey should take not more than a minute and will show the three to six core ideas around which the discussion will cluster. This orientation will help you organize the ideas as you read them later.

QUESTION Now begin the work. Turn the first heading into a question. This will arouse your curiosity and thereby increase comprehension. It will bring to mind information already known, thus helping you to understand that section more quickly. The question also will make important points stand out at the same time that explanatory detail is recognized as such. Turning a heading into a question can be done at the instant of reading the heading, but it demands a conscious effort on your part.

READ Read to answer that question, i.e., to the end of the first headed section. This is not a passive plodding along each line, but an active search for an answer.

RECITE Having read the first section, look away from the book and try briefly to recite the answer to your question. Use your own words and cite an example. If you can do this you know what is in the book; if you cannot, glance over the section again. An excellent way to do this reciting from memory is to jot down brief cue phrases in outline form on a sheet of paper.

Now repeat the steps of Question, Read and Recite with each successive headed section; that is turn the next heading into a question, read to answer that question, and recite the answer by jotting down cue phrases in your outline. Read in this way until the entire lesson is completed.

REVIEW When the lesson has been read through in this way, look over your notes to get a bird's eye view of the points and their relationship and check your memory as to the content by reciting the major subpoints under each heading. This checking of memory can be done by covering up the notes and trying to recall the main points. Then expose each major point and try to recall the subpoints listed under it. (Robinson, 1970, pp. 32-33)

SQ3R for Addison-Wesley Science

Survey	1) Read the chapter title and introduction. 2) Answer the introduction questions out loud. 3) Read the sub-headings and look at the pictures. 4) Read the blue pages.
Question	Ask a question for each sub-title omitting Something to Try.
Read	Read each section to find the answer to the question.
Recite	Write jot notes on each answer using the sub-title.
Review	Make notes about the most important things you have learned.

SQ3R for Addison-Wesley Science could easily be presented as a class activity when a new chapter is being introduced. Students need to understand the usefulness of each step of the strategy.

OK4R

This strategy is similar to the **SQ3R** in that it has some of the same steps and it also deals with mastering a textbook chapter. Thomas and Robinson (1977) present their version of **OK4R** as a strategy that can be particularly useful for study in the sciences or any area that involves difficult concepts. They describe the work of Dr. Walter Pauk of the Cornell University Reading Centre in helping college students raise their grade point average by using his **OK4R** strategy.

Purpose **OK4R** is a chapter attack strategy which students can use to reflect on difficult or new concepts of the chapter. In using **OK4R**, students will learn to strategically attack the chapter, focusing on the most important concepts.

Suggestions for Instruction **OK4R** can also be used to introduce a chapter in science class. The teacher could model the steps and have students offer their questions and insights for each step of the strategy. Once the strategy has been modified and mastered, students should be encouraged to use it during their home studies.

Overview of OK4R

Overview	What is the purpose of reading this chapter? Read the introduction, headings, and summary.
pick out Key ideas	Note the key ideas in each sub-section.
Read	Read the difficult paragraphs carefully, closely, thoughtfully. Make jot notes in the margins of the text. Underline or bracket key ideas. These steps will make the review easier.
Recite	Look away or cover your text and recite the key points. Check to see how well you knew each point. The cover-up technique forces you to concentrate.
Reflect	Reflect on the concepts you have learned. Ask why, probe, and challenge the author.
Review	Recapture the broad chapter plan. Give the chapter another overview. Check yourself on the crucial content

(Thomas & Robinson, 1982, p. 378).

The **OK4R** strategy is especially useful for science as it emphasizes self-reflection. Unfortunately, some of the wording may be too difficult for grade VI. The strategy recommends that students mark on their texts, a real no-no in most schools. The following modification of **OK4R** might prove more useful for introducing this strategy to the class.

OK4R for Addison-Wesley Science

Overview	Overview the chapter. Read the title, the introduction, the headings, and the blue pages. Look at the pictures, graphs, and charts. Get an idea of what the chapter is about.
Key ideas	Read each sub-section. Write split page notes about the important ideas.
Read	Carefully *read* the difficult or important sections. Do not go on until you understand and remember. Add each new point to your notes.
Recite	Use a cover card with your notes. Cover your notes and recite the information.
Reflect	Read *Something To Try*, *Find Out on Your Own*, and *Something to Think About.* Answer the questions in your mind.
Review	Go over the whole chapter again. Re-read *Ideas for Review* Answer all the questions in *Test Your Understanding.* Focus on anything that is difficult or important.

RESPONSE

RESPONSE, an interactive study strategy, was developed by Jacobson (1989). Students are required to complete a **RESPONSE** sheet of questions for a reading assignment. They pass the completed forms to their teachers who answer the questions and return papers to the individual students. The teacher uses the group information to assist with the preparation of the next lesson. Farris, Fuhler, and Ginejko (1991) argue that using this strategy will make students more interested in lectures because their direct questions will be answered in the lecture. This strategy differs from most because both the student

and teacher are involved in and gain knowledge from using the strategy. The teacher learns where the students' needs are and the student learns the material.

Purpose The purpose of the **RESPONSE** strategy is to allow students to have their questions answered as well as giving teachers an idea as to which areas of the text are difficult for the students. In completing the **RESPONSE** sheets, students will also outline the important ideas and list the new terms. Since students are expected to include page numbers for all the questions, they will also be introduced to good notetaking habits.

Suggestions for Instruction The **RESPONSE** sheet should be discussed in class, and then one sheet should be completed as a group activity so that students have an example to model. The format of the sheet can be modified to meet the needs of the class. Students should be given some guided practice using the **RESPONSE** sheets in the classroom before they are required to complete a sheet independently.

Overview of the RESPONSE strategy

1) As the student reads the content area material, major points are recorded.

2) While reading the text, the student writes down questions as they arise along with the page number of the text.

3) Whenever a new term or concept is encountered, the student writes it down. Again the page number on which the term or concept appeared is recorded.

4) Students place an asterisk beside those questions, terms, or conceptsthat require explanation or definition. The page number is again recorded.

5) The student gives the completed **RESPONSE** sheet to the teacher, who then writes a "response" to the student in order to clarify the text and/or elaborate upon some aspect.

6) The teacher returns the **RESPONSE** sheet to the student the following class period and then holds a class discussion of the text material (Farris et al., 1991).

The following is a sample **RESPONSE** sheet (Farris et al., 1991, p.266), and an example of how it could be completed:

RESPONSE

Name: Lindsey **Date**: 1-2-90
Reading assignment: Social Studies, pgs 94-98, lesson 1

1) Important Points : Important Ideas - Put page #s
(Things you think are important to the topic)

pg. 95 - at first there were no women in the colony
pg. 95 - food ran out quickly, water was dirty, winter was coming
pg. 96 - Captain Smith said, "He who will not work, will not eat."
pg. 97 - The Virginia Company gave permission for white, males to vote

2) Questions: Questions that come to you as you read- put page #s
a) Things you don't understand/words, charts, etc.
b) Things you find interesting/agree or disagree with.
pg. 95 - chart at bottom, what is the building outside the fence
pg. 96-97 - I don't understand why people had to march everywhere after Sir Thomas Oates arrived to serve as governor

3) New terms: Vocabulary, people's names, new words
pg. 96 Captain John Smith
pg. 96 Powhatan People
pg. 97 Sir Thomas Oates
pg. 97 burgesses

Research has shown **RESPONSE** to be an effective strategy in the classroom, but the students' questions are not answered until the next class. I would question its effectiveness for the less able student who might have difficulty completing the **RESPONSE** sheet. For these two reasons, I propose the following modification:

RESPONSE modified

1) Students are arranged in groups of four; mixed ability grouping is used.
2) One **RESPONSE** sheet is assigned to each group.
3) The group reads the assigned pages and records major points.
4) As questions arise in the reading, the question and page number is recorded.
5) Any new terms or hard words are listed with the page number.
6) Once all the **RESPONSE** sheets are completed, the findings are discussed in class.
7) Notes are made on the board for the important points and key words.
8) Students record these notes in their exercises.
9) All questions are answered in class.

The benefits of the above modifications to **RESPONSE** are:

- Students will have their questions answered immediately in class.
- The less able student will benefit from the group involvement.
- The notes taken in class will benefit all students.
- Students and teacher will be involved in an interactive study and learning process.

In completing the **RESPONSE** sheet, students should be tuned in to the idea that any unfamiliar words, as well as words in italics, are new vocabulary. Addison-Wesley Science is filled with questions; you need to stop and think about these questions to determine if you can answer them. If you are not sure about the answer, then that question should be included in your **RESPONSE** sheet.

A **RESPONSE** sheet, modified for Addison Wesley Science, as it might be completed by a group of students. The sheet is completed in jot note form.

RESPONSE

Name: John, Sue, Mary, Frank **Date**: March 25, 1993
Reading assignment: Science, pgs. 171-175, lesson 2

1) Important Points : PUT PAGE #s

pg. 171 - objects upward push matches earth's downward push

pg.171 - for things to stay still, forces have to be matched

pg. 173 - for objects to stay still, the force must be equal and opposite

pg. 175 - only an extra, unmatched force will cause motion

2) Questions: Questions that come to you as you read - PUT PAGE #s
a) Things you don't understand like words, pictures etc.
b) Questions in the text that you can't answer.

pg. 175 - how can you tell if a force is matched or unmatched?

pg. 173 - what force makes a kite stay up in the air?

pg. 171 - what is gravity?

pg. 174 - I don't understand what they are trying to do

3) New vocabulary, new ideas - PUT PAGE #s

pg. 171 - matched forces

pg. 173 - gravity

pg. 171 - exert

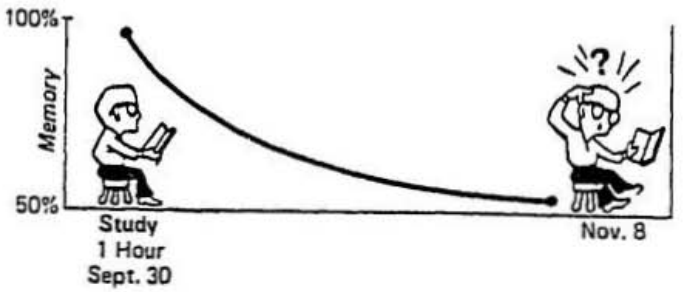
MEMORY

"Since memory plays such an important part in learning, students need to understand what memory is, how it works, and what contributes to its development and use."

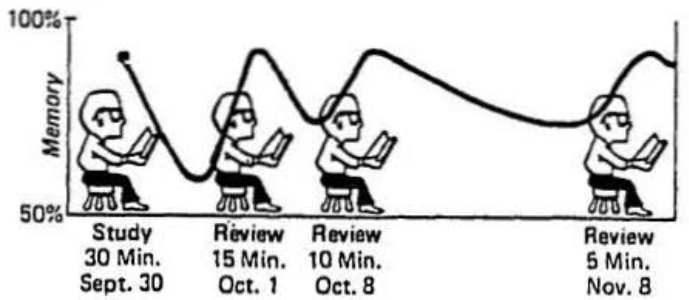
James D.Weinland (cited in Christ, 1969, p.127)

Research indicates that most forgetting occurs fairly soon after learning. It is important for students to realize that they will likely forget in the first twenty-four hours most of what they have learned. Reviewing material soon after it has been learned is an excellent way to increase retention. Repeated, intermittent review is the best way to ensure recall of information.

Pattern of forgetting without review



Pattern of forgetting with intermittent review



(Staton, cited in Thomas & Robinson, 1982, pg. 185)

Strategies can enhance any student's retrieval of information because ideas that are presented in an organized manner are more likely to be recalled.

Four factors in retaining information are outlined by Robinson (1970) in his landmark book, Effective Study. He describes his methods as an attempt to attack the process of forgetting. If students want to ensure recall of information they should:

1. have interest and **intent to remember**,
2. select **major points** and key phrases from the information,
3. practice **self-reciting**, and
4. **distribute learning** over a number of time periods instead of reviewing everything before the test (Robinson, 1970).

Robert Carman and W. Royce Adams (1972) highlight four areas to concentrate on in enhancing the memory:

1. **Focus** your efforts; review your notes frequently, possibly on a weekly basis. You can quickly skip over the things you already know and spend more time on the things you do not know. It is important that you *want to remember* the information.
2. **Recite** the information you want to remember, actively try to remember it. Since most of us remember best, the things we see, make a **mental picture** of the information.
3. **Associate** the idea with something that sounds or looks the same, use **mnemonics.**
4. Develop a **positive attitude** towards remembering. Expect to remember the information and use strategies to help you do that (Carman & Adams, 1972).

Overlearning is an accepted method of retention. It involves repeating or reciting the information a number of times to ensure that it is committed to memory. It takes a lot of time to overlearn, but overlearning is a dependable way to memorize.

There are five strategies introduced in this section. Students need to assess their own learning style and entertain the use of all strategies to determine which approach works best for them. No single strategy will work for every student in the class. Students must be encouraged to find out which strategies work best for them. **Pictorial, keyword**, and **peg-word mnemonics** help students retain isolated bits of information or lists. Third, the **EEEZ** strategy helps students to remember what they read. David Sousa (1992) outlines eight strategies that teachers can use in the classroom to help their students remember what taught material. **Self-Recitation** by using a cover card is the final, and possibly the most important, memory strategy outlined in this section.

MNEMONICS

Mnemonics can be defined as any process or technique which is intended to help us remember. We can enhance our memory by using such devices as rhymes, patterns, associations, and pictures. The word mnemonic is derived from the name of the ancient Greek goddess of memory, Mnemosyne. Mnemonics are meant not to replace but to use principles of learning (Higbee, 1977). Mnemonics are often represented as an acronym for memorizing some unrelated information. For example to recall the Great Lakes use:

HOMES - Huron, Ontario, Michigan, Erie and Superior.

Scruggs and Mastropieri (1992) found that mnemonic instruction produces long and lasting results in the acquiring and maintaining of science content. Once students

understand the concept, it is wise to have them make their own mnemonics using things which are familiar to them.

FIRST LETTER MNEMONICS

Mulcahy, Marfo, Peat, and Andrews (1986) present **first letter mnemonics** as a way to remember lists of words. It is especially useful for words that are unrelated, or perhaps difficult for the student to retain because they are abstract in nature. The letters used to form the mnemonic generally come from key words and should be represented in upper case. Any words which are less important can be presented in lower case letters.

Purpose **First letter mnemonics** is useful for remembering lists of words. It is not useful for remembering definitions or concepts.

Suggestions for Instruction Mulcahy et al., (1986) suggest a way to introduce the first letter mnemonics strategy. Present the students with a list of words to be memorized. Do not mention the words again until the next day. Quiz the students on how many of the words they can recall. The retention rate will be quite low. Introduce the students to the **first letter mnemonic** strategy using the words as an example. Again, leave the words until the next day, quiz the students again, and the retention rate should be much higher. This activity will demonstrate to students the effectiveness of this strategy. The next step might be to require the students to develop their own mnemonic for recalling something meaningful from their science work.

Overview of First Letter Mnemonics

F Form first letters into a word (upper case)

l Include other letters (lower case)

R Rearrange letters (if needed)

S Sentence formation

T Try it many times

(Mulcahy et al., 1986, p. 85)

Example of First Letter Mnemonics from Addison-Wesley Science

On page 241 of the text there is a diagram which outlines the anatomy of a flower. From right to left in the diagram, the following list of words is used. The corresponding sentence uses the **First Letter Mnemonic** strategy to aid the recall of the original list.

Anatomy of a flower list	>	First letter mnemonic list
Egg cells	>	Elaine
Filament	>	Frank
Anther	>	And
Petal	>	Patsy
Stigma	>	Sing
Style	>	Songs
Ovary	>	Often

First Letter Mnemonics Modified

This strategy does not have to be used to form a sentence. The mnemonic itself might form a word as in the following examples:

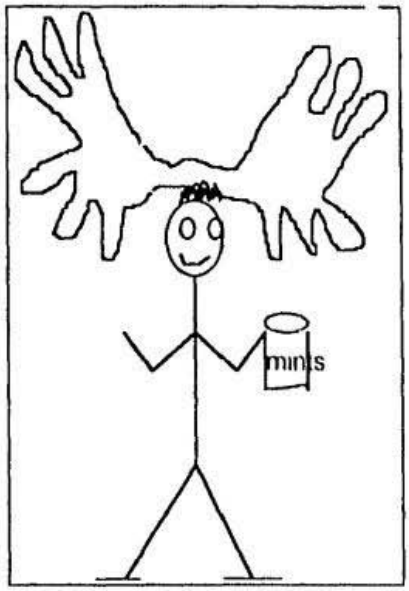
THE GREAT LAKES	COMPASS DIRECTIONS
H > Huron	**N** > North
O > Ontario	**E** > East
M > Michigan	**W** > West
E > Erie	**S** > South
S > Superior	

PICTORIAL MNEMONICS

Pictorial mnemonics, as described by Levin, Rosenheck, and Levin (1988), are pictures created to develop more concrete and memorable links between difficult concepts or definitions. The mnemonic should create a picture that is easily remembered and quickly associated with the desired information.

Purpose **Pictorial mnemonics** are useful in recalling abstract concepts or the key points of definitions that may not be so easily remembered without some cue or strategy.

Suggestions for Instruction This strategy will be most useful for the student who learns best visually. It could be presented in class when a difficult concept is introduced. Students will need several specific examples of how the strategy can be used.



Overview Pictorial Mnemonics are best explained by example. On page 240 of the Science text, the parts of a ***stamen*** are shown to be ***anther*** and ***filament***. Students could recall these abstract words by picturing a ***sta***nding ***man*** wearing ***antlers***, holding a jar ***filled*** with ***mint***.

PEG-WORD METHOD

The **peg-word** method is used to assist retention of lists of words that are unrelated, in a given order. A common approach to this method is to use **easily pictured objects** that **rhyme** with numbers. The numbers are the peg-words that are already committed to memory. For example 1-SUN, 2-SHOE, 3-TREE, 4-DOOR, 5-HIVE, 6-STICKS, 7-HEAVEN, 8-PLATE... Providing that you can count, and that you can associate the objects with the numbers by rhyming, you have the strategy half accomplished. The next step is to associate each word on the list with its corresponding peg word.

Purpose This method will help students remember lists of unrelated or abstract words in order. Remind students not to over-use the strategy because this will defeat its purpose of assisting remembering.

Suggestions for Instruction To demonstrate the effectiveness of this strategy, give the students a list of ten unrelated words. Do not require students to study the words. The next day ask students how many of the words they can recall. The retention rate should be low. At this point teach the strategy by assigning one peg word to each word on the list. Help students to create an image of the two words together. Again do not require students to study the words. The next day ask them to recall the list words again. There should be a significant increase in the number of words retained.

Example On page 127 of the science text the planets are discussed. **Venus, Mars, Jupiter and Saturn are the most easily seen planets.** Remembering this list may be difficult, because of the abstract nature of the words. Here is how the peg-word strategy could be used to make the task easier:

1-SUN	the SUN shining on a VENUS fly trap plant	**VENUS**
2-SHOE	a MARS bar stuck to the bottom of my SHOE	**MARS**
3-TREE	the planet JUPITER on top of a juniper TREE	**JUPITER**
4-DOOR	opening the DOOR of a SATURN car	**SATURN**

At first students will need direct instruction in creating peg words and using the peg-word strategy. Once the strategy has been mastered students should create their own peg-word system so that it is more meaningful and thus more beneficial for retention. A sample list of words and corresponding peg-words is included in Chapter 5. It could serve as a guide for introducing the strategy in class.

SOUSA'S STRATEGIES for TEACHERS

David Sousa (1992) adopts a teacher-centered approach to memory enhancement. He believes that classroom teachers can do much to improve students' retention of what they learn in class. He points out eight strategies for teachers to consider. As with all strategies, it is important to only make use of what is practical for you in your teaching.

Purpose These ideas are meant to be used by the classroom teacher. They are suggestions to enhance instruction time so that it is more beneficial to the student who wants to remember.

Suggestions for instruction Sousa's ideas are intended for the student's benefit. However the strategies are written for teachers who need to transmit these ideas to their students through instruction. Due to the wording of Sousa's strategies they are not suitable for students as they are presented here.

Eight Strategies to Improve Retention of Learning:

1. Place **new learning at the beginning** of a learning sequence and **student review at the end**. Use the in-between time for practice.
2. Find ways to **link new learning to something** the student already knows so that it has more relevance.
3. Keep in mind how the information already in the student's memory will have an impact on new learning. Find ways to have this **old learning help** and not interfere with the new material.
4. Provide a variety of unique and **clear verbal cues** that students can use to tag the new learning accurately before storage.
5. Use simple diagrams, graphs, or pictures to help students with **visual cues.**
6. Space out new material so the learner has **time to rehearse** and attach meaning to it.

7. Remember that a great deal of practice will allow for immediate learning, but that **distributed practice** in short intense periods is what **leads to retention.**

8. **Organize the new material** so that students can easily classify and link it with the appropriate network in long-term memory (Sousa, 1992, p. 22).

EEEZ

The **EEEZ** strategy was developed by Carol Dana (1989) to help students remember what they read. Dana's strategy is based on the belief that the more time people spend actively processing what they read, the more likely it is that they will remember the information. **EEEZ** is a three-step strategy that plays on the phrase take it easy. It will not be necessary to use each step of the strategy for every situation. Students have to look at sources outside their textbooks to use this strategy.

Purpose The purpose of **EEEZ** is to anchor the content of reading into the users memory after reading has taken place. This strategy is most useful when a student comes upon a difficult topic that is not fully explained in the text. **EEEZ** reinforces the idea that the text and the teacher are not the only sources of information and that students should be working towards independence in their learning.

Suggestions for Instruction When a difficult concept has been introduced to the class, discuss the idea that a textbook does not always offer all the information we need. Have the students suggest other ways they might gather information about a topic, like using the library, looking in dictionaries, or reading encyclopedias at home. Once students see the merit of looking outside the text for information and clarification, then the strategy can be introduced. **EEEZ** should be demonstrated in the classroom first, then the students should be have some opportunity for guided practice. Depending on your resources, this guided practice could take place in the library or the classroom.

Finally, students would be required to use the strategy independently. The main purpose of **EEEZ** is not to create a written assignment but to increase understanding and retention of a difficult concept. Students could report orally what they have learned. This strategy could also be used as an enrichment task for the more able student.

Overview of EEEZ

E **Explain** the content in a manner commensurate with the purpose of the reading.
Answer questions, generate questions, define a concept, provide a summary.
If you are unsure continue on to Explore and/or Expand.

E **Explore** the same subject matter as written by other authors.
Again try to elaborate on the concept, relating what was read.

E **Expand** your knowledge by increasing your information from the original text.
Increase your background knowledge on the original topic.
Embellish your answers with the additional knowledge gained (Dana, 1989, p. 33).

The following modification of **EEEZ** might be more suitable for the grade VI student.

EEEZ Modified

E **Explain** in your own words what you have read.
If this is difficult go on to Explore.

E **Explore** the idea with another person in discussion.
Explore the idea in a dictionary or encyclopedia.
Put the idea in your own words.
If this is difficult or if you would like to learn more, go on to Expand.

E **Expand** on the work in your text by going to other sources.
Increase your background knowledge by doing a library search.
Make jot notes about what you learn so you can share it with the class.

SELF-RECITATION

"Self-recitation is all-out, active study, you're changing half learned material to fully learned material." (Thomas & Robinson, 1982, p. 159)

Self-recitation or self-testing, is widely considered the most powerful tool for remembering information. The Reading Study Center at Cornell University is recognized for its success in helping college students improve their academic performance through more effective study skills. At Cornell, students are advised to keep the print out of sight at least 50 per cent of the time while they are studying. They are instructed to look away from the text frequently, cover it with their hand or a cover card, and check their comprehension and retention of the material.

Purpose Students should **self-recite** because self-recitation:

1. ensures comprehension and retention,
2. gets the student actively involved in the learning process,
3. keeps the student fully on task, and
4. allows the student to monitor personal progress accurately.

Suggestions for Instruction Students often feel falsely confident that they know the material for a test because they have spent a long time studying. The picture of what has or has not been remembered finally becomes clear during the test situation. If students are to be successful in evaluating the efficiency of their study sessions, they must learn to **self-recite** accurately. To instruct self-recitation the teacher should first introduce the idea of monitoring one's progress during study. Once the students can see the merit of keeping an eye on what they are retaining during study, then the teacher should model **self-recitation**. This involves the teacher reading a passage to the class

and having the students relay the main ideas of the passage without assistance. Once the students understand the concept, they can be paired with another student to practice the strategy. Teachers monitor students' progress to ensure proper performance of the task properly. Encourage students to use the strategy at home in their independent studies. Some students may have difficulty using this strategy independently but can still benefit from the strategy by practising at home with an adult who can assist them with the reading, comprehension and retention; the adult can also help the student to find the main points.

Overview of Self- Recitation Using a Cover Card

COVER CARD FOR STUDY

WITH MY NOTES

1) MAKE SPLIT PAGE NOTES
2) STUDY THE NOTES
3) COVER THE KEY POINTS
4) SUMMARIZE THE MAIN IDEA
5) CHECK FOR CORRECTNESS
6) IF THERE IS A PROBLEM, RE-READ THAT NOTE AND REPEAT

WITH MY TEXTBOOK

1) READ THE MATERIAL
2) READ SUBHEADINGS & IMPORTANT WORDS (MANY IMPORTANT WORDS ARE IN *ITALICS*)
3) LOOK AWAY AFTER READING AND TRY TO SUMMARIZE THE IMPORTANT POINTS
4) IF THERE IS A PROBLEM, RE-READ THE SECTION

READ IT
COVER IT
SAY IT
CHECK IT
REPEAT IF NEEDED

TEST TAKING

"Test panic's a worm
that erases the blackboard of my mind
and writes, "Worry!"
So I worry
about those I'll let down.
What will they say?
What will they think?
What will I do
if I fail?
Panic's now a python
crushing my chest
gnawing my gut
turning my adam's apple to stone.

While my bluebook waits,
time
runs
out."

(Maxwell, 1979, p. 318)

Test anxiety is a situation-specific personality trait which refers to individual differences in proneness to anxiety in test situations. People who are test anxious are more likely to:

- react emotionally with tension, apprehension and nervousness;
- have worry interfere with their ability to attend in the test situation; and
- arouse their autonomic nervous system (O'Neill & Spielberger, 1979).

Teaching study skills and **test-wiseness** as well as teaching students to be aware of any negative self-talk are among the ways to combat **test anxiety** (Flippo & Caverly, 1991).

Test wiseness refers to the skills a student needs to approach the test situation properly. This could include a list of steps a student might follow to complete a test or to improve efficiency and accuracy of test performance. Two strategies that may assist students in this area are **SCORER** and **SLOWER**.

Following the directions of a test accurately is critical to test success. The next activity might prove useful in demonstrating to your students the importance of following directions accurately.

Read all the directions before you do anything.

1) Write all your answers in ink.
2) Put your name, first name last, in the blank provided.

_____

3) Draw a line between the syllables in your name.
4) How many syllables does your full name have?_
5) Draw a square around every consonant in your name.
6) How many vowels does your name have?_____
7) Put tomorrow's date in the upper right hand corner.
8) Put your complete date of birth below the date.
9) Re-check your work.
10) Do only question number two.

The strategies and pointers introduced in this section address important concerns in test taking. **PRAISE** and **SMARTS** are strategies developed to help students overcome test anxiety by calming themselves down before the test starts and focusing on what they do know in the test situation. These strategies were developed at the Student Resource Centre with students who experience test anxiety. **SCORER** (Carman & Adams, 1972) is intended to help students approach the test situation in a more organized and strategic fashion and heighten their test wiseness. Also included here is a list of test-taking tips

for essay and objective type tests compiled by experts in the area of study skills. Finally the **SLOWER** strategy is designed for a strategic approach to essay type exams.

PRAISE

The idea for **PRAISE** came from a grade VI student who attended the Student Resource Centre. A bright girl who spent a considerable amount of time on her studies, she consistently did poorly on tests because she was so nervous when writing them.

Purpose **PRAISE** is meant to be used just **before the test begins.** The **PRAISE** strategy is designed for those students who are using effective study methods but cannot meet with success because of **test anxiety**. This strategy is useful in the time period when students are ready and waiting to receive their test. Since test anxiety is brought on for many different reasons, students should modify this strategy to manage their individual stresses in writing tests.

Suggestions for Instruction Introduce this strategy to an individual or small group of students for whom it might prove effective. Students must first be familiar with how negative self-talk can affect their performance. That is, telling themselves they are going to fail will increase their chances of actually failing.

Overview of PRAISE

PRETEND Pretend I'm somewhere else, a quiet, calm place.

RELAX Relax.

ARRANGE Arrange the things I need to write the test.

I CAN Tell myself "I CAN DO IT!"

SILENCE Ignore all the other students talking about the test.

ENJOY Enjoy writing the test because "I know I can do well."

SMARTS

SMARTS was developed at the Student Resource Centre with a student who experienced test anxiety. The strategy like the preceeding PRAISE strategy is most appropriate for the student who has effective study methods but does poorly on tests because of test anxiety.

Purpose **SMARTS** is to be used **during the test** to help the student approach the activity in a more organized and efficient way. The simple steps will help to focus the student on the information which they do know versus that which they do not know.

Suggestions for Instruction This strategy would be useful for the entire class. Introduce the idea of thinking positively and being organized to write a test. Students should spend only a few minutes using this strategy to prepare for writing the test, but it should save them time in the writing. Using a test that has already been graded, introduce the students to the steps of the strategy. As a class or individually, modify where necessary to make this strategy personally useful. Just before the writing of the next test, model the strategy for the students using the test as an example. Encourage, but do not require, the students to use the strategy when writing the test.

Overview of SMARTS

SKIM Skim the test.

MAKE Make jot notes on the questions that I know.

ASK Ask questions if I need to.

REALLY Really hard questions - circle them and go on.

THINK Think positively, "I am going to do well".

START Start writing the test.

SCORER

SCORER was developed by Carman and Adams (1972) to help students approach tests in a more organized and strategic manner. "Research studies show that your ability to reason with what you know is even more important than what you know. When taking tests, it is important that you be able to read and interpret questions correctly if you are to succeed." (Carman & Adams, 1972, p. 210).

Purpose **SCORER** is a strategy to be used **during the test**. It focuses students on the skills necessary to achieve success in the test situation, like scheduling their time properly, doing the easier questions first and checking their work.

Suggestions for Instruction **SCORER** is best introduced in a class discussion and then practiced in the context of a test. The steps of **SCORER** need some explaining. In terms of ***Scheduling*** students need to understand that they should spend more time and effort on questions that are worth more. They should keep an eye on the clock to make sure they are not spending too much time on any given question. ***Clue words*** can help to determine an answer, or they may assist with the spelling of a troublesome word. ***Omit*** means to leave out difficult questions for the moment and to come back to them once the other questions have been attempted. ***Estimating*** the answers is only useful in tests requiring computation, like a math test. ***Read carefully*** to make sure that you understand the instructions. It is very important that students ***Review*** or check every part of the test to make sure they have not inadvertently left out any questions or made any errors.

Overview of SCORER

SCHEDULE Schedule your time.

CLUE Look for Clue words.

OMIT Omit difficult questions.

READ Read carefully.

ESTIMATE Estimate your answers.

REVIEW Review your work.

(Carman & Adams, 1972, p.210)

One small modification to **SCORER** makes the strategy more useful for tests which involve essay questions. And, of course, students should be encouraged to modify the strategy to meet their personal needs.

SCORER modified for essay tests:

SCHEDULE Schedule your time.

CLUE WORDS Look for clue words to help you.

OMIT Omit difficult questions until last.

READ Read carefully.

EXAMPLES Give examples where you can.

REVIEW Review the whole test.

TEST FORMAT POINTERS

The **format of the test**, whether it be multiple choice, short answers, or essays determines how the tes. should be attacked. Students need to be aware of the importance of using the best approach for a given **test format**. For the sake of simplicity there is a focus on pointers for writing an essay test versus an objective test. Millman and Pauk

(1969) outline how to best approach each type of test format. During discussion the class can add ideas to its own list of pointers.

Essay Questions

- **Read** all essay questions first.
- As they occur to you, put **jot notes** next to each question on the test paper.
- **Order** your **ideas** (1,2,3...) as you want to write them.
- Order your supporting ideas or **examples** as 1a, 2b, and so on.
- Do not spend long on the jot notes as they are just an **outline**.
- **Organize your writing** ideas from the outline.
- Put the **question in** the **answer**.
- **Write** your answer from the outline (Millman & Pauk, 1969).

Objective Test Items

- Choose the answer the test maker intended; avoid interpreting the question.
- Look for the **facts you remember** from study or from class.
- **Anticipate** the answer. Then look for it.
- **Use information** you find in other questions.
- Always **guess** an answer rather than leaving a question blank.
- **Eliminate** the choices that you know are incorrect (Millman & Pauk, 1969).

SLOWER

This strategy developed by Carman and Adams (1972), outlines the six general steps for **writing a good essay**. Many students do poorly on essay questions in tests, not because they don't have the knowledge but because they have poor organizational skills in their writing. The mnemonic **SLOWER** encourages students to slow down and formulate

their ideas, taking time to revise and edit before they pass the paper in for evaluation. This strategy fits suits the process approach to writing, presently in vogue.

Purpose **SLOWER** is designed to give students a simple but effective outline for writing essay answers independently. Carman and Adams (1972) intended this strategy to be used for test-taking and for in-class essays. For our purposes here, we will consider it only as a test-taking strategy.

Suggestions for Instruction This strategy is useful in situations where students are required to write essay answers. Do not create a false situation to introduce the strategy. Use a question from their current curriculum. If **SLOWER** is appropriate for your class, discuss with the group what you look for in a good essay answer and how essay responses are evaluated. Take them through each step of the strategy explaining its purpose and meaning. With your guidance, have the students practice using the strategy in class. Finally, require them to complete an essay at home showing the steps of **SLOWER**. Once students have mastered the strategy they may want to modify it to meet their needs.

Overview of SLOWER

SELECT Select a topic you can handle.

LIST List all your ideas related to the topic.

ORDER Order your ideas.

WRITE Write a first draft.

EXAMINE Examine your draft for errors.

REVISE Revise before turning in the paper.

(Carman & Adams, 1972, p. 145)

5. AN ALPHABETICAL LIST OF STRATEGIES

EEEZ

E **Explain** the content in a manner commensurate with the purpose of the reading.
Answer questions, generate questions, define a concept, provide a summary.
If you are unsure continue on to Explore and/or Expand.

E **Explore** the same subject matter as written by other authors.
Again try to elaborate on the concept, relating what was read.

E **Expand** your knowledge by increasing your information from the original text.
Increase your background knowledge on the original topic.
Embellish your answers with the additional knowledge gained.

(Dana, 1989, p. 33)

EEEZ Modified

E **Explain** in your own words what you have read.
If this is difficult, go on to Explore.

E **Explore** the idea with another person in discussion.
Explore the idea in a dictionary or encyclopedia.
Put the idea in your own words.
If this is difficult or if you would like to learn more, go on to Expand.

E **Expand** on the work in your text by going to other sources.
Increase your background knowledge by doing a library search.
Make jot notes about what you learn so you can share it with the class.

First Letter Mnemonics

F **F**orm first letters into a word (upper case)

I **I**nclude other letters (lower case)

R **R**earrange letters (if needed)

S **S**entence formation

T **T**ry it many times

(Mulcahy et al., 1986, p. 85)

EXAMPLE FROM PAGE 241 OF ADDISON-WESLEY SCIENCE

ANATOMY OF A FLOWER		FIRST LETTER MNEMONIC
Egg cells	>	Elaine
Filament	>	Frank
Anther	>	And
Petal	>	Patsy
Stigma	>	Sing
Style	>	Songs
Ovary	>	Often

FORCE

F FIND OUT Your teacher announces a test. If you don't receive all of the information that you need, ask questions, for example "What will the test cover?", "What types of questions will be used?"

O ORGANIZE Collect all necessary materials for taking the test, for example; notes, old tests, books, etc.

R REVIEW Do the general review necessary to study for this test. For example; skim chapters, charts, maps, summaries, questions, or vocabulary; highlight notes; review old tests and assignments.

C CONCENTRATE Make a study sheet (cue sheet) by putting important information into question/answer format.

E EARLY EXAM Practice the test by pretesting. For example take turns asking questions with a partner (study buddy); have your parents or other adults help you drill from your study sheet; take your own test from your study sheet. Now review those weak spots until you are certain of what you know. There may be a few items you want to review right before the test.

(Wehrung-Schaffner & Sapona, 1990, p.293)

FORCES for Addison-Wesley Science

F FIND OUT

Find out what pages the test will cover.

Can any pages be left out?

O ORGANIZATION

Do I have all the class notes and lesson tests from the unit?

Make a study sheet of all the words in *italics*, keeping words on the left and definitions on the right.

R REVIEW

Read the chapter, notes, study sheets, lesson tests.

Put an asterisk (*) next to anything that is important or difficult to understand or remember.

Try the Ideas for Review, and Test for Understanding.

C CONCENTRATE

Add to the study sheet any ideas or words that have an *.

Review these ideas for understanding and memory.

E EARLY EXAM

Use a cover card to test myself.

Discuss any important or difficult ideas with someone.

S STRATEGIES

Use memory strategies to remember difficult stuff.

OK4R

Overview	What is the purpose of reading this chapter? Read the introduction, headings, and summary.
pick out Key ideas	Note the key ideas in each subsection.
Read	Read the difficult paragraphs carefully, closely, thoughtfully. Make jot notes in the margins of the text. Underline or bracket key ideas. These steps will make the review easier.
Recite	Look away or cover your text and recite the key points. Check to see how well you knew each point. The cover-up technique forces you to concentrate.
Reflect	Reflect on the concepts you have learned. Ask why; probe; challenge the author.
Review	Recapture the broad chapter plan. Give the chapter another overview. Check yourself on the crucial content.

(Thomas & Robinson, 1982, p. 378)

OK4R for Addison-Wesley Science

Overview

Overview the chapter.
Read the title, the introduction, the headings, and the blue pages.
Look at the pictures, graphs and charts.
Get an idea of what the chapter is about.

Key ideas

Read each sub-section.
Write split page notes about the important ideas.

Read

Carefully *read* the difficult or important sections.
Do not go on until you understand and remember.
Add each new point to your notes.

Recite

Use a cover card with your notes.
Cover your notes and recite the information.

Reflect

Read *Something To Try*, *Find Out on Your Own* and *Something to Think About.*
Answer the questions in your mind.

Review

Go over the whole chapter again.
Re-read *Ideas for Review.*
Answer all the questions in *Test Your Understanding.*
Focus on anything that is difficult or important.

PEG-WORD

PEG-WORDS	*LIST WORDS*	*PICTURE THIS...*
1 sun	dog	a dog sitting in the sun
2 shoe	car	a car driving over my shoe
3 tree	light switch	a tree with a light switch on it
4 door	computer	finding a computer behind my front door
5 hive	mother	mother being stung by a bee
6 sticks	oranges	orange colored sticks
7 heaven	floral curtains	opening the curtains to look at heaven
8 plate	house	smashing a giant plate on my house
9 wine	sewing machine	spilling wine on a sewing machine
10 pen	dictionary	scribbling marks on a dictionary

PRAISE

PRETEND Pretend I'm somewhere else - a quiet, calm place.

RELAX Relax.

ARRANGE Arrange the things I need to write the test.

I CAN Tell myself "I CAN DO IT!"

SILENCE Ignore all the other students talking about the test.

ENJOY Enjoy writing the test because "I know I can do well."

PREP

P Plan what I need: pencils, text, exercise, lab book.

R Review my notes the night before.

E Explore ideas in class, ask questions.

P Predict the outcome of experiments in my mind.

PREPARE

P Plan locker visits.

R Reflect on what you need.

E Erase personal needs.

P Psych yourself up for class.

A Ask yourself, "What is going on in class today?"

R Review your notes and study guides.

E Explore the meaning of the class introduction.

(Rafoth & DeFabo, 1990, p. 16)

RESPONSE

1) As the student reads the content area material, major points are recorded.

2) As questions arise while reading the text, the student writes them down along with the page number of the text.

3) Whenever a new term or concept is encountered, the student writes it down along with the page number on which the term or concept appeared.

4) Students place an asterisk beside those questions, terms or concepts which the student would like to have explained or defined, as well as giving the page number from which they came.

5) The student gives the completed RESPONSE sheet to the teacher, who then writes a "response" to the student in order to clarify and/or elaborate upon the text itself.

6) The teacher returns the RESPONSE sheet to the student the following class period prior to holding a class discussion of the text material.

(Farris et al., 1991, p. 262)

A sample **RESPONSE** sheet:

RESPONSE

Name:_____ **Date:**_____
Reading assignment:_____

1) Important Points : Important Ideas - Put page #s
(Things you think are important to the topic)

2) Questions: Questions that come to you as you read- put page #s
a) Things you don't understand/words, charts, etc.
b) Things you find interesting/agree or disagree with.

3) New terms: Vocabulary, people's names, new words

(Farris et al., 1991, p. 266)

RESPONSE (MODIFIED)

1) Students are arranged in groups of four, with mixed ability grouping.

2) One **RESPONSE** sheet is assigned to each group.

3) The group reads the assigned pages and major points are recorded.

4) As questions arise in the reading, the question and page number are recorded.

5) Any new terms or hard words are listed with the page number.

6) Once all the **RESPONSE** sheets are completed, the findings are discussed in class.

7) Notes are made on the board for the important points and key words.

8) Students record these notes in their exercises.

9) All questions are answered in class.

RESPONSE sheet modified for Addison-Wesley Science

RESPONSE

Name:_____ **Date:**_____

Reading assignment: _____

1) Important Points : PUT PAGE #s

2) Questions: Questions that come to you as you read - PUT PAGE #s
a) Things you don't understand like words, pictures etc.
b) Questions in the text that you can't answer.

3) New vocabulary, new ideas - PUT PAGE #s

Self-Recitation Using a Cover Card

COVER CARD FOR STUDY

WITH MY NOTES

1) MAKE SPLIT PAGE NOTES
2) STUDY THE NOTES
3) DO I KNOW THE KEY POINTS?
4) LOOK AWAY & SUMMARIZE THE MAIN IDEA
5) CHECK FOR CORRECTNESS
6) IF THERE IS A PROBLEM, RE-READ & REPEAT

WITH MY TEXTBOOK

1) READ THE MATERIAL
2) READ SUBHEADINGS & IMPORTANT WORDS (MANY IMPORTANT WORDS ARE IN *ITALICS*)
3) LOOK AWAY AFTER READING AND TRY TO SUMMARIZE THE IMPORTANT POINTS
4) IF THERE IS A PROBLEM, RE-READ THE SECTION

READ IT
COVER IT
SAY IT
CHECK IT
REPEAT IF NEEDED

SCORER

SCHEDULE Schedule your time.

CLUE Look for Clue words.

OMIT Omit difficult questions.

READ Read carefully.

ESTIMATE Estimate your answers.

REVIEW Review your work.

(Carman & Adams, 1972, p. 210)

SCORER modified for essay tests

SCHEDULE	Schedule your time.
CLUE WORDS	Look for clue words to help you.
OMIT	Omit difficult questions until last.
READ	Read carefully.
EXAMPLES	Give examples where you can.
REVIEW	Review the whole test.

SLOWER

SELECT	Select a topic you can handle.
LIST	List all your ideas related to the topic.
ORDER	Order your ideas.
WRITE	Write a first draft.
EXAMINE	Examine your draft for errors.
REVISE	Revise before turning in the paper.

(Carman & Adams, 1972, p. 145)

SMARTS

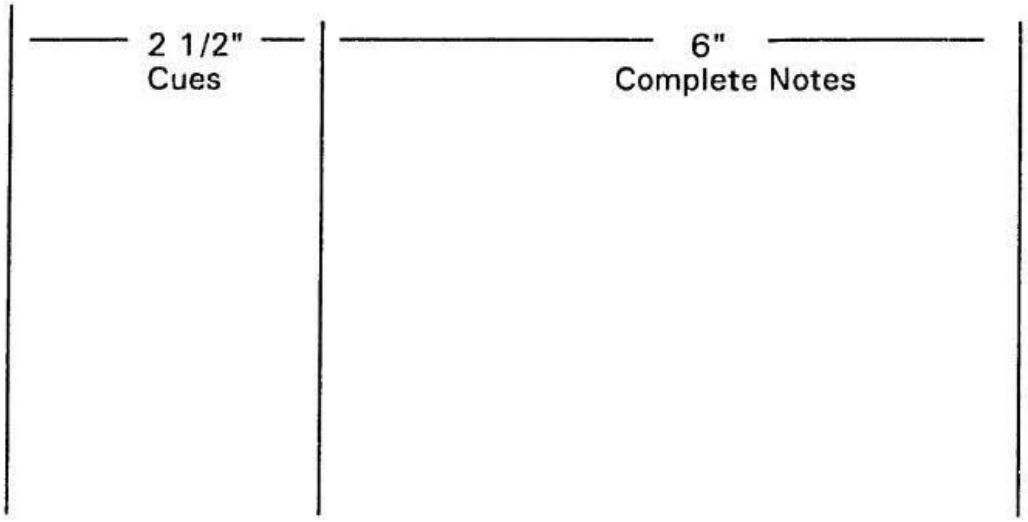
SKIM	Skim the test.
MAKE	Make jot notes on the questions I know.
ASK	Ask questions if it is necessary.
REALLY	Circle Really hard questions, and go on.
THINK	Think positively: "I am going to do well."
START	Start writing the test.

Sousa's Strategies for Teachers

- Place **new learning at the beginning** of a learning sequence and a **student review at the end**. Use the in-between time for practice.
- Find ways to **link new learning to something** the student already knows and therefore has the most relevance.
- Keep in mind how the influence already in the student's memory will have an impact on new learning. Find ways to have this **old learning help** and not interfere with the new material.
- Provide a variety of unique and **clear verbal cues** that students can use to tag the new learning accurately before storage.
- Use simple diagrams, graphs, or pictures to help students with **visual cues.**
- Space out new material so the learner has **time to rehearse** it and attach meaning to it.
- Remember that massed practice is for immediate learning, but that distributed practice in short intense periods is what leads to retention.
- Organize the new material so students can easily classify and link it with the appropriate network in long-term memory.

(Sousa, 1992, p. 22)

SPLIT-PAGE NOTETAKING



STUDENT TIPS FOR TEXT NOTETAKING

read	**Read** the whole section before you take any notes.
own words	Write notes in your **own words** so you will remember them.
split page	Make **split page** notes with key points and details.
highlight	Use **highlighters** to accentuate key words, but don't get color-crazy.
concise	Don't rewrite the chapter; be **concise**.
jot notes	Don't write in full sentences, use a "-" and make **jot notes**.
abbrev.	**Abbreviate** where you can, but make sure you will remember the abbrev. later.
re-organize	Simply re-writing notes serves no purpose; re-write to **re-organize.**
page #	Write the **page number** of each note for easy reference.
once a week	Don't leave all the notetaking until the last minute. Take notes on your text at least **once a week**.

SQ3R

SURVEY Glance over the headings in the chapter to see the few big points that will be developed. Also read the final summary paragraph if the chapter has one. This survey should take not more than a minute and will show the three to six core ideas around which the discussion will cluster. This orientation will help you organize the ideas as you read them later.

QUESTION Now begin the work. Turn the first heading into a question. This will arouse your curiosity and thereby increase comprehension. It will bring to mind information already known, thus helping you to understand that section more quickly. The question also will make important points stand out at the same time that explanatory detail is recognized as such. Turning a heading into a question can be done at the instant of reading the heading, but it demands a conscious effort on your part.

READ Read to answer that question, i.e., to the end of the first headed section. This is not a passive plodding along each line, but an active search for an answer.

RECITE Having read the first section, look away from the book and try briefly to recite the answer to your question. Use your own words and cite an example. If you can do this you know what is in the book; if you cannot, glance over the section again. An excellent way to do this reciting from memory is to jot down brief cue phrases in outline form on a sheet of paper.

Now repeat the steps of Question, Read and Recite with each successive headed section; that is turn the next heading into a question, read to answer that question, and recite the answer by jotting down cue phrases in your outline. Read in this way until the entire lesson is completed.

REVIEW When the lesson has been read through in this way, look over your notes to get a bird's eye view of the points and their relationship and check your memory as to the content by reciting the major sub-points under each heading. This checking of memory can be done by covering up the notes and trying to recall the main points. Then expose each major point and try to recall the sub-points listed under it.

(Robinson, 1970, pp. 32-33)

SQ3R for Addison Wesley Science

Survey 1) Read the chapter title and introduction.

2) Answer the introduction questions out loud.

3) Read the sub-headings and look at the pictures.

4) Read the blue pages.

Question Ask a question for each sub-title except Something to Try.

Read Read each section to find the answer to the question.

Recite Write jot notes on each answer using the subtitle.

Review Make notes about the most important things you have learned.

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APPENDICES

APPENDIX A

VOCABULARY FOR TESTS

The following clue words are often used in essay type exam questions. The test maker understands the precise meaning of these words but the students' understanding may not be so clear. The **highlighted** words are most **frequently encountered**, therefore students must understand these words.

CLUE WORD	ACTION REQUIRED
Analyze	To find the main ideas and show how they are related and why they are important.
Comment On	To discuss, criticize, or explain its meaning as completely as possible.
Compare	**To show both the similarities and differences.**
Contrast	**To compare by showing the differences.**
Criticize	To give your judgment or reasoned opinion of something, showing its good and bad points. It is not necessary to attack it.
Define	To give formal meaning by distinguishing it from related terms. This is often a matter of giving a memorized definition.
Describe	To write a detailed account or verbal picture in logical sequence or story form.
Diagram	To make a graph, chart, or drawing. Be sure you label it and add a brief explanation if it is needed.
Discuss	Means to describe giving the details and explaining the pros and cons.
Enumerate	To list. Name and list the main ideas one by one. Number them.
Evaluate	To give your opinion or some expert's opinion of the truth or importance of the concept. Tell the advantages and disadvantages.
Illustrate	To explain or make it clear by concrete examples, comparisons, or analogies.
Interpret	To give the meaning using examples and personal comments to make it clear.

Justify	A statement of why you think it is so. Give reasons for your statement or conclusion.
List	**To produce a numbered list of words, sentences, or comments. Same as enumerate.**
Outline	To give a general summary. It should contain a series of main ideas supported by secondary ideas. Omit minor details. Show the organization of the ideas.
Prove	To show by argument or logic that it is true. The word "prove" has a very special meaning in mathematics and physics.
Relate	To show the connections between things, telling how one causes or is like another.
Review	To give a survey or summary in which you look at the important parts and criticize where needed.
State	To describe the main points in precise terms. Be formal. Use brief clear sentences. Omit details or examples.
Summarize	To give a brief, condensed account of the main ideas. Omit details and examples.
Trace	To follow the progress or history of the subject.

(Carman & Adams, 1972, pp. 231-233)

APPENDIX B

POETIC DEVICES TO AID MEMORY

1) RHYME *INTENSIFIES THE IMPACT OF WORDS*

Thirty days hath September,
April, June, and November,
All the rest have thirty one,
Excepting February alone
And that has twenty-eight days clear,
And twenty-nine in each leap year.

I before E except after C.

2) RHYTHM *A CONNECTING DEVICE*

Some students may find it beneficial to recite their science notes to a familiar song. Lyrics of a song, and poetry are much easier to retain than the lines of prose.

3) GROUPING *MEANINGFUL CHUNKS*

Break information into meaningful chunks, like a telephone number. We commit each piece to memory, thus achieving the whole.

9026784321 versus 902-678-4321

A good example of RHYME and GROUPING together is the song we teach children to help them remember the alphabet:

ABCD, EFG, HIJK, LMNOP, QRS, TUV, W, X, Y
AND Z. Now I know my ABC's, next time won't
you sing with me.

(McKowen, cited in Criscoe & Gee, 1984, p. 251)

APPENDIX C

PERSONAL STUDY ENVIRONMENT

We all learn differently, and where we study can have an impact on what we remember. As you look at these questions think about what environment would work best for you, not necessarily how you are studying at present. Consider your personal preferences in study environment by completing the following survey.

ENVIRONMENTAL INFLUENCE	GOOD	BAD	?
1. FOOD/DRINK			
2. BACKGROUND MUSIC			
3. COMPLETE QUIET			
4. STUDY ALONE			
5. WITH A GROUP			
6. WITH ONE OTHER PERSON			
7. BRIGHT OVERHEAD LIGHT			
8. DESK LAMP			
9. NATURAL LIGHT			
10. STUDY ON MY BED			
11. STUDY AT A DESK OR TABLE			
12. STUDY IN AN ARMCHAIR			
13. STUDY AFTER SCHOOL			
14. IN THE EVENING			
15. IN THE MORNING			

ADD ANY IDEAS THAT ARE NOT INCLUDED ABOVE FOR YOUR OWN IDEAL STUDY ENVIRONMENT.

APPENDIX D

SELF-REPORT SURVEY

Please answer the following questions by circling the appropriate number.

ALWAYS	USUALLY	SOMETIMES	RARELY	NEVER
5	4	3	2	1

1) I read material more than once if I don't understand it.	5	4	3	2	1
2) I try to pick out the most important points as I read.	5	4	3	2	1
3) I survey new reading assignments.	5	4	3	2	1
4) I recite facts to learn them.	5	4	3	2	1
5) I review for a test more than one day before it is given.	5	4	3	2	1
6) I concentrate when I try to study.	5	4	3	2	1
7) I get all of my homework done.	5	4	3	2	1
8) I study with a friend.	5	4	3	2	1
9) I finish my tests before the time is up.	5	4	3	2	1
10) I try to "overlearn" material before a test.	5	4	3	2	1
11) I plan in my mind the answer to an essay question before writing.	5	4	3	2	1
12) I pay attention in class.	5	4	3	2	1
13) I take notes that help me when we have a test.	5	4	3	2	1
14) I take the required materials to class.	5	4	3	2	1
15) I really try to get good grades.	5	4	3	2	1

NAME: _____.

(Davis, 1990, p. 278)