The Use of Learning and Study Strategies by Students Taking a Remedial Workshop at Selkirk College

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I certify that I have read this manuscript and that, in my judgment, it is fully adequate in scope and quality for the degree of Master of Arts in Curriculum and Instruction.

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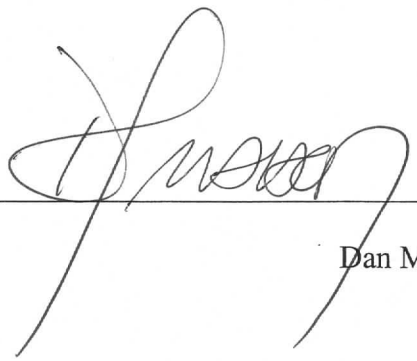

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Abstract

The purpose of this study was to discover what the students' use of learning and study strategies, as measured by the Learning and Study Strategies Inventory (LASSI), is at Selkirk College on the Castlegar Campus, British Columbia. Nineteen students completed the second, online version of the LASSI, developed by Weinstein, Palmer, and Schulte (2002) at the beginning of the semester and prior to taking a 15-hour "Student Success Skills" workshop, and again after having completed the workshop and after having completed one semester. Overall, the results confirm other studies that students, in general, are not prepared for the college experience regarding the non-content related area of learning strategies (e.g. Albaili, 1997; Haynes et al., 1988; Puntambekar, 1995; Schumacker & Sayler, 1995), and although scores and percentiles increased in all ten LASSI scales and seven out of the ten LASSI scales experienced a significant increase in means ($p>0.5$), students still need to improve their learning and study strategies further.

Because of the small sample size, methodological weaknesses, and Selkirk College's unique geographical and demographical situation, care should be taken when trying to generalize the results of this study to other student populations and institutions. Nevertheless, this research gives rise to numerous possibilities for follow-up studies, which include large-scale studies for the entire student population at Selkirk College, small-scale program-specific studies, as well as correlation studies. The existing data can be used for the improvement of the currently existing Learning and Study Skills Centre on the Castlegar Campus and the programs it offers, as well as the development of a first-year, three-credit, university-transfer course in college success skills.

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CHAPTER ONE

Introduction

Background

Although remedial programs have existed since the founding of postsecondary institutions, the teaching of study skills is considered a relatively new area within the education system when, in fact, even Harvard offered remedial Greek and Latin courses shortly after its founding in 1630 (Boylan & White, 1994; Maxwell, chap. 1, 1997). Hunter Boylan & William White (1994) summarize the current state of developmental education as follows: "The field of developmental education is simply the modern version of past efforts to respond to the fact that, at their point of entry, many students are unable to succeed without some sort of special assistance" (p.3). It is important to note that this definition of developmental education encompasses content and non-content deficiencies. Content deficiencies relate to specific content prerequisites for a course; for example, a student who does not have a firm grounding in algebra and trigonometry will have difficulty in calculus. Non-content deficiencies refer, as the name applies, to areas that exist outside of specific content areas. For example, students who have never lived on their own may have trouble managing a household and their own finances and time.

According to Martha Maxwell (1997, chap. 1) and Darrel Clowes (1994), the mainstreaming of developmental education started in the 1960's when most postsecondary institutions adopted an "open-admission" policy, which allowed all students to enter postsecondary education. When Selkirk College was founded in 1966, it also instigated an open-door policy, which entails that all students who have the prerequisites for a given

program will be admitted into that particular program, instead of admitting only the highest-qualified students, as measured by GPA or entrance placement tests for example. The open-admission policy was geared toward groups that were underrepresented in academic and professional careers; however, these groups were generally under-prepared for postsecondary education as well. In fact, Martha Maxwell (1997, chap. 6) asserts that "equal opportunity" really meant "guaranteed failure" (p. 135). Unsurprisingly, this open-door policy was followed by an explosion of remedial programs, which, in turn, was followed by an explosion of research and publications in developmental education. Consequently, developmental education started to be recognized as a legitimate field in education in the 1980's (Clowes; Maxwell, 1997, chap. 1).

Despite the advances in mainstreaming remedial education, at the postsecondary education level, it is still often assumed that students, having completed the K-12 system, have somehow acquired the knowledge of how to study (Weinstein, 1988; Weinstein & Mayer, 1986). Norman (1980) points out the following:

> It is strange that we expect students to learn yet seldom teach them about learning. We expect students to solve problems yet seldom teach them about problem solving. And, similarly, we sometimes require students to remember a considerable body of material yet seldom teach them the art of memory. (as cited in Weinstein & Mayer, 1986, p. 97)

Even though over 20 years have past since Norman wrote this, in my experience as the Learning Specialist at Selkirk College on the Castlegar Campus, many students have not received training in how to study, and once entering the postsecondary education system,

these students find themselves at a loss when faced with the increase in freedom and responsibilities.

Schumacker and Sayler (1995) showed that being ready for college involves more than high aptitude measures and success in high-school classes. Students who have the academic ability to be successful may, nevertheless, have problems with college work if they have not developed good study habits and time-management skills. Schumacker and Sayler's findings suggest that even gifted and talented students should not be overlooked in their need for adjustments in these areas. Colleges and universities have acknowledged the need for study-skills training and have implemented intervention strategies by providing resources (Weinstein, 1988). These resources can be categorized into three areas: the skill aspect, the emotional aspect, and the metacognitive aspect (McCombs, 1988; Weinstein & Mayer, 1986; Wittrock, 1986).

The skill aspect refers to what is typically called study skills; it is the "how to." Usually, study skills include scheduling, listening, note taking, reading, memorization, test preparation, and test taking. In general, study skills are thought of as skills that can be learned and practiced, like math (Schmeck, 1988; Weinstein, 1988). Many people believe this to be the extend of remediation in non-content areas. However, study skills, per se, refer to the doing aspects of academics rather than the emotional or intuitive ones.

This is an important distinction. The emotional aspect influences whether or not students actually use the skills they have. I have always been amazed at the amount of students who approach me for help in mathematics with the attitude that they are not "going to understand it anyway." These beliefs about themselves strongly influence the extent to which these students implement the study skills they know. Often, they simply do not

attempt the homework assignments because according to them, "It's no use." Obviously, the affective domain of the students' college experiences cannot be dismissed when talking about study skills.

Already, it becomes apparent that studying is more than just a few memorization tricks. Once students know the different techniques, they need to want to use them, and then they need to assess how well these techniques worked for them. The last aspect here is called metacognition – "the learners' knowledge about and control over their cognitive processes" (Wittrock, 1986, p. 310). In my workshops students are often surprised when they discover that a single, foolproof way of studying does not exist. Instead, they need to find out what does and does not work for them in general and for specific subjects and tasks.

Since successful studying includes much more than a few methods, all three previously-mentioned aspects combined – the skill component, emotional component, and metacognitive component – comprise what is referred to as college-success skills. This term is often used in conjunction with study skills, but is generally thought of as a broader category. It includes all the aspects of study skills, but then incorporates metacognition and, of course, motivation and attitude (the primary emotional aspects). Furthermore, textbooks on college-success skills often include awareness of institutional and communal resources, extending from counselors, academic advisors, special needs advisors, assessment services, tutoring services to library access, computer access, drug and alcohol help, and financial aid (Ellis, 2000; Fleet, Goodchild, & Zajchowski, 1999; Gardner & Jewler, 2001; Wahlstrom & William, 2002).

Evidently, successful studying encompasses many aspects: students need to know the tools of effective studying, they need to have the motivation to use these tools, and they need

to have the skills and awareness to analyze what does and does not work for them. Unsurprisingly, since the actual use of study strategies depends on many aspects, not all students know how to employ study strategies effectively or they simply do not employ the strategies they know. An adequate term for all of the non-content aspects required for successful study is "learning strategies," which Weinstein (1988) defines as "any behaviors or thoughts that facilitate encoding in such a way that knowledge integration and retrieval are enhanced" (p. 291). They are a sequence of events rather than a single event and should be employed deliberately rather than accidentally or obediently (Garner, 1988). Consequently, this definition incorporates the skill, emotional, and metacognitive aspects of learning.

Rationale

The teaching of these learning strategies in postsecondary institutions often falls within some kind of student-support-services department, which usually includes counseling, learning assistance, and tutoring services (LRNASST@listserv.arizona.edu, personal communications, 2001-2002). As a learning specialist, my primary responsibility is facilitating students' success, which often entails fostering the development of learning strategies in students. Per academic year, I have contact with about 150 students on a one-on one basis (with about 400 individual appointments) and with about 250 students in approximately 10 group settings. Clearly, the demand exceeds the capacity of one person.

Although it is commonly known that learning strategies improve students' performances and retention (Weinstein, 1988; Wittrock, 1986), hardly any institution (especially public) has the resources to hire the required amount of personnel (especially in support services) (LRNASST@listserv.arizona.edu, personal communications, 2001-2002).

As a result, I would like to expand the teaching of study skills in group settings because I would be able to reach more students than I would if I continue on a primarily one-on-one basis. Specifically, I would like to create a three-credit, first-year-university course in college-success skills. However, since the topics are numerous and could be delivered in a variety of modes and to varying degrees of emphasis, I would benefit from knowing what exactly the needs are of the students for whom this course will be designed. Although this course would be open to all students, not all students will be interested in taking it as an elective. Therefore, I needed to find out what the characteristics are of students who are interested in improving their readiness for college.

In order to achieve this, I used the Learning and Study Strategies Inventory (LASSI), which was originally developed in 1987 at the University of Texas in Austin by Claire E. Weinstein, Ann C. Schulte, and David R. Palmer (LASSI – Background, 1996-2002). It assesses students' strategies on ten different scales: attitude, motivation, time management, anxiety, concentration, information processing, selecting main ideas, study aids, self-testing, and test strategies (LASSI – Scales, 1996-2002). These scales relate to the three different components of strategic learning: the skill component (information processing, selecting main ideas, and test strategies), the will or emotional component (attitude, motivation, and anxiety), and the self-regulation or metacognitive component (concentration, time management, self-testing, and study aids) (LASSI – Background, 2002). After having investigated research on learning and study strategies and after having communicated with learning assistance professionals in North America, I found that the LASSI is currently the most prevalent and most reliable test available.

The benefits of this study for my work are abundant. With the increased emphasis on accountability, this study provides valuable data for the need of our department's existence. Prior to this research, no study (of which I am aware) on college readiness had been completed at Selkirk College. Secondly, the data could function as a needs assessment preceding the curriculum development of the university-transfer course, which helps to ensure that the course content is tailored to the specific needs of Selkirk College students. Working with the LASSI in the context of a 15-hour workshop also gave me an indication of its usefulness in the future. And finally, the data gives some insight into the changes in the use of learning and study strategies after one semester.

Purpose

The purpose of this study was, first of all, to discover what the learning and study strategies are of students who are taking the "Student Success Skills" workshops offered August 19th – 23rd, August 26th – 30th, and September 30th – December 3rd, 2002. In order to assess these strategies, the Learning and Study Strategies Inventory (LASSI) was used. Second, this study investigated the changes in these students' use of learning and study strategies by administering the LASSI again in January and February 2003. The data can be used for the improvement of the currently existing Learning and Study Skills Centre and the programs it offers, as well as the development of a first-year, three-credit, university-transfer course in college-success skills.

Research Questions

1. What is the profile according to the Learning and Study Strategies Inventory (LASSI), of students who are taking a one-week (15 hours) study skills workshop at Selkirk College?
2. Does the learning and study skills profile, as measured by the LASSI, change after having taken the workshop and after having completed one semester at Selkirk College?

Operational Definitions

These definitions are organized by categories rather than in alphabetical order.

Developmental education – programs designed to address the fact that, at their point of entry, many students are unable to succeed without some sort of special assistance (Boylan & White, 1994).

Remedial education – for the purpose of this study, remedial education is synonymous with developmental education (Maxwell, chap. 1, 1997).

- *Content skills remediation* – an area within developmental education that focuses on the content remediation, such as mathematics or writing; these are measurable content skills that students need in order to succeed in a particular course.
- *Non-content skills remediation* – an area within developmental education that focuses on learning strategies, which are not content specific.

Learning strategies – any behaviours or thoughts that facilitate encoding in such a way that knowledge integration and retrieval are enhanced (Weinstein, 1988).

- *Skill component* – also called the cognitive component; an aspect of learning strategies that relates most directly to the doing aspects by translating cognitive processes into observable behaviours; it is the "how-to" component and includes scheduling, listening, note taking, and memorization techniques (Weinstein, 1988).
- *Metacognitive component* – also called the self-regulation component; an aspect of learning strategies that relates to the students' thinking aspects and includes awareness, knowledge, and control over their cognitive processes (Wittrock, 1986).
- *Will component* – also called the emotional or affective component; an aspect of learning strategies that relates to students' thoughts, feeling, and attitudes about themselves in relation to education; the will component influences the implementation of the skill component and the metacognitive component (McCombs, 1988).

Study Skills – technically, this term refers to the skill component of learning strategies; it is the most commonly used term within educational institutions and study skills comprises what most people consider to be the extend of learning strategies without realizing that the will component and the metacognitive component are equally important.

College-success Skills – the broadest term within the non-content area of developmental education; it includes all of the learning strategies (skill, will, and metacognition) as well as more peripheral influences on students, such as awareness of institutional and communal resources

CHAPTER TWO

Review of the Literature

Concept of Learning Strategies

Background

The teaching of study skills used to be primarily behaviouristic, based on the work of John Watson and B.F. Skinner, but with the technological advances and the consequent rise of neuroscience and cognitive research starting in the 70's, the focus shifted from training overt behaviors that have proven successful in the past to an understanding of the underlying processes in the brain (Jensen, 1998; Mayer, 1988; Weinstein, 1988). Martha Maxwell (1994) identifies more specifically that "research studies based on new theories in cognitive psychology, information processing, linguistics, and neurophysiology have produced results that challenge old ideas about memory, intelligence, and learning skills" (p.161). As a result, learning and study behaviours revealed themselves to be much more complex than previously thought.

Clearly, there are individual differences in the way students study, and numerous analyses (Braten & Olaussen, 1998; Puntambekar, 1995; Williams, 1995) have demonstrated that these differences in study strategies are related to differences in achievement. In fact, Schumacker and Sayler (1995) were able to classify 90 % of the student population based on students' scores from the Learning and Study Strategies Inventory (LASSI) by Weinstein, Palmer, and Schulte (1987) and academic achievement measured by GPA's. Obviously, "A" students' study approach is different than "C" students' approach (McKeachie, 1988).

Generally, learning strategies can be divided into three main categories: the skill component, the affective component, and the metacognitive component; they do, however, all interact with and influence each other (McCombs, 1988; Weinstein & Mayer, 1986, Wittrock, 1986).

Skill Aspects

When students are asked to list different study strategies, they will most likely name the ones that fall into this category, for example mnemonic devices and note taking. Generally, skills are capacities, or abilities, which can be expressed in behavior at any time because they have been developed through practice; skills are the tools we have available in our cognitive tool kits (Schmeck, 1988). Weinstein (1988) categorizes these tools into the following three areas: rehearsal strategies, elaboration strategies, and organizational strategies. These three areas increase in the complexity and in the required level of student involvement; however, all three presume the ability to identify key information. Nist and Holschuh (2000) indicate that the inability to identify important information can lead to academic frustration and failure. Unfortunately, research indicates that many students experience difficulty in this area (Nist & Holschuh).

Rehearsal strategies, as the name implies, use repetition mostly through auditory, visual, or kinesthetic/tactile senses. This could include simple, straightforward verbal repetition or more active underlining and copying of material. Highlighting and underlining is "by far the most common study-reading strategy in postsecondary education" with 50% to 97% of students using these strategies on a regular basis (Caverly, Orlando, & Mullen, 2000, p. 109).

However, research on underlining and highlighting is very inconsistent: some studies indicate no difference in effectiveness when compared to other study methods; some indicate that underlining and highlighting is less effective than note taking, while still others indicate that highlighting and underlining are more effective than other text-marking techniques (Nist & Holschuh, 2000). Nist and Holschuh indicate that research may be inconclusive because of the methodologies: laboratory experiments do not simulate real classroom and other educational settings, and, as mentioned, a prerequisite for effective use of rehearsal strategies is the appropriate identification of important information.

According to Weinstein (1988), **elaboration strategies** involve adding some sort of symbolic construction to what one is trying to learn in order to make it more meaningful, which requires a more active involvement from the learner than rehearsal strategies. For basic learning tasks, elaboration strategies could include the use of mental imagery or mnemonic devices, and for more complex learning tasks, they could include creating analogies, paraphrasing, and using prior knowledge, experiences, attitudes and beliefs to help make the new information more significant (Weinstein).

One major elaboration strategy is summarizing, which becomes evident most often in note taking. Caverly et al. (2000) conclude that note taking while study reading helps students improve on tests because given appropriate instruction, students engage in deeper encoding (elaboration) processes, which is useful for any type of tests and results in a set of notes. Note taking seems to be most effective when it is combined with review – a rehearsal strategy. In studies that compared test performance of groups with all possible combination of note and review (notes/review, no notes/no review, no notes/review, and notes/no review), the group with notes and review scored the highest (Maxwell, 1994). Consequently, the act

of taking notes, an elaboration technique, combined with the act of reviewing these notes, a rehearsal technique, results in the highest achievement.

As indicated by Weinstein (1988), o**rganizational strategies** translate information into another form that will be easier to understand than the original one. These strategies require the most active involvement of the learner. They impose organization on an otherwise unordered set of items, and strategies include grouping, outlining, creating conceptual diagrams of relationships, and creating a hierarchy of the information (Weinstein). Research indicates that the use of these strategies improves test performance; for example, Nist and Holschuh (2000) cite studies demonstrating that at-risk students perform better when they have received direct instruction on the use of concept maps, which allow for a visual representation of the hierarchy relationships. However, Caverly et al. (2000) conclude that students, especially low-reading-ability students, must be taught how to use outlining and mapping in order for these strategies to be effective, and that these strategies improve the recall of main ideas, but not necessarily of details.

Obviously, all of these skills can be learned and practiced. Skills are abilities – something we can do; however, strategies and tactics involve the conscious decision to implement these skills. Failure to carry out an activity does not automatically imply lack of skill (Schmeck, 1988). This is where the affective aspects come into play.

Affective Aspects

Reynolds and Shirey (1988) point out that although studying and learning from written discourse has been investigated extensively since about 1910, research looking at the utility of note taking, underlining, outlining, and summarization has revealed mixed results.

Half the studies showed that the strategies do have positive effects, whereas the other half suggested no positive effects. Apparently, other factors aside from the simple implementation of a study aid influence its effectiveness. Although Reynolds and Shirey concede that flawed methodologies may have yielded these mixed results, they emphasize that the emotional side of a person influences whether or not information is actually learned and retained. Although more recent reviews of existing research are somewhat more positive about the effectiveness of different strategies, the researchers emphasize the importance of quality instruction and methodological circumstances (Caverly et al., 2000; Nist & Holschuh, 2000).

Wittrock (1986) and McComb (1988) were among the first to compile the theories, based on available research at that time, which separates the following aspects of affective thinking:

- Competence motivation – Students' beliefs that success in school is possible is one of the most important factors related to school achievement. In other words, self-efficacy is very important.
- Attribution – The learners' attributions about the causes of their success and failure influence their interest and persistence in learning in schools.
- Self-control – Students who feel they have control over their learning are more likely to be actively involved in the learning process.

Obviously, although motivation is usually the one area that comes to mind when considering affective thinking, it is only one piece of an intricately interwoven system of beliefs, attitudes, motivation, perceptions, expectations, and attributions.

Competence motivation arises out of self-efficacy, which is "an internal set of belief systems that enables individuals to monitor their thoughts, feelings, and actions (Bandura, 1977, 1986)" (as cited in Allgood, Risko, Alvarez, & Fairbanks, 2000). Allgood et al. (2000) and Maxwell (1997, chap. 6) reveal that self-efficacy influences how well and to what extend a student believes in his or her capacity to achieve in a given course. This, in turn, influences the effort exerted, and research shows that higher self-efficacy leads to higher achievement (Allgood et al.; Maxwell). Weinstein, Woodruff, and Awalt (2001) explain self-efficacy as a continuous cycle that can work for a student or against a student (Figure1).

Figure 1. Cyclical affect of self-efficacy, goals, motivation, and confidence

Attribution theory closely relates to self-efficacy because beliefs about one's own ability will influence the perceived reasons for successes and failures, which are called

attributions (Weinstein et al., 2001). On the one hand, attributing academic performance to uncontrollable factors, such as innate ability (talents we are born with), luck, or other people (like teachers), can make students feel frustrated and out of control. Believing that the outcomes in one's life depend on the actions or contributions of some outside force or person can have extremely negative consequences on the level of motivation – why even try if any effort will not change the final outcome? On the other hand, when controllable factors, such as acquired ability (abilities we develop, like good reading skills) or effort (the amount and type of effort we put into our studies), are attributed to what happens to us, then these factors helps us to feel in **control**. Believing that the outcomes in one's life depend on developed abilities and effort can have positive consequences on the level of motivation (Weinstein et al.).

Wittrock's (1986) and McCombs' (1988) findings have solidified, and it is now generally accepted that the affective domain has a significant influence on the use of learning and study strategies. Palmer and Goetz (1988) started by investigating why students who have received study-strategy training do not utilize these strategies. Their results show that students' perceptions of themselves as learners (self-efficacy beliefs), students' perceptions of the task (e.g. "This assignment is stupid"), and students' perceptions of the study strategy (e.g. "It doesn't work anyway" or "It requires to much effort") strongly influence the usage because strategy use requires intentional, active, effortful investment on the part of the learner.

Several studies have identified motivation (the term is used to include the entire affective domain) as the most powerful factor that separates low-achieving students from high-achieving students. Haynes, Comer, and Hamilton-Lee (1988) found that among Black

high school students in an urban inner city area, motivation was the strongest predictor of academic success. Albaili (1997) obtained similar results when studying undergraduate students. Schmeck (1988) concludes that if we know what a particular task means to a student (what the frame of mind and perception is), then we can predict how the student will approach the task.

An area that stands somewhat separate from the all the other affective components is anxiety, especially **test anxiety**. In a review of research and theories, Flippo, Becker, and Wark, (2000) illustrate that test anxiety as a scientific concept has existed for approximately 50 years, and it has physiological, intellectual, and emotional symptoms. In fact, as many as 20% of the college population may be suffering from severe and debilitating test anxiety. Although some educators do not believe in the concept of test anxiety and simply see poor performance as poor test-taking skills, Flippo et al. (2000) conclude that the field of test anxiety continues to evolve and expand and that to varying degrees meditation, relaxation, study-skills instruction, and self-control improvement all help in the alleviation of anxiety. Nevertheless, one result is certain: an inverse relationship exists between anxiety and performance – as anxiety increases, performance decreases.

Metacognitive Aspects

Obviously, in order to change any of the affective aspects, students need to know about their attitudes and beliefs; consequently, they need to acquire a certain amount of self-awareness. This is referred to as metacognition (Byrd & Carter, 1997). More specifically, "metacognition is used to refer to individuals' knowledge about their own cognitive processes by organizing, monitoring, and modifying them as a function of learning outcomes

and feedback" (Weinstein, 1988, p. 294). Developing metacognition influences the effectiveness of the implementation of study strategies, and a significant aspect of metacognition is the flexible use of available strategies: knowing when to use a specific strategy is as important as knowing how to use it (Garner, 1988).

Weinstein (1988) identifies a subarea of metacognition, called comprehension monitoring, which "involves establishing learning goals, assessing the degree to which these goals are being met, and, if necessary, modifying the strategies being used to facilitate goal attainment" (pp. 294-5). Assessing the degree of goal attainment is called **self-testing**, which allows students to identify gaps or errors in understanding and comprehension of information (Weinstein, 1994, as cited in Nist & Holschuh, 2000). This is an important area since many students do not even know what they do not know. One a smaller scale, comprehension monitoring and self-testing also relate to attention and **concentration**. How many students cannot answer the question, "Why are you day dreaming?" Obviously, these students have not examined when and why their concentration wanes. This relates to both listening during class and reading a book. Because this is such a difficult aspect of oneself to control and train, it often causes much frustration in teachers and students alike.

In the context of comprehension monitoring, self-testing, and concentration, one of the most popular textbook reading strategies is the SQ3R method (**S**urvey, **Q**uestion, **R**ead, **R**ecite, **R**eview) developed by R. F. Robinson shortly after the Second World War (Caverly et al., 2000). In short, this method entails surveying the material by skimming it in order to discover the organizational structure, formulating questions using the subheadings discovered through the surveying, reading the text to answer the prepared questions (which includes monitoring one's progress and possible modification of the process), reciting the answers to

the questions once the reading of a section is completed, and reviewing all of the answers once the entire study reading session is completed. After an extensive review of existing research, Caverly et al. conclude that "SQ3R [method] can provide a useful heuristic for successfully processing text," but its effectiveness depends on students' reading ability as well as the quality and quantity (about 10 hours) of instruction (p.126).

Another major area of metacognition is **time management**, where the boundaries of the skill component, will component, and metacognitive component of learning strategies are especially blurred. Although learning the mechanics of keeping a monthly calendar with due dates and a weekly schedule falls more within the skill area of learning strategies, the monitoring of how well the weekly schedules represent the actual time spent as well as adjusting the schedule to different study needs is a metacognitive activity.

Interestingly, the teaching of time management principles has persisted, yet little research on its actual effectiveness has been completed (Maxwell, 1994). Maxwell indicates that time management is usually based on business-management-training principles, and two studies show that the most important factor in determining GPA is the perceived control over time, followed by short-term-goal-setting ability. The mechanics of scheduling and long-term goal setting have less influence on GPA; however, the they are still needed in the facilitation of the gaining control of time and short-term goal setting.

Furthermore, time management, especially short-term goal setting, requires what Frank Christ, a leading learning support center specialist, calls task organization (personal communication, October 2002). Obviously, in order to schedule one's time, one first needs to be aware of the demands; one also needs a relatively accurate estimate of the time required

to achieve the different tasks. This is definitely a metacognitive aspect that needs to be practiced through conscious record keeping and accurate reflection about oneself as a learner.

Clearly, the all metacognitive processes require numerous interrelated steps: learners need to know what does and does not work for them (for example in regard to study times, subjects, and the way information is presented to them); they also need to understand the task they are supposed to perform in order to establish the learning goals in the first place; learners need to be aware of the strategies available to guide their learning; and they need to know how to monitor their goal attainment and which strategies need to be modified (Weinstein & Mayer, 1986; Weinstein, 1988). Byrd and Carter (1997) aptly summarize that metacognition is knowing how one's mind works, which includes self-awareness, task awareness, and strategy awareness.

Summary of Learning Strategies

Overall, students need to understand the tools of effective studying; they need the motivation to use these tools, and they need to be motivated enough to analyze what does and does not work for them. Although the individual strategies have been separated in order to facilitate understanding of the complex brain processes, all of the strategies combined form a more accurate picture of the student. For example, the seemingly simple act of taking notes during a lecture involves numerous.aspects: first, the student needs to be motivated to show up for class and arrive with the intention of taking good notes for future studying; then, the student needs to have the ability to pay attention and concentrate on what happens during class instead of day dreaming about the weekend or worrying about the amount of homework; also, the student needs to have the ability to comprehend the ideas presented in

class, and in order to do so the student needs to monitor the comprehension level the entire class time; finally, the student needs to be able to write down information while, simultaneously, doing all of the aspects just listed. Evidently, note taking is much more complicated than it looks.

Unsurprisingly, since the actual use of study strategies depends on many aspects, not all students know how to employ study strategies effectively, or they simply do not employ the strategies they know. Numerous studies have explored the relationship between the use of learning and study strategies as outlined here and academic performance and have observed significant differences between low-achieving and average-to-high-achieving students in a variety of settings: Haynes et al. (1988) studied black high school children, Puntambekar (1995) studied British high school students, Braten and Olaussen (1998) studied Norwegian first-year college students, and Albaili (1997) studied undergraduates at the United Arab Emirates University. Schumacker and Sayler (1995) found that these findings even apply to gifted students in early-college-entrance programs. These studies confirm that cognitive, affective, and metacognitive factors are significantly related to students' learning and achievement.

Assessment of Learning Strategies

Background

One reason for the interest in learning-strategy assessment was the increasingly large number of academically under-prepared or disadvantaged students entering postsecondary institutions (Weinstein, 1988). That is why many institutions have created special program to address these academic deficits (Weinstein). According to Weinstein, Zimmerman, &

Palmer (1988), traditionally, most of these programs addressed academic deficiencies, especially in mathematics, reading, communication, and study habits and attitudes. However, in the 80's an explosion of studies focused on the subtler, less measurable aspects of studying, and the research demonstrated that one way to influence the manner in which students process new information and acquire new skills is to instruct them in the use of learning strategies (Weinstein et al., 1988).

Of course, successful implementation and evaluation of these training programs requires reliable and valid means for measuring students' entry-level deficits and their progress (Weinstein, 1988). An accurate diagnosis of students' entry-level learning-strategies deficit can be used to create individualized prescriptions for training, and subsequent assessment can be used to evaluate the effectiveness of that training (Weinstein et al., 1988). Weinstein and Weinstein et al. embarked on an extensive review of existing measurements at that time and found that in order to assess learning strategy use, many instruments assessed students' study practices focusing on traditional areas of study skills, such as note taking, study attitudes towards school and learning, text marking, and test taking. However, these instruments were not useful in the development of intervention programs. Weinstein and Weinstein et al. also found reliability problems with these assessments and consequently developed their own instrument.

The LASSI

The Learning and Study Strategies Inventory (LASSI) was developed at the University of Texas in Austin by Claire E. Weinstein, Ph.D., Ann C. Schulte, Ph.D., and David R. Palmer, Ph.D. (LASSI – Background, 1996-2002) as part of the Cognitive Learning

Strategies Project at the University of Texas Austin (Weinstein, 1988). After an extensive review of commercially available and experimental instruments, Weinstein et al. (1988) found that the existing inventories predicted grade-point average from a low to a moderate degree (.19 to .60), but they did not yield information about how the students learn. In other words, available tools at that time predicted academic performance, but did not allow for the development of an intervention program because they did not give insight into the cognitive, affective, and metacognitive processes.

The LASSI was developed as an instrument to help educators and trainers diagnose strengths and weaknesses in students' learning and study strategies in order to provide remedial training (Weinstein, 1988; Weinstein et al., 1988). From the preliminary pilot testing to the scale construction to the field-testing and reliability and validation studies, the overall development took nine years (Weinstein, 1987). The LASSI assesses students' strategies on ten different scales: attitude, motivation, time management, anxiety, concentration, information processing, selecting main ideas, study aids, self-testing, and test strategies (LASSI – Scales, 1996-2002). These scales relate to the three different components of strategic learning outlined earlier: the skill component, which includes information processing, selecting main ideas, and test strategies; the will component, which includes attitude, motivation, and anxiety; and the self-regulation component, which includes concentration, time management, self-testing, and study aids (LASSI – Background, 2002).

Ever since its creation, the LASSI has been used in a huge amount and variety of studies (e.g. Albaili, 1997; Braten & Olaussen, 1998; Kern, Fagley, & Miller 1998; Haynes et al., 1988; Schumacker & Sayler, 1995). Overall, the LASSI has established itself as the most prevalent test of learning and study strategies today. The LASSI has gained such respect that

the University of Iowa makes it mandatory for students to rank in the average percentile or above in order to graduate from the university (University of Iowa, 2000).

Teaching of Learning Strategies

Weinstein (1988) identifies three techniques for the teaching of learning strategies: embedded instruction, one-on-one remediation, and a course or workshop presented to a group. Today, in my research of postsecondary institutions and being a member of the Learning Assistance Listserve, I have yet to find an institution that does not offer some form of study-skills instruction in any combination of these three delivery methods.

Embedded instruction concentrates on incorporating learning strategies into existing educational materials (Weinstein, 1988), and falls therefore within the jurisdiction of the individual instructor teaching the course. Although this format guarantees the implementation of the strategies, it does not really accommodate individual differences and preferences of the students. Furthermore, this method requires content teachers to expand their areas of expertise. In a way, everything that has just been applied to students can be applied to the teachers; they need to acquire learning- and study-strategy knowledge; they need to be motivated to implement these strategies; and they need to monitor how well the implementation did or did not work. Depending on the strategy embedded into the curriculum, this can be a very time-consuming and labour-intensive process, especially for the more complex strategies, for which the research indicates that extensive instruction is needed in order for strategies to be effective.

In contrast to embedded instruction, **one-on-one remediation** allows for the individualization of the instruction. In this setting, the instructor, who usually belongs to a

learning assistance/student support services department, is already a specialist in learning and study strategies. Speaking from experience, one-on-one remediation can be highly effective because it allows the instructor to tailor the information to the individual student and monitor the application of the strategies to the course content. However, just like content instructors would need to become learning specialists to a certain degree, learning specialists need to become content specialists in order to maximize the effectiveness of the employed strategies. This can be a daunting task, and it is virtually impossible to become a specialist in all subjects.

An individual workshop or course is also called the "**adjunct approach**" because it involves some form of supplementary instruction separate from any content course (Weinstein, 1988). This approach allows for more individual differences and preferences in students than embedded instruction, but less than one-on-one remediation. However, this method accommodates a broader audience than one-on-one delivery, which is an important factor in today's climate of decreased funding. Nevertheless, it can be difficult to follow up on the implementation of the strategies unless demonstrated use is part of course requirements.

Of course, the effectiveness of any instruction depends very much on the circumstances of individual schools, but if the instruction is successful, the results can be remarkable. When Weinstein (1988) first started the Cognitive Learning Strategies Project, a semester-long course focusing on the ten areas identified on the LASSI, the course led to significant pre-to-post changes on all of the measures except for the anxiety scale. Outside judges evaluated in-class and homework assignments, and the quality showed definite improvement. Furthermore, scores on the Nelson-Denny Reading Test showed

improvements ranging from 14 to 34 percentile points, and there were significant increases in academic grade point averages.

Summary

With the rise of neuroscience in the 1970s, the research on learning shifted from a behaviouristic focus to a cognitive one, and the interest in how learning actually occurs led to an investigation of the differences between high- and low-achieving students beyond just observable behaviours. These studies firmly established that learning strategies can be divided into conginitive, affective, and metacognitive components, all of which are necessary to maximize learning. Students need to know the tools for successful studying; they need to want to implement these tools, and they need to analyze to what degree the strategies are effective. Numerous studies have demonstrated that there are significant differences between high- and low-achieving students in these three aspects.

Because of an increasingly large number of under-prepared students at the postsecondary level, the need for training programs in learning strategies increased starting in the 1960's. The instruction can be embedded within regular courses, which would guarantee the application of the different strategies. Learning strategies can also be taught in a one-on-one setting, which permits the tailoring the instruction to the students' specific needs. Most often, learning strategies are taught in an adjunct course separate from any content, which often makes it difficult to follow up on the implementation.

With the development of these training programs in learning strategies arose a need for a reliable and valid measure of students' learning strategies that goes beyond assessing overt behaviors. Weinstein, Palmer, and Schulte (1987) developed the Learning and Study

Strategies Inventory (LASSI) to create this kind of measure, its primary purpose being a guideline for remediation and a guide for curriculum development (Weinstein et al., 1988). The LASSI measures the use of learning strategies on ten different scales – attitude, motivation, time management, anxiety, concentration, information processing, selecting main ideas, study aids, self-testing, and test strategies – and is to date the most established test.

CHAPTER THREE

Methodology

Subjects and Setting

Population and Sample

According to the Selkirk College 2002/2003 Calendar (Selkirk College 2002), the overall student profile shows that the average age for full-time students is 22.6, and for part-time students it is 25.3. Forty-two percent of the students are female and 58% are male, and 52 % of the students attending Selkirk College come from outside the West Kootenay region. The specific sample consisted of 19 students attending a one-week (15 hours) "Student Success Skills" workshop, August 19-23, 2002 and August 26-30, 2002, as well as a semester-long workshop (1.5 hours per week for ten weeks). This workshop is free of charge and is advertised in the registration packages, which are sent out to students after they have applied.

Setting

Selkirk College is a public postsecondary institution located British Columbia, Canada. It opened in 1966 and consists of five campuses – Castlegar, Trail, Grand Forks, Silver King, and Tenth Street – and two satellite learning centers – Kaslo, and Nakusp (Selkirk College, 2002). According to Jake van Hemert, the former Financial Aid Officer at Selkirk College (personal communications, March 20, 2002), Selkirk College has overall about 2,250 full-time equivalent students with an actual enrolment of approximately 3,600

students. Selkirk College employs 175 faculty, 123 support staff, and 36 administrators (Selkirk College, 2002).

This study took place on the Castlegar Campus, which is the main campus. As outlined in the Selkirk College 2002/2003 Calendar (Selkirk College, 2002), Selkirk College offers the following programs on the Castlegar Campus: first- and second-year university courses leading to associate degrees in Engineering, Kinesiology/Physical Education, Arts, and Science and transferable prerequisite courses for pre-professional and professional degree programs; diploma programs including Aviation, Business Administration, Computer Information Systems, Office Management, Integrated Environmental Planning Technology, Forestry Technology and Recreation, Fish and Wildlife Technology, Nursing, and Human Services; certificate programs in Early Childhood Care and Education; and English as a Second Language Programs for international students.

Instrumentation

Introduction

In order to find out what the learning and study strategy profile of the students is prior to taking the "Students Success Skills" workshop and after having taken the workshop and having completed one semester at Selkirk College, the second online version of the Learning and Study Strategies Inventory (LASSI), developed by Weinstein, Palmer, and Schulte (2002), was used (Appendix A).

Learning and Study Strategies Inventory (LASSI)

Description. The LASSI contains 80 statements related to thoughts and behaviors necessary for successful learning and studying. Students respond to individual items using a Likert Scale: very typical of me, fairly typical of me, somewhat typical of me, not very typical of me, and not at all typical of me. Each of the Likert-Scale responses has a correspondent numerical value, ranging from one to five. The 80 items correspond to 10 different areas, or scales: Anxiety, Attitude, Concentration, Information Processing, Motivation, Selecting Main Ideas, Self Testing, Study Aids, Test Strategies, and Time Management. Out of the overall 80 Likert-scales items, each of the 10 scales has 8 corresponding items, so the minimum possible score per scale is 8 and the maximum is 40 (Weinstein & Palmer, 2002).

The LASSI can be administered in a paper or an online version. I used the web-based version because the results are revealed immediately after the test has been completed. The subscale raw scores are compared to a norm group and given percentile ranks (Appendix B). According to the *LASSI User's Manual* (Weinstein & Palmer, 2002), students who score above the 75th percentile do not need to improve that specific skill or strategy. Students who score between the 50th percentile and the 75th percentile should consider improvement in specific areas. Students who score below the 50th percentile usually need to improve that particular skill or strategy.

The LASSI scales are categorized into three main areas: the skill component, the will component, and the self-regulating component (LASSI – Background, 1996-2002). The LASSI scales related to the **skill** component of strategic learning are: Information Processing, Selecting Main Ideas and Test Strategies. These scales examine students' learning strategies,

skills, and thought processes related to identifying, acquiring, and constructing meaning for important new information, ideas, and procedures. They also explore how students prepare for and demonstrate their new knowledge on tests or other evaluative procedures (LASSI – Background, 1996-2002).

As outlined in the H&H Publishing web page (LASSI – Scales, 1996-2002), the **Information Processing Scale** assesses how well students can use imagery, verbal elaboration, organization strategies, and reasoning skills as learning strategies to help build bridges between what they already know and what they are trying to learn and remember. Students who score low on this scale may have difficulty making information meaningful and storing it in memory in a way that will help them recall it in the future. The **Selecting Main Ideas Scale** assesses students' skill at identifying important information for further study from among less important information and supporting details. Students who score low on this scale may need to develop their skill at separating out critical information on which to focus their attention, in other words reading comprehension. The **Test Strategies Scale** assesses students' use of test-preparation and test-taking strategies. Low-scoring students may need to learn more effective techniques so that they are able to effectively demonstrate their knowledge of the subject matter (LASSI – Scales, 1996-2002).

The LASSI Scales related to the **will** component of strategic learning are Attitude, Motivation, and Anxiety. These scales measure students' receptivity to learning new information, their attitudes about and interest in college, their diligence, self-discipline, and willingness to exert the effort necessary to complete academic requirements successfully, and the degree to which they worry about their academic performances (LASSI – Background, 1996-2002).

Specifically, the **Attitude Scale** assesses students' attitudes about and interest in college and academic success. It examines how facilitative or debilitative their approaches to college and academics are for helping them get their work done and succeeding in college. Students who score low on this scale may not believe college is relevant or important to them and may need to develop a better understanding of how college and their academic performances relate to their future life goals. The **Motivation Scale** assesses students' diligence, self-discipline, and willingness to exert the effort necessary for successful studies. Students who score low on this scale need to accept more responsibility for their academic outcomes and learn how to set and use goals to help accomplish specific tasks. The **Anxiety Scale** assesses the degree to which students worry about school and their academic performances. Students who score low on this scale are experiencing high levels of anxiety associated with school (note that this scale is reverse scored). High levels of anxiety can direct attention away from completing academic tasks. Students who score low on this scale may need to develop techniques for coping with anxiety and reducing worry so that attention can be focused on the task at hand (LASSI – Scales, 1996-2002).

The LASSI Scales related to the **self-regulation** component of strategic learning are Concentration, Time Management, Self Testing, and Study Aids. These scales measure how students manage, or self-regulate and control, the whole learning process through using their time effectively, focusing their attention, maintaining their concentration over time, checking to see if they have met the learning demands, and using study supports, such as review sessions, tutors, or special features of a textbook (LASSI – Background, 1996-2002).

In particular, the **Time Management Scale** assesses students' application of time management principles to academic situations. Students who score low on this scale may

need to develop effective scheduling and monitoring techniques in order to assure timely completion of academic tasks and to avoid procrastination while realistically including non-academic activities in their schedule. The **Concentration Scale** assesses students' ability to direct and maintain attention on academic tasks. Low-scoring students may need to learn to monitor their level of concentration and develop techniques to redirect attention and eliminate interfering thoughts or feelings so that they can be more effective and efficient learners (LASSI – Scales, 1996-2002).

The **Study Aids Scale** assesses students' use of supports or resources to help them learn or retain information. Students with low scores may need to develop a better understanding of the resources available to them and how to use of these resources to help them be more effective and efficient learners. The **Self Testing Scale** assesses students' use of reviewing and comprehension monitoring techniques to determine their level of understanding of the information to be learned. Low-scoring students may need to develop an appreciation for the importance of self-testing, and learn effective techniques for reviewing information and monitoring their level of understanding or ability to apply what they are learning (LASSI – Scales, 1996-2002).

Validity. A number of different approaches have been used to examine the validity of the LASSI. First, scale scores have been compared to other tests or subscales measuring similar factors. For example, scores from the Information Processing Scale of the LASSI have been correlated to the scores in the Elaborate Processing Scale of Schmeck's Inventory of Learning Processes (1977) ($r = .60$). Second, several scales have been validated against performance measures. For example, scores on the Selecting Main Ideas scale were

compared to students' scores on selecting the main idea from texts and other readings (r = .40 and above). Finally, the LASSI has been subjected to repeated tests of user validity. Professors, advisors, developmental educators, and learning-centre specialists at more than 30 colleges and universities used the LASSI on a trial basis and reported few, if any, administration problems and a high degree of usefulness (Weinstein, 1987; Weinstein, Zimmermann, & Palmer, 1988).

Reliability. The development of the first LASSI version was an extremely thorough process that started in 1980 (Weinstein & Palmer, 2002). First, the developers surveyed 47 study skills books, manuals, and program guides and categorized the materials into 19 areas (Weinstein et al., 1988). Then, they created a pool of possible items; 645 potential items were categorized according to the surveyed study-skills materials, and the potential items were narrowed to 291. A preliminary pilot testing included a measure of social desirability in order to determining the degree of relationship between responses to individual items and the subject's desire to be socially acceptable. Since this kind of response bias can be a major problem for self-report instruments, items correlating above 0.50 were eliminated (Weinstein & Palmer, 2002). Based on the preliminary pilot testing, the overall categories were reduced to 14 and the items to 149; the developers also changed from a True/False format to the Likert-Scale format. Because of the large amount of revisions, a second pilot testing was conducted, which resulted in the reduction of the items to 130 for the field testing (Weinstein et al., 1988).

A preliminary test-retest reliability study, based on 96 students, yielded a test-retest correlation of .88 for the total instrument (the results for the individual scales are outlined in Table 1). In 1982, data from 783 students were collected for the final revisions using

coefficient alphas, an upper-limit estimate of the test-retest reliability. Items in the LASSI were adjusted to obtain the maximum alpha, and the overall number of items was further reduced to 90 (Table 1) (Weinstein et al., 1988).

Table 1

LASSI reliability results after the pilot testing

	Alpha (based on 130 items)	r (based on 90 items)	n
Attitude	0.60	0.64	96
Motivation	0.87	0.79	95
Time Management	0.69	0.77	96
Anxiety	0.82	0.81	95
Concentration	0.82	0.80	95
Information Processing	0.88	0.79	95
Selecting Main Ideas	0.61	0.64	95
Study Aids	0.69	0.7	96
Self Testing	0.64	0.66	96
Test Strategies	0.83	0.79	95

Based on item analysis data of another large-scale field test in 1984, the first, 77-item version of the LASSI was developed. Norms were established using a sample of 880 incoming freshmen students from a large southern university, and test-retest correlations (Table 2), based on a three-week interval, were computed on a sample of 209 students (Weinstein, 1987). The first version of the LASSI became commercially available in 1987.

In 1997, work began on the second edition of the LASSI (Weinstein & Palmer, 2002). There were seven purposes for this edition: update the LASSI and remove dated items, incorporate current research findings, incorporate changes in educational practice, broaden

the scope of some of the scales, create equal number of items for each scale, improve the psychometric properties, and create national norms based on a broader sample. First, a pool of 134 items was created consisting of the 77 items from the first edition of the LASSI and 57 new items to address the seven goals. The first pilot testing was administered to 2,400 students; as a result, 166 possible items were developed (77 from the first edition of the LASSI, 29 from the 57 added items, 60 new items) and submitted to a series of field tests (Weinstein & Palmer, 2002).

Table 2

Reliability results of the first version of the Learning and Study Strategies Inventory

	Coefficient alpha	Test-retest correlation coefficient
Attitude	0.72	0.75
Motivation	0.81	0.84
Time Management	0.86	0.85
Anxiety	0.81	0.83
Concentration	0.84	0.85
Information Processing	0.83	0.72
Selecting Main Ideas	0.74	0.78
Study Aids	0.68	0.75
Self Testing	0.75	0.78
Test Strategies	0.83	0.81

As a result of the field tests and norming, the second edition has 80 items with 8 items for each scale. The lowest Coefficient Alpha is now 0.73 (instead of 0.68 on the first version), and all but two scales are above 0.80 (instead of four scales being below 0.80 on the

first version) (Table 3). Instead of being based on one institution, the norms themselves are based on twelve different institutions representing different student demographics, geographical regions, as well as different types of postsecondary institutions (Appendix C) (Weinstein & Palmer, 2002).

Table 3

Scale Statistics for the second version of the Learning and Study Strategies Inventory

Scale Name	Scale Mean	Standard Deviation	Coefficient Alpha
Anxiety	25.52	6.95	0.87
Attitude	33.41	4.29	0.77
Concentration	26.97	6.01	0.86
Information Processing	27.25	5.66	0.84
Motivation	31.19	5.32	0.84
Self Testing	24.53	6.15	0.84
Selecting Main Ideas	28.06	6.10	0.89
Study Aids	25.25	5.56	0.73
Time Management	26.08	6.30	0.85
Test Strategies	29.13	5.08	0.80

Other, independent studies on the reliability of the first version of the LASSI have been done. For example, one study using 99 students showed that 9 out of the 10 subtest reliability coefficients approached but did not equal the earlier study; students scored better than expected on three subtests, no differently than the national norms on four subtests, and worse than the national norms on three subtests (Deming, Valeri-Gold, & Idleman, 1994). A recent study using two samples, one of 319 and the other of 2,535 students, showed that the Cronbach alphas appear to be slightly better than the indices in the LASSI manual and that, overall, the alpha coefficients reasonably matched those reported in the manual (Obiekwe,

2000). Since the sample size is very large in the second study, the reliability for the LASSI is supported.

Design and Procedure

Design

This study is action research that uses a descriptive design. The study could have been be a pre-experimental, one-group pretest-posttest design in order to answer the second research question because students took a pretest (the LASSI) before the start of the workshop and a posttest (the LASSI) about five months after the pretest. However, since this study involves only one group, a significantly better score on the posttest in comparison to the pretest cannot be assumed to be the result of the treatment – the workshop. The sources of invalidity in this kind of a design include history, maturation, testing, instrumentation, regression, and pretest-treatment interaction (Gay & Airasian, 2000). Consequently, it would be extremely difficult to establish the cause of any improvement. Since the goal of my research is not to establish cause but to discover the specific characteristics of Selkirk College students who want to improve their learning and study skills, a descriptive design is best suited for this research.

Procedures

General Procedures. Since the study is not anonymous, student consent forms were obtained (Appendix D), and in order to ensure students' understanding of the consent, an explanation of the study was given (Appendix E). This explanation also guaranteed that the same information was presented to the three groups. Students' scores are confidential and

individual names were not released to anyone. Furthermore, since the study cost about $200.00 Canadian and since it took place at Selkirk College, permission was obtained form the Department Head of Student Access and Support and the Director of Support Services/Registrar at Selkirk College (Appendix F).

Specific Procedure. Both, the Department Head of Student Access and Support and the Director of Support Services/Registrar at Selkirk College, were contacted on July 3, 2002, to request meetings. A complete verbal orientation to this study was given to the Department Head of Student Access and Support on July 8th, 2002. Due to time constraints, the Department Head debriefed the Director of Support Services/Registrar on July 9th, 2002. Both were given the option of reviewing a copy of the proposal, and they requested a copy to review at their leisure. Letters of permission were obtained from the Department Head of Student Access and Support and from the Director of Support Services/Registrar on July 9, 2002.

Since the web-based version of the LASSI had never been used at Selkirk College, a test run occurred during the week of August 12th – 16th. The test subject consisted of a volunteer from my department. A total of 21 students participated in the pre-test study. The first group of students started the workshop on August 19th, 2002, at 9 am. After an introduction and orientation to the workshop and an icebreaker activity, the study was introduced. The purpose, importance, and scope were explained and written consent was obtained. Then the students completed the LASSI online. The LASSI results were explained verbally accompanied by a handout (Appendix G). The option of more in-depth, one-on-one analysis was given, and information throughout the workshop was related to the ten LASSI scales where appropriate. The exact same procedure was followed for the second group of

students, who started the workshop on August 26th, 2002, but not for the third group of students, who started the workshop September 30th, 2002. This group was given the same explanation, but times for taking the LASSI was scheduled outside of the workshop time during October 1st and 4th.

Students of the first and second group were contacted in the week of January 6th – 10th to make appointments to write the post-LASSI during the time of January 13th –17th and 20th – 24th. Students of the third group were contacted in February 24th to 26th, and re-wrote the LASSI on February 28th. The total number of students rewriting the LASSI was 19 – two students did not continue their education at Selkirk College: one student was not reachable and another student was unable to write the LASSI again because of work commitments. As a result, the pre-test scores for these two students were discarded because the online LASSI does not give raw scores for the pre-test only and because hypothesis testing requires equal numbers of pre- and post-scores.

The script before the post-assessment was the same for every student (Appendix H). A quick debriefing (five minutes) of the pre-post LASSI scores and the implication on the student's college experience followed the completion of the LASSI, with the option of a more detailed analysis. Again, the students were also given the option of knowing the final, overall results of the study.

Some irregularities happened. As mentioned, the first group wrote all at once on August 19th; the second group wrote all at once on August 26th; the third group, however, wrote the pre-LASSI during the October 1st to 4th, rather than all at once. Nevertheless, the explanation of the study was the same. Secondly, for the post-LASSI, students made appointments that fit their schedules, and some students missed their appointments and had to

be rebooked. As a result, the earliest post-LASSI was written after 20 weeks, and the latest was written after 25 weeks plus one day.

Data Analysis. The data generated by the LASSI was numerous. First of all, I obtained the overall scores as well as the scores for all 10 LASSI subscales, to which measures of central tendency and variability – the mean and the standard deviation – were applied. In addition, the means of the 10 scales' scores were converted into percentiles (Appendix I), which gives more information on how students compare to the established norms. The scales can then be compared to each other using the means of the students' percentile ranks in order to find out which scales are, overall, the weakest and strongest. All these analyses were applied to the pre- and post-LASSI data, and I used the paired t-test for dependent samples to discover whether or not there was significant change in the use of learning and study strategies in the individual scales. The significance level for the hypothesis testing is 0.5. Since the data was extensive, I used tables and figures for the analyses.

CHAPTER FOUR

Results

Profile of Incoming Students

Skill Components

The possible scores of each scale range from 8 to 40. Descriptive statistical analysis of the pre-test raw scores (Appendix J) revealed a mean Information-Processing score of 27.6 with a standard deviation of 7.08, a mean Selecting-Main-Ideas score of 26.5 with a standard deviation of 4.90, and a mean Test-Strategies score of 26.8 with a standard deviation of 5.04 (Table 4).

Table 4

Score means and standard deviations for the three skill-component scales of the Learning and Study Strategies Inventory of students (n=19) tested prior to having taken a fifteen-hour student-success-skills workshop and prior to having completed a semester at Selkirk College

	Information Processing	Selecting Main ideas	Test Strategies
Mean	27.6	26.5	26.8
Standard deviation	7.08	4.90	5.04

The Information-Processing mean is comparable to the norms group's mean of the second LASSI version (27.6 versus 27.25); the Selecting-Main-Ideas mean is a bit lower than the norms group's mean (26.5 versus 28.06); and the Test-Strategies mean is quite a bit lower

than the norms group's mean (26.8 versus 29.13). Correspondingly, the equivalent mean percentiles are 53.0 for Information Processing (average range), 37.5 for Selecting Main Ideas (below average range), and 29 for Test Strategies (below average range) (Figure 2).

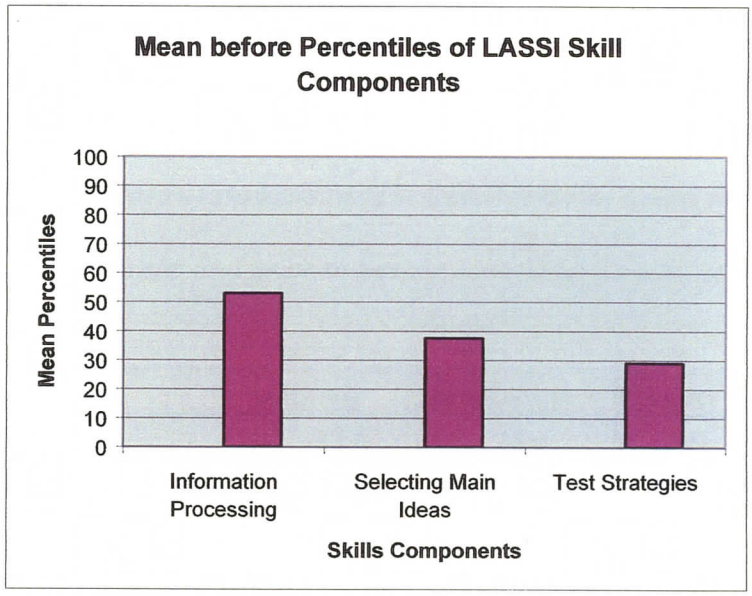

Figure 2. Mean percentiles for the three skill-component scales of the Learning and Study Strategies Inventory of students (n=19) tested prior to having taken a fifteen-hour student-success-skills workshop and prior to having completed a semester at Selkirk College.

Will Components

The possible scores of each scale range from 8 to 40. Descriptive statistical analysis of the pre-test raw scores revealed a mean Attitude score of 32.6 with a standard deviation of 3.67, a mean Motivation score of 28.4 with a standard deviation of 8.09, and a mean Anxiety score of 25.9 with a standard deviation of 7.21 (Table 5). The Attitude mean is a bit lower than the norms group's mean (32.6 versus 33.41); the Motivation mean is quite a bit lower than the norms group's mean (28.4 versus 31.19); and the Anxiety mean is comparable to the

norms group's mean (25.9 versus 25.52). Correspondingly, the equivalent mean percentiles are 36.0 for Attitude (below average range), 27.0 for Motivation (below average range), and 49.5 for Anxiety (below average range) (Figure 3).

Table 5

Score means and standard deviations for the three will-component scales of the Learning and Study Strategies Inventory of students (n=19) tested prior to having taken a fifteen-hour student-success-skills workshop and prior to having completed a semester at Selkirk College

	Attitude	Motivation	Anxiety
Mean	32.6	28.4	25.9
Standard deviation	3.67	8.09	7.21

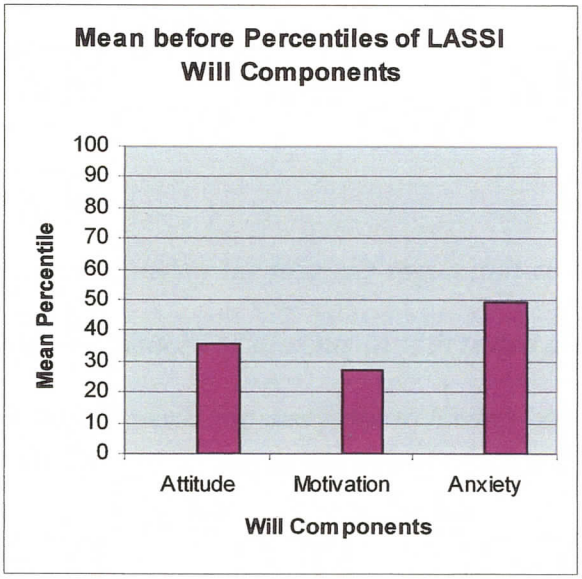

Figure 3. Mean percentiles for the three will-component scales of the Learning and Study Strategies Inventory of students (n=19) tested prior to having taken a fifteen-hour student-success-skills workshop and prior to having completed a semester at Selkirk College.

Self-regulation Components

The possible scores of each scale range from 8 to 40. Descriptive statistical analysis of the pre-test raw scores revealed a mean Time-Management score of 24.1 with a standard deviation of 7.16, a mean Concentration score of 25.6 with a standard deviation of 6.31, a mean Study-Aids score of 27.4 with a standard deviation of 6.72, and a mean Self-Testing score of 23.1 with a standard deviation of 5.84 (Table 6). The Time-Management mean is quite a bit lower than the norms group's mean (24.1 versus 26.08); the Concentration mean is also quite a bit lower than the norms group's mean (25.6 versus 26.97); the Study-Aids mean is quite a bit higher than the norms group's mean (27.4 versus25.25), and the Self-Testing mean is a bit lower than the norms group's mean (23.1 versus 24.53). Correspondingly, the equivalent mean percentiles are 35.5 for Time Management (below average range), 38.0 for Concentration (below average range), 62 for Study Aids (average range), and 40.5 for Self Testing (below average range) (Figure 4).

Table 6

Score means and standard deviations for the four self-regulation-component scales of the Learning and Study Strategies Inventory of students (n=19) tested prior to having taken a fifteen-hour student-success-skills workshop and prior to having completed a semester at Selkirk College

	Time Management	Concentration	Study Aids	Self-testing
Mean	24.1	25.6	27.4	23.1
Standard deviation	7.16	6.31	6.72	5.84

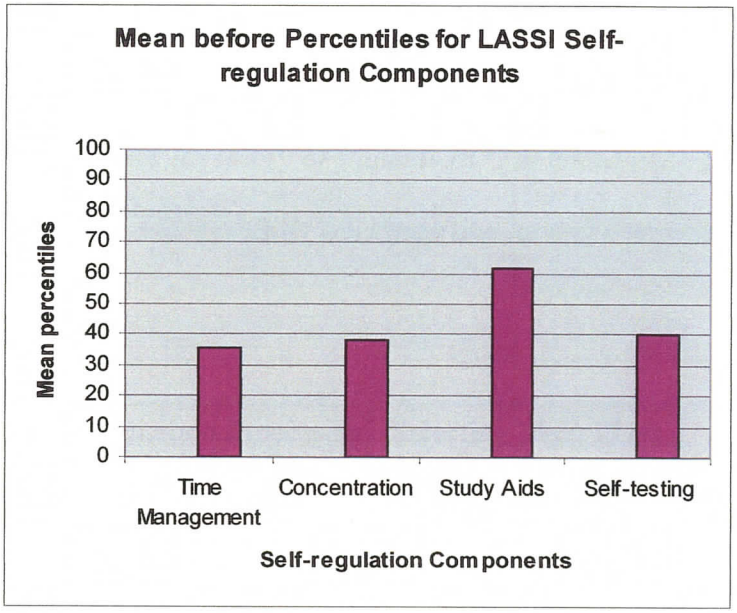

Figure 4. Mean percentiles for the four self-regulation-component scales of the Learning and Study Strategies Inventory of students (n=19) tested prior to having taken a fifteen-hour student-success-skills workshop and prior to having completed a semester at Selkirk College.

Change in Learning and Study Strategies Profile

Skill Components

The possible scores of each scale range from 8 to 40. Descriptive statistical analysis of the post-test raw scores (Appendix J) revealed a mean Information-Processing score of 31.5 with a standard deviation of 4.54, a mean Selecting-Main-Ideas score of 28.8 with a standard deviation of 6.44, and a mean Test-Strategies score of 30.1 with a standard deviation of 4.88 (Table 7 and Figure 5). Hypothesis testing (Appendix K) shows that these increases result in a significant change (p-value < 0.05) in Information Processing and Test Strategies; however, Selecting Main Ideas did not indicate a significant change (Table 7).

Table 7

Mean scores, standard deviations, and p-values for the three skill-component scales of the Learning and Study Strategies Inventory of students (n=19) tested before and after having taken a fifteen-hour student-success-skills workshop and having completed a semester at Selkirk College

	Information Processing		Selecting Main Ideas		Test Strategies	
	before	after	before	after	before	after
Mean	27.6	31.5	26.5	28.8	26.8	30.1
Standard Deviation	7.08	4.54	4.90	6.44	5.04	4.88
p-value	0.0086		0.1047		0.0040	

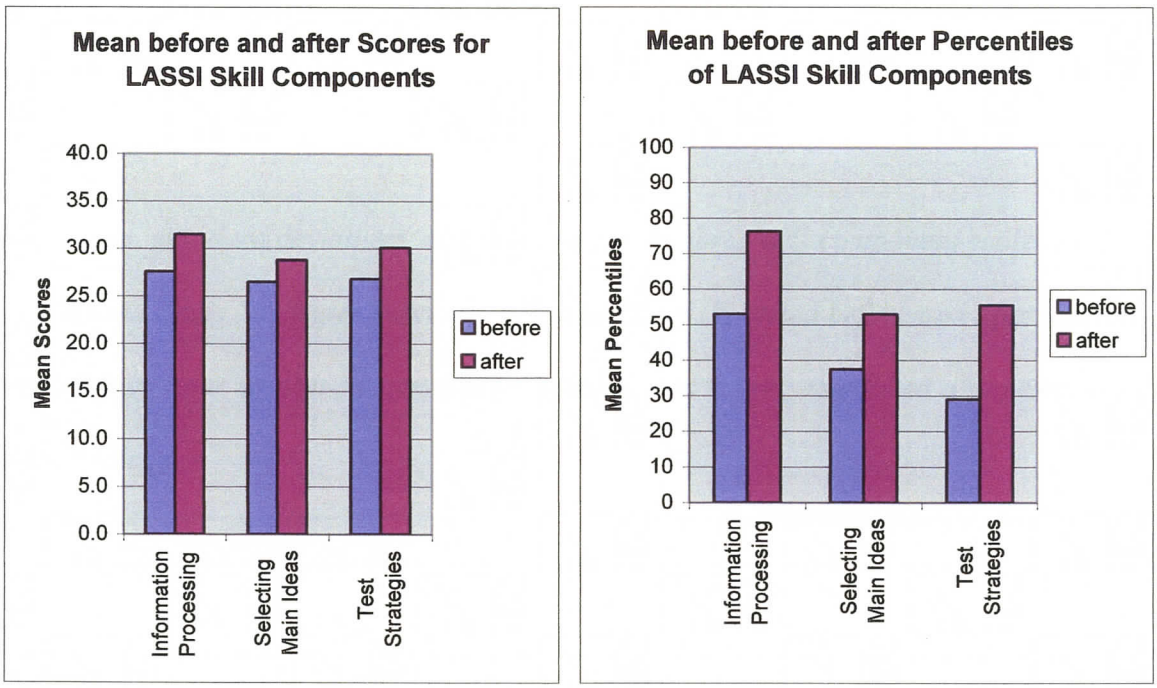

Figure 5. Mean scores and percentiles for the three skill-component scales of the Learning and Study Strategies Inventory of students (n=19) tested before and after having taken a student-success-skills workshop and having completed a semester at Selkirk College.

The equivalent percentiles changed from 53.0 (average range) to 76.25 (above average range) for Information Processing, from 37.5 (below average range) to 53.0 (average range) for Selecting Main Ideas, and from 29.0 (below average range) to 55.5 (average range) for Test Strategies (Figure 5).

Will Components

The possible scores of each scale range from 8 to 40. Descriptive statistical analysis of the post-test raw scores revealed a mean Attitude score of 33.2 with a standard deviation of 3.63, a mean Motivation score of 31.7 with a standard deviation of 5.70, and a mean Anxiety score of 29.5 with a standard deviation of 6.62 (Table 8 and Figure 6). This results in a significant change (p-value < 0.05) in Motivation and Anxiety; however, Attitude did not indicate a significant change (Table 8).

Table 8

Mean scores, standard deviations, and p-values for the three will-component scales of the Learning and Study Strategies Inventory of students (n=19) tested before and after having taken a fifteen-hour student-success-skills workshop and having completed a semester at Selkirk College

	Attitude		Motivation		Anxiety	
	before	after	before	after	before	after
Mean	32.6	33.2	28.4	31.7	25.9	29.5
Standard deviation	3.67	3.63	8.09	5.70	7.21	6.62
p-value	0.5561		0.0495		0.0266	

The equivalent percentiles changed from 36.0 to 42.0 (below average range) for Attitude, from 27.0 to 48.5 (below average range) for Motivation, and from 49.5 (below average range) to 67.5 (average range) for Anxiety (Figure 6).

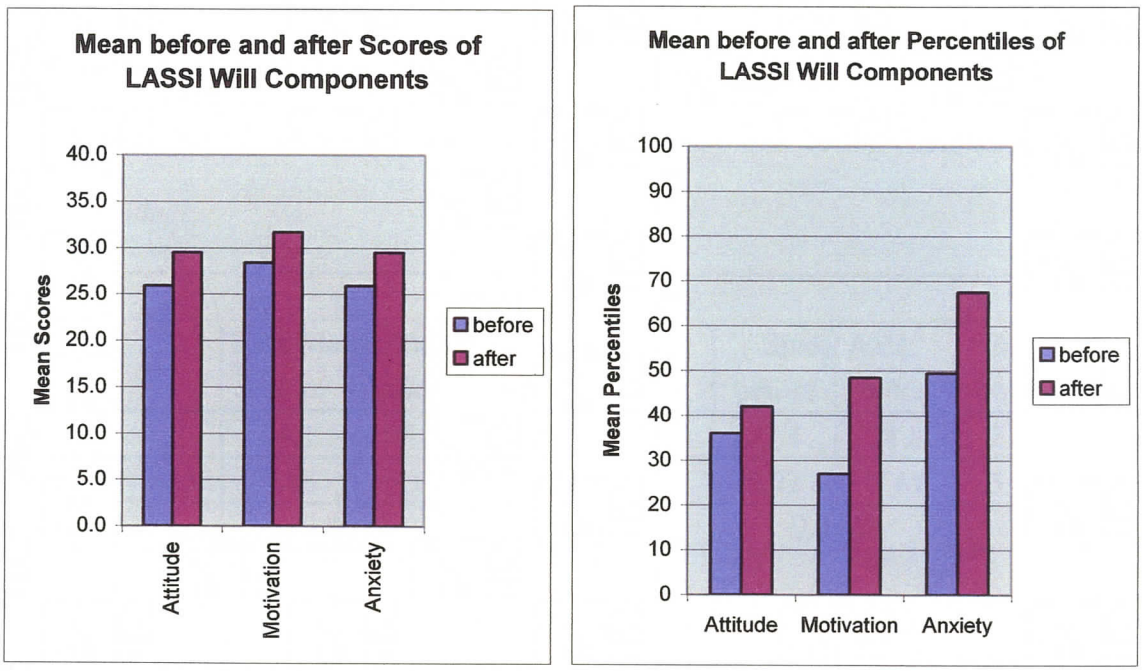

Figure 6. Mean scores and percentiles for the three will-component scales of the Learning and Study Strategies Inventory of students (n=19) tested before and after having taken a student-success-skills workshop and having completed a semester at Selkirk College.

Self-regulating Components

The possible scores of each scale range from 8 to 40. Descriptive statistical analysis of the post-test raw scores revealed a mean Time-Management score of 28.1 with a standard deviation of 7.09, a mean Concentration score of 29.2 with a standard deviation of 6.91, a mean Study-Aids score of 28.8 with a standard deviation of 5.41, and a mean Self-testing score of 26.6 with a standard deviation of 6.63 (Table 9 and Figure 7). This results in a

significant change (p-value < 0.05) in Time Management, Concentration, and Self Testing; however, Study Aids did not indicate a significant change (Table 9).

Table 9

Mean scores, standard deviations, and p-values for the four self-regulation-component scales of the Learning and Study Strategies Inventory of students (n=19) tested before and after having taken a fifteen-hour student-success-skills workshop and having completed a semester at Selkirk College

	Time Management		Concentration		Study Aids		Self Testing	
	before	after	before	after	before	after	before	after
Mean	24.1	28.1	25.58	29.2	27.4	28.8	23.1	26.6
Standard Deviation	7.16	7.10	6.31	6.91	6.72	5.41	5.84	6.63
p-value	0.0017		0.0021		0.2461		0.0079	

The equivalent percentiles changed from 35.5 (below average range) to 60.5 (average range) for Time Management, from 38.0 (below average range) to 61.0 (average range) for Concentration, from 62.0 to 73.0 (average range), and from 40.5 (below average range) to 63.0 (average range) for Self Testing (Figure 7).

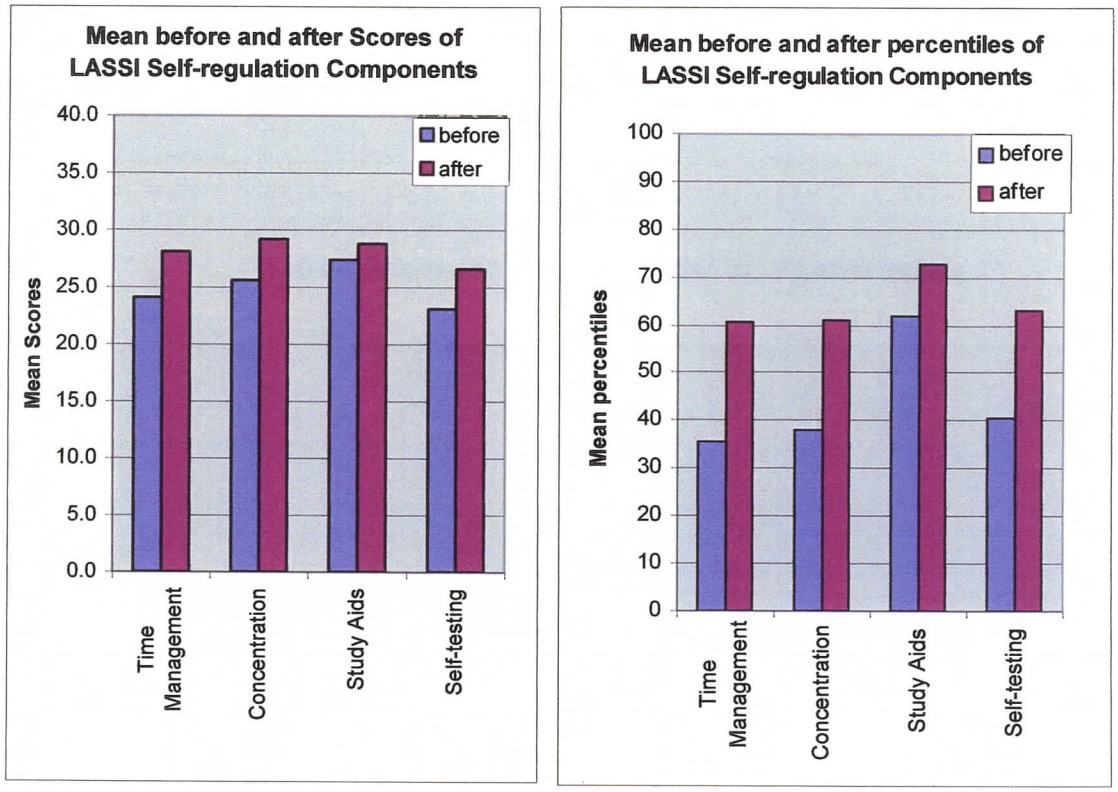

Figure 7. Mean scores and percentiles for the four self-regulation-component scales of the Learning and Study Strategies Inventory of students (n=19) tested before and after having taken a student-success-skills workshop and having completed a semester at Selkirk College.

Summary

Scores and percentiles increased in all ten scales. Specifically, at the beginning the mean percentiles of eight of the ten scales were below the 50th percentile and ranked "below average" and two (Information Processing and Study Aids) were between the 50th and 75th percentile and ranked "average." This changed to the mean percentiles of two scales being below the 50th percentile and ranking as "below average" (Attitude and Motivation), seven scales scoring between the 50th and 75th percentile and ranking as average, and one scale

scoring above the 75th percentile and ranking "above average" (Information Processing) (Figure 8).

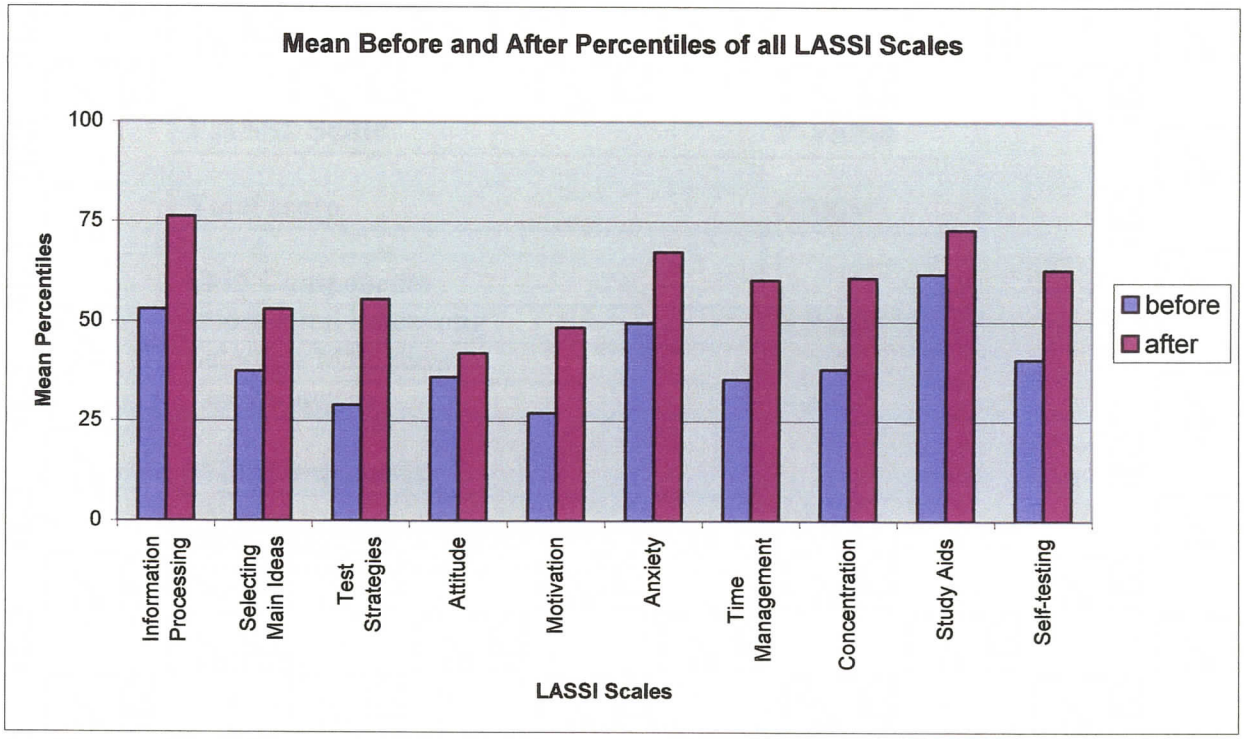

Figure 8. Mean percentiles for all scales of the Learning and Study Strategies Inventory of students (n=19) tested before and after having taken a fifteen-hour student-success-skills workshop and having completed a semester at Selkirk College.

Statistical analysis of the pre- and post-scores (Appendix K) revealed a significant change (p-value < 0.05) in seven out of the ten scales (Table 10). The scales that did not change significantly are Selecting Main Ideas, Attitude, and Study Aids.

Table 10

P-values of before and after mean scores of all scales of the Learning and Study Strategies Inventory of students (n=19) tested before and after having taken a fifteen-hour student-success-skills workshop and having completed a semester at Selkirk College

LASSI Scale	**P-value**
Total score	0.0005*
Skill Components	
Information Processing	0.0086*
Selecting Main Ideas	0.1047
Test Strategies	0.0040*
Will Components	
Attitude	0.5561
Motivation	0.0495*
Anxiety	0.0266*
Self-regulating Components	
Time Management	0.0017*
Concentration	0.0021*
Study Aids	0.2461
Self Testing	0.0079*
* indicates a significant difference (p-value < 0.5)	

CHAPTER FIVE

Discussion and Conclusion

Limitations

Care should be taken when trying to generalize the results of this study to other student populations and institutions. First of all, Selkirk College's student profile may be unique to its geographical situation and program makeup. Even within Selkirk College, results should be treated carefully since the Castlegar Campus is different from all the other campuses simply because of the programs this campus offers. Although the workshop is open to all students, some of the other campuses offer similar workshops, and I would not be surprised if their student profile is different from this study's.

Secondly, this study contained methodology weaknesses. For one thing, the sampling was not ideal. A sampling size of 19 participants is small. Although critical values adjust to the sample size in hypothesis testing, these results do not reflect the entire Selkirk College student population. Furthermore, two students who took the pre-LASSI did not complete the post-LASSI. Obviously, these two students dropped out; however, not being able to include their scores in the calculations may have influenced the results since presumably their post-LASSI scores would have been lower than the average. Last, the conditions for the pre-LASSI were not strictly identical since some students wrote the pre-LASSI on the first day of the workshop and prior to the semester, whereas some student had already started the semester.

Thirdly, students participating in this study voluntarily signed up for a workshop aiming at improving their college readiness. One of the major frustrations in developmental and remedial education is that students who need the extra help do not utilize the existing services. Obviously, these students thought they would benefit from such a workshop, and they were motivated enough to pursue it. Consequently, results may not be generalizable to the entire student population since many students are not motivated enough to seek out help if they need it, and sometimes they are not able to identify that they need help in the first place. In other words, these results may apply only to a small, distinctive subpopulation within the larger college population.

Finally, these results are based on self-rated responses. This takes many conditions for granted. To begin with, it assumes that students are honest. Even if they do not have to share the results and consequently do not have to live up to anybody else's expectations, they may still lie to themselves choosing answers that reflect how they would like to be rather then how they actually are. In addition, self-assessment assumes that students can accurately assess themselves in comparison to others. How could a student who has been out of school for 20 years do that? Not knowing enough about other students' attitudes and behaviours may result in an over or underestimation of one's own behaviours and attitudes. Consequently, some increases or decreases in the pre-to-post LASSI scores could result not from a change in behaviour or attitude but from a having gained a more accurate picture of the entire college experience. Some, if not all, of these factors are accounted for in the intense development of the instrument and then in the percentile ranking; nevertheless, any self-ranking should be approached cautiously.

Overall Discussion

Pre-LASSI Percentiles

Overall, the results confirm other studies that students, in general, are not prepared for the college experience regarding the non-content related area of learning strategies (Albaili, 1997; Haynes et al., 1988; Puntambekar, 1995; Schumacker & Sayler, 1995). At the beginning of the semester, the mean percentiles of eight out of the ten scales were below the 50th percentile and therefore "below average" (Figure 9). This means that students need to improve motivation, test strategies, time management, attitude, selecting main ideas, concentration, self-testing, and anxiety. Only two scales – Information Processing and Study Aids – were the 50th and 75th percentile and ranked "average" (Figure 9). This indicates that students, on average, should consider improvement in specific areas within the larger categories of information processing and study aids.

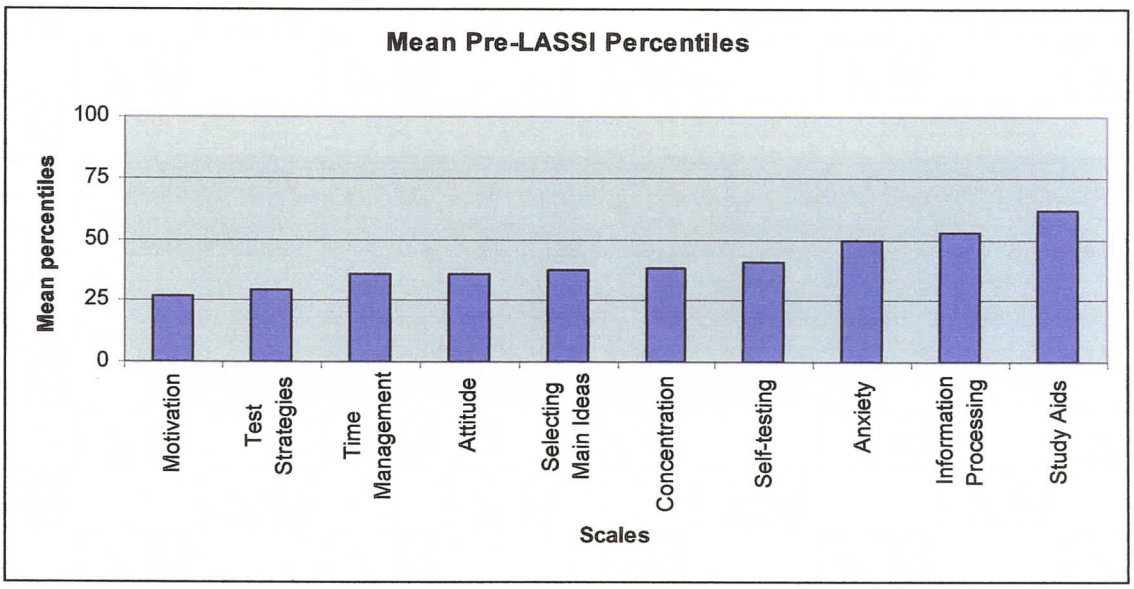

Figure 9. Mean percentiles for pre-LASSI results, arranged in ascending order

Post-LASSI Percentiles

After one semester at Selkirk College and after having completed a 15-hour "Student Success Skills" Workshop, these percentiles improve to only two out of the ten scales – Motivation and Attitude – being below the 50th percentile ("below average"), seven scales being between the 50th and 75th percentile ("average"), and one scale – Information Processing – being above the 75th percentile ("above average") (Figure 10). The increase in the mean percentiles of all scales is optimistic; however, motivation and attitude still need to be improved substantially; selecting main ideas, test strategies, time management, concentration, self-testing, anxiety, and study aids need to be improved in specific areas within each of the larger categories. Information processing is the only scale that does not need improvement. Although the improvement in learning and study skills behaviours and attitudes is encouraging, students still need to improve more in order to maximize their learning experiences.

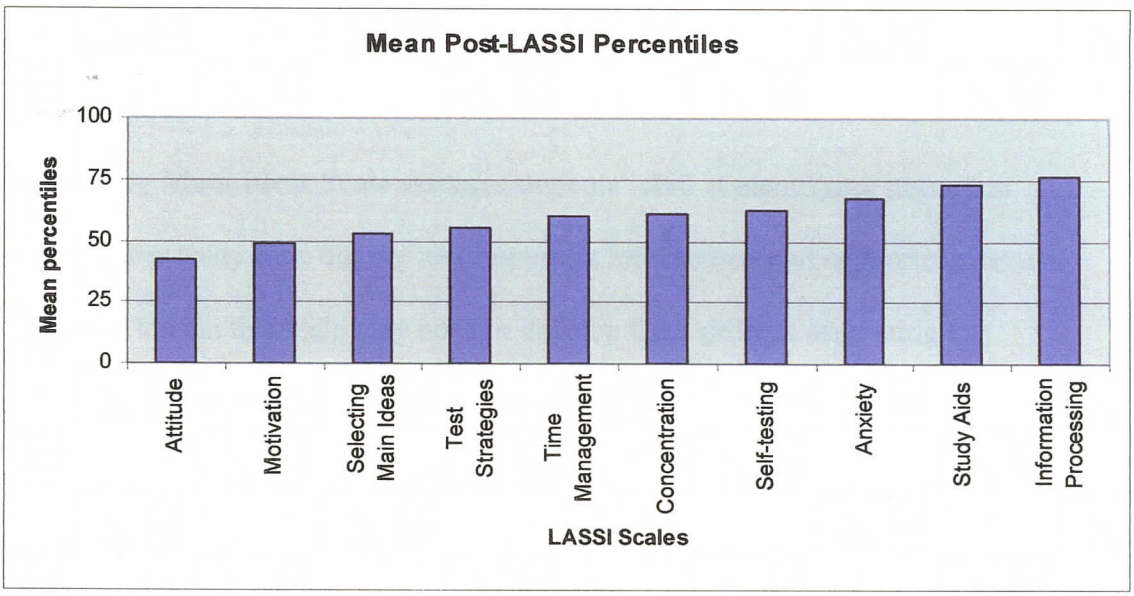

Figure 10. Mean percentiles for post-LASSI results, arranged in ascending order

Individual LASSI Scales

Skill Components

Information Processing Scale assesses how well students can use imagery, verbal elaboration, organization strategies, and reasoning skills as learning strategies to process new information and incorporate it into existing knowledge. Students who score low on this scale may have difficulty making information meaningful and storing it in memory in a way that will help them recall it in the future (LASSI – Scales, 1996-2002). The mean scores for this scale had the fifth highest pre-to-post change (p=0.0086) (Table 11). The equivalent percentiles changed from 53.0 (2nd highest pre-percentile) to 76.25 (highest post-percentile). This is an interesting result since this scale measures what most people think of as study skills – that is, primarily, memorization techniques. Many educators assume that these particular techniques influence educational success most directly. However, in this group information processing was the second highest pre-percentile and the highest post-percentile; in other words, students are obviously knowledgeable about and confident in their memorization techniques.

The **Selecting Main Ideas Scale** assesses students' skill at identifying important information for further study from among less important information and supporting details. Students who score low on this scale may need to develop their skills at separating out critical information on which to focus their attention (LASSI – Scales, 1996-2002); in other words, students need to improve what is generally thought of as reading comprehension. With the third lowest change in a p-values, this scale experienced an insignificant change (p=0.1047) (Table 11). The equivalent percentiles changed from 37.5 (5th lowest pre-

percentile) to 53.0 (3rd lowest post-percentile). Being able to select main ideas is a prerequisite to effective studying. As a result, these pre- and post-percentiles are quite scary. It is much easier to teach different information processing techniques if students accurately comprehend text (and speech). However, memorization techniques are relatively ineffectual if they are applied to wrong material.

Table 11

P-values of before and after mean scores of all LASSI scales (n=19) arranged in descending significance of change

LASSI Scale	P-value
Time Management (self-regulation)	0.0017*
Concentration (self-regulation)	0.0021*
Test Strategies (skill)	0.0040*
Self-testing (self-regulation)	0.0079*
Information Processing (skill)	0.0086*
Anxiety (will)	0.0266*
Motivation (will)	0.0495*
Selecting Main Ideas (skill)	0.1047
Study Aids (self-regulation)	0.2461
Attitude (will)	0.5561
* indicates a significant difference (p-value<0.5)	

Overall, I am not surprised by this result because Selkirk College's Accuplacer Reading Comprehension test shows that about 45% of incoming students score below the 50th percentile when entering college. This means that these students cannot do the following:

- answer questions that require them to synthesize information, including gauging point of view and intended audience,
- recognize organizing principles in a paragraph or passage, or
- identify contradictory or contrasting statements. (College Entrance Examination Board, 2002)

Since this is such a wide-ranging problem, reading-comprehension improvement is an area Selkirk College needs to address at all teaching levels of the institution.

The **Test Strategies Scale** assesses students' use of test-preparation and test-taking strategies. Low-scoring students may need to learn more effective techniques so that they are able to demonstrate their knowledge of the subject matter effectively (LASSI – Scales, 1996-2002). Although this scale experienced the third highest change ($p=0.0040$) (Table 11), the equivalent percentiles changed from 29.0 (2^{nd} lowest pre-percentile) to 55.5 (4^{th} lowest post-percentile). In other words, the mean post-percentile is still quite low. This could be related to the results in the Selecting Main Ideas Scale because just as students need to find the important information before they can study it, they also need to know which type of studying works for which type of test. In other words, studying for a multiple-choice exam is vastly different from studying for an essay exam.

The conclusion for the skills section seems to be that students are familiar with an array of traditional study techniques. However, employing these techniques to the right material and employing the right techniques given the context of testing needs to be improved in order to maximize the benefits of the techniques study themselves.

Will Components

The **Attitude Scale** assesses students' attitudes about and interest in college and academic success. It examines how facilitative or debilitative their approaches to college and academics are for helping them get their work done and succeeding in college. Students who score low on this scale may not believe college is relevant or important to them and may need to develop a better understanding of how college and their academic performances relate to their future life goals (LASSI – Scales, 1996-2002). This scale presented a major surprise for me because out of all the scales it had the lowest overall pre-to-post change with p=0.5561 (Table 11). The equivalent percentiles changed from 36.0 (4th lowest pre-percentile) to 42.0 (lowest post-percentile). Students just do not seem to see the relevancy of going to school or of the courses they are taking, nor do they seek the help they need when they need it.

The **Motivation Scale** fared a little better than the Attitude one. The motivation scale assesses students' diligence, self-discipline, and willingness to exert the effort necessary for successful studies. Students who score low on this scale need to accept more responsibility for their academic outcomes and learn how to set and use goals to help accomplish specific tasks (LASSI – Scales, 1996-2002). This scale had the fourth lowest change (p=0.0495) (Table 11), and the equivalent percentiles changed from 27.0 (lowest pre-percentile) to 48.5 (2nd lowest post-percentile). Although these result are slightly better than the attitude scale's, motivation and attitude are the only two scales that ranked below the 50th percentile in the mean post-LASSI results, which means that they still need significant improvement.

Since studies have shown that motivation and attitude are often the most important factors in student success (Albaili, 1997; Haynes et al., 1988; McCombs, 1988; Palmer &

Goetz, 1988; Schmeck, 1988; Wittrock, 1986), these results have huge implication for Selkirk College. The two most contributing factors to student success ranked the lowest in the post-LASSI results and are the only two that still ranked below the 50th percentile. Selkirk College is currently experiencing a 25% dropout rate (Paris Voykin, personal communication, May 14, 2003); among all the possible variables, a major contributing factor to this dropout rate may lie right here.

The **Anxiety Scale** assesses the degree to which students worry about school and their academic performances. Students who score low on this scale are experiencing high levels of anxiety associated with school. High levels of anxiety can help direct attention away from completing academic tasks. Students who score low on this scale may need to develop techniques for coping with anxiety and reducing worry so that attention can be focused on the task at hand (LASSI – Scales, 1996-2002). From my experience as a learning specialist, anxiety can be an insurmountable problem for some students, and I expected this scale to rank relatively low in comparison to the other scales; nevertheless, in this study the equivalent percentiles changed from 49.5 (3rd highest pre-percentile) to 67.5 (3rd highest post-percentile), which constitutes the fifth lowest (but significant) change ($p=0.0266$) (Table 11). For many students, the concept of attending college is scary mostly because of tests. This is especially true for adult students who have been out of school for a long time. That this scale ranked the third highest in the pre- and post-LASSI mean percentiles may indicate that students feel somewhat apprehensive at first, but after having completed one semester, they become more comfortable with the whole college system including tests, and anxiety subsides.

Self-regulating Components

In particular, the **Time Management Scale** assesses students' application of time management principles to academic situations. Students who score low on this scale may need to develop effective scheduling and monitoring techniques in order to assure timely completion of academic tasks and to avoid procrastination while realistically including non-academic activities in their schedule (LASSI – Scales, 1996-2002). This scale experienced the highest change with p=0.0017 (Table 11). Correspondingly, the equivalent percentiles changed from 35.5 (3rd lowest pre-percentile) to 60.5 (5th lowest post-percentile). These results are very encouraging since falling behind is a major contributor for students failing in or dropping out of college. When I commented on this huge improvement to one student, he replied, "You have to in order to survive." This is a highly accurate observation, and students seem to learn time-management principles without much outside "pushing." In other words, once students are exposed to the techniques, they seem to be employing them out of necessity.

The **Concentration Scale** assesses students' ability to direct and maintain attention on academic tasks. Low-scoring students may need to learn to monitor their level of concentration and develop techniques to redirect attention and eliminate interfering thoughts or feelings so that they can be more effective and efficient learners (LASSI – Scales, 1996-2002). This scale had the second highest change with p=0.0021 (Table 11), which means that the equivalent percentiles changed from 38.0 (5th highest pre-percentile) to 61.0 (5th highest post-percentile). This result surprised me since concentration (or the lack of it) is one of the most persistent problems when experienced by a student. Similar to anxiety, my observations indicate that daydreaming is one of the brain patterns that is most difficult to

control; however, I can (albeit cautiously) deduce that this is true for the isolated cases I encounter and that for students, in general, concentration improves with practice.

The **Study Aids Scale** assesses students' use of supports or resources to help them learn or retain information. Students with low scores may need to develop a better understanding of the resources available to them and how to use of these resources to help them be more effective and efficient learners (LASSI – Scales, 1996-2002). This scale experienced the second lowest change ($p=0.2461$) (Table 11). Although this change may seem rather dismal, this scale started out with the highest percentile, and equivalent percentiles changed from 62.0 (highest pre-percentile) to 73.0 (2^{nd} highest post-percentile). This is another encouraging result. Students seem to be aware of the different resources available to them; however, since these students took advantage of the college-success-skills workshop offered, they may be actively seeking out resources and then choosing which ones to access. In other words, this particular result especially may not be representative of the entire college student population. On the other hand, this result may also indicate that Selkirk College is succeeding in advertising its services, leaving it then up to the students to access these services.

The **Self-Testing Scale** assesses students' use of reviewing and comprehension-monitoring techniques to determine their level of understanding of the information to be learned. Low-scoring students may need to develop an appreciation for the importance of self-testing, and learn effective techniques for reviewing information and monitoring their level of understanding or ability to apply what they are learning (LASSI – Scales, 1996-2002). This scale underwent the fourth highest change ($p=0.0079$) (Table 11), which represents and equivalent percentile change from 40.5 (4^{th} highest pre-percentile) to 63.0 (4^{th}

highest post-percentile). Although this increase is positive, students should have more skill in this area. After all, knowing what one does not know is a crucial aspect of effective studying.

Recommendations for Future Studies

Future studies encompass a huge array of possibilities. Most importantly in the large-scale studies, a study with a larger random sample to find a representative sample of Selkirk College is imperative in order to find generalizable results for the entire Selkirk College student population. As mentioned, a sample of 19 self-identified students is too small and too specific in its characteristics to represent a student population of about 3,600. Furthermore, longitudinal studies are necessary to explore any changes in the student profile over time. The job market and consequently education is changing more than ever. As a result, the students entering postsecondary education will probably also change in their skill sets as well as their goals and attitudes.

On the smaller scale, it would be beneficial to investigate the student profile of individual programs to find out whether or not students within a specific field, such as aviation, have specific strengths and weaknesses, which can then be addressed in program-specific workshops as well as integrated instruction (by training content teachers to integrate specific learning and study strategies into their curriculum). Of course, it is always interesting to see if there are any direct correlations between the LASSI and some other variable, such as GPA or age. For example, I observed in this study that high school scholarship recipients' motivation dropped, whereas motivation of adult students returning to school, upgrading to grade 12 and being quite apprehensive, increased dramatically.

Finally, Selkirk College would benefit from a follow-up study just for attitude and motivation in order to discover whether or not a correlation exists between attrition and motivation, and for me professionally, a controlled experiment would be highly beneficial. This experiment would entail a treatment and a non-treatment group in order to see whether or not the intervention workshop or a first-year transfer course results in a significant difference when compared to the non-treatment group.

Conclusion

Much research has shown that high aptitude is not necessarily a predictor for successful postsecondary education (Albaili, 1997; Haynes et al., 1988; Puntambekar, 1995; Schumacker & Sayler, 1995). Although adequate content skills are necessary for the individual subjects, students who possess these skills may not necessarily successfully complete courses in which they enroll. The other part to the equation is learning and study strategies – an aspect that has gained much attention over the last 20 years and is slowly being recognized and as a fundamental component of education.

In order to investigate the profile of students enrolled in a 15-hour "Student Success Skills" workshop at Selkirk College, a study was designed using the Learning and Study Strategies Inventory (LASSI). The LASSI is a 40-item self-scored instrument that measures students' attitudes and behaviours on ten different scales relating to three different areas: skill component – Information Processing, Selecting Main Ideas, and Test Strategies; will component – Attitude, Motivation, and Anxiety; self-regulating component – Time Management, Concentration, Study Aids, and Self Testing. The specific research questions were:

1. What is the profile according to the Learning and Study Strategies Inventory (LASSI), of students who are taking a one-week (15 hours) study skills workshop at Selkirk College?
2. Does the learning and study skills profile as measured by the LASSI change after having taken the workshop and after having completed one semester at Selkirk College?

In order to answer those questions, 19 students enrolled in a "Student Success Skills" Workshop at the Castlegar Campus of Selkirk College completed the LASSI at the beginning of the semester and then again after having completed one semester.

In confirmation of other research studies, results indicate that students are not prepared for the college experience since the mean percentiles of eight out of the ten scales were below the 50th percentile and therefore "below average." Only two scales – Information Processing and Study Aids – were the 50th and 75th percentile and ranked "average." Although seven out of the ten scales showed significant improvement after one semester, the post-LASSI results show that more improvement would be desirable since two out of the ten scales – Motivation and Attitude – were still below the 50th percentile ("below average"), seven scales were between the 50th and 75th percentile ("average"), and only one scale – Information Processing – was above the 75th percentile ("above average").

Overall, the behaviours and attitudes relating to the self-regulating (metacognitive) component are the most encouraging, whereas the will (affective) component is the most troublesome. In the metacognitive domain, time management, concentration, and self-testing seem to improve substantially just by being in college. Furthermore, students seem to be aware of the available study aids. However, all of these areas could still be improved more.

The skills area shows that students are aware of the different traditional study/memorization techniques, but need to improve how to find the information to which to apply these techniques as well as tailoring their approach to specific test requirements. Within the will component, although anxiety seems to subside substantially, attitude and motivation are worrisomely low; unfortunately, it takes the latter two to implement all the skills learned and all the insights gained through metacongnitive analysis.

In general, these findings should be treated carefully, primarily because a small sample of 19 self-identified students who participated in a 15-hour "Student Success Skills" workshop does not represent the entire Selkirk College student population. Nevertheless, these findings are a good start, and future studies offer much potential for a more in-depth understanding of the entire student population here at the college as well as individual subpopulations. This study clearly indicates that, right now, reading-comprehension improvement and motivation are the two most important aspects needing to be addressed by Selkirk College, preferably through a combination of all three instructional delivery modes: embedded instruction, one-on-one remediation, and adjunct instruction.

Selkirk College has experienced many changes recently, including severe budget restraints with an increased focus on accountability by the government's change of the funding formula from an enrollment-based calculation to a successful-graduation one. In this context, this study investigated students' readiness for college in the non-content areas of learning and study strategies. As such, this study has been extremely valuable. Students face many challenges when entering college, and hopefully we will be able to address some those challenges more effectively after having gained a deeper understanding of all the aspects involved.

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APPENDICES

Appendix A

The Learning and Study Strategies Inventory (2nd edition)

LASSI Learning And Study Strategies Inventory

by
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David R. Palmer, Ph.D.
Texas Health and Human Services Commission
Ann C. Schulte, Ph.D.
University of North Carolina

Directions

The Learning and Study Strategies Inventory (LASSI) is designed to gather information about learning and study practices and attitudes. Upon submission and approval of your school number, several statements will be presented that relate to learning and studying.

You are to read each statement and then select a response according to the following key:

* Make a Selection * <--- Click on the pull-down menu to the left to select your response.

To help you decide which responses to select, we would like to explain what is meant by each term.

- By **Not at all typical of me,** we do not necessarily mean that the statement would never describe you, but that it would be true of you only in rare instances.
- By **Not very typical of me,** we mean that the statement generally would not be true of you.
- By **Somewhat typical of me,** we mean that the statement would be true of you about half the time.
- By **Fairly typical of me,** we mean that the statement would generally be true of you.
- By **Very much typical of me,** we do not necessarily mean that the statement would always describe you, but that it would be true of you almost all the time.

Before you begin it is important to know whether you have taken the LASSI previously. Choose the correct box below.

First Administration
If this is your first time taking the LASSI, enter your school number, user name, and password into the space below and click the "Submit" button to continue.
Enter Your **School Number:**

Second Administration
If you are taking this assessment for the second time (Post-Test), enter your school number and your student key into the spaces below and click the "Take Post-Test" button.
Enter Your **School Number:**

Enter Your **User Name:**	
Enter Your **Password:**	

Submit

* Enter Your **Student Key:**	

Take Post-Test

*Note: Your student key was issued the first time you took the LASSI. If you misplaced your student key, your advisor/instructor can look it up for you.

1231 Kapp Drive, Clearwater, FL 33765-2116
(800) 366-4079, (727) 442-7760

LASSI Learning And Study Strategies Inventory 2nd Edition

Enter your first name, last name, ID number, and e-mail address into the spaces below.

School Number: 77416

First Name:

Last Name:

ID Number:

E-mail Address:

Try to answer according to how well the statement describes you, not how you think you should be or what others do. There are no right or wrong answers to these statements. Please work as quickly as you can without being careless and please answer all the items.

1. I concentrate fully when studying.

* Make a Selection *

2. I am unable to summarize what I have just heard in a lecture or read in a textbook.

* Make a Selection *

3. I try to find relationships between what I am learning and what I already know.

* Make a Selection *

4. I find it hard to stick to a study schedule.

* Make a Selection *

5. In taking tests, writing papers, etc., I find I have misunderstood what was wanted and lose points because of it.

* Make a Selection *

6. I am able to study subjects I do not find interesting.

* Make a Selection *

7. When I decide to study, I set aside a specific length of time and stick to it.

* Make a Selection *

8. Because I don't listen carefully, I don't understand some course material.

* Make a Selection *

9. I try to identify potential test questions when reviewing my class material.

* Make a Selection *

10. During class discussions, I have trouble figuring out what is important enough to put in my notes.

* Make a Selection *

11. To help me remember new principles we are learning in class, I practice applying them.

* Make a Selection *

12. My underlining is helpful when I review text material.

* Make a Selection *

13. When it comes to studying, procrastination is a problem for me.

* Make a Selection *

14. I set high standards for myself in school.

* Make a Selection *

15. When I am studying a topic, I try to make everything fit together logically.

* Make a Selection *

16. I find it difficult to maintain my concentration while doing my coursework.

* Make a Selection *

17. I only study the subjects I like.

* Make a Selection *

18. When preparing for an exam, I create questions that I think might be included.

* Make a Selection *

19. When I take a test, I realize I have studied the wrong material.

* Make a Selection *

20. If there is a web site for my textbook, I use the information provided there to help me learn the material.

* Make a Selection *

21. I have difficulty identifying the important points in my reading.

* Make a Selection *

22. When work is difficult, I either give up or study only the easy parts.

* Make a Selection *

23. To help me learn the material presented in my classes, I relate it to my own general knowledge.

* Make a Selection *

24. There are so many details in my textbooks that it is difficult for me to find the main ideas.

* Make a Selection *

25. I review my notes before the next class.

* Make a Selection *

26. I have difficulty adapting my studying to different types of courses.

* Make a Selection *

27. I translate what I am studying into my own words.

* Make a Selection *

28. I put off studying more than I should.

* Make a Selection *

29. I get discouraged because of low grades.

* Make a Selection *

30. Even if I am having difficulty in a course, I can motivate myself to complete the work.

* Make a Selection *

31. I spread out my study times so I do not have to "cram" for a test.

* Make a Selection *

32. My mind wanders a lot when I study.

* Make a Selection *

33. I stop periodically while reading and mentally go over or review what was said.

* Make a Selection *

34. I go to the college learning center for help when I am having difficulty learning the material in a course.

* Make a Selection *

35. I feel very panicky when I take an important test.

* Make a Selection *

36. I have a positive attitude about attending my classes.

* Make a Selection *

37. I test myself to see if I understand what I am studying.

* Make a Selection *

38. When I study for a test, I have trouble figuring out just what to do to learn the material.

* Make a Selection *

39. Even if I do not like an assignment, I am able to get myself to work on it.

* Make a Selection *

40. When they are available, I attend review sessions for my classes.

* Make a Selection *

41. I would rather not be in school.

* Make a Selection *

42. I set goals for the grades I want to get in my classes.

* Make a Selection *

43. When I am taking a test, worrying about doing poorly interferes with my concentration.

* Make a Selection *

44. I try to see how what I am studying would apply to my everyday life.

* Make a Selection *

45. I have trouble understanding exactly what a test question is asking.

* Make a Selection *

46. I worry that I will flunk out of school.

* Make a Selection *

47. To help make sure I understand the material, I review my notes before the next class.

* Make a Selection *

48. I do not care about getting a general education, I just want to get a good job.

* Make a Selection *

49. I find it hard to pay attention during lectures.

* Make a Selection *

50. I try to relate what I am studying to my own experiences.

* Make a Selection *

51. I dislike most of the work in my classes.

* Make a Selection *

52. I review my answers during essay tests to make sure I have made and supported my main points.

* Make a Selection *

53. When studying, I seem to get lost in the details and miss the important information.

* Make a Selection *

54. I use special study helps, such as italics and headings, that are in my textbook.

* Make a Selection *

55. I am very easily distracted from my studies.

* Make a Selection *

56. Even when I don't like a course, I work hard to get a good grade.

* Make a Selection *

57. It is hard for me to decide what is important to underline in a text.

* Make a Selection *

58. To help me learn the material, I complete at least some of the practice problems in my textbooks.

* Make a Selection *

59. I do not have enough time to study because I spend too much time with my friends.

* Make a Selection *

60. To check my understanding of the material in a course, I make up possible test questions and try to answer them.

* Make a Selection *

61. Even when I am well prepared for a test, I feel very anxious.

* Make a Selection *

62. I set aside more time to study the subjects that are difficult for me.

* Make a Selection *

63. I do poorly on tests because I find it hard to plan my work within a short period of time.

* Make a Selection *

64. During a demonstration in class, I can identify the important information I need to remember.

* Make a Selection *

65. I am up-to-date in my class assignments.

* Make a Selection *

66. When I am having trouble with my coursework, I do not go to the instructor for help.

* Make a Selection *

67. I end up "cramming" for every test.

* Make a Selection *

68. When I listen to class lectures, I am able to pick out the important information.

* Make a Selection *

69. When I am studying, worrying about doing poorly in a course interferes with my concentration.

* Make a Selection *

70. I do not care if I finish college as long as I have a good time.

* Make a Selection *

71. I try to find a study partner or study group for each of my classes.

* Make a Selection *

72. Courses in certain subjects, such as math, science, or a foreign language, make me anxious.

* Make a Selection *

73. When completing a problem-solving task, it is difficult for me to pick out the important information.

* Make a Selection *

74. After a class, I review my notes to help me understand the information that was presented.

* Make a Selection *

75. If I get distracted during class, I am able to refocus my attention.

* Make a Selection *

76. In my opinion, what is taught in my courses is not worth learning.

* Make a Selection *

77. If I am having trouble studying, I ask another student or the instructor for help.

* Make a Selection *

78. I get so nervous and confused when taking an examination that I fail to answer questions to the best

of my ability.

* Make a Selection *

79. I find that during lectures I think of other things and don't really listen to what is being said.

* Make a Selection *

80. Even when study materials are dull and uninteresting, I manage to keep working until I finish.

* Make a Selection *

After responding to statements 1-80, click the button below.

Submit Your Answers

1231 Kapp Drive, Clearwater, FL 33765-2116
(800) 366-4079, (727) 442-7760

Appendix B

LASSI Conversions from Raw Scores to Percentiles

National Norms for the Learning and Study Strategies Inventory, 2nd edition (Weinstein & Palmer, 2002, p.28)

Percentile Score	Anxiety ANX	Attitude ATT	Concentration CON	Information Processing INP	Motivation MOT	Self Testing SFT	Selecting Main Ideas SMI	Study Aids STA	Time Management TMT	Test Strategies TST	Percentile Score
99	40	40	40	40	40	40	40	38	40	40	99
95	37	39	37	38	39	36	38	35	37	38	95
90	35		35	35	38	33	37	33	35	36	90
85	33	38	34	34	37	31	35	32	33	35	85
80	32	37	33	33	36	30	34	30	32	34	80
75	31		32	31		29	33	29	31	33	75
70	30	36	31	30	35	28	32		30	32	70
65	29		30		34	27	31	28	29		65
60	28	35	29	29	33	26	30	27	28	31	60
55	27			28			29	26	27	30	55
50	26	34	28	27	32	25					50
45	25		27		31	24	28	25	26	29	45
40	24	33	26	26		23	27	24	25	28	40
35	23		25	25	30	22	26		24		35
30	22	32	24	24	29		25	23	23	27	30
25	21		23		28	21	24	22	22	26	25
20	20	31	22	23	27	20	23	21	21	25	20
15	18	30	21	22	26	19	22	20	20	24	15
10	17	28	19	21	24	17	21	19	18	23	10
05	14	26	17	19	22	15	18	17	16	21	05
01	10	21	13	15	18	12	13	13	12	18	01

Appendix C

LASSI Norms Group Data

Demographics of the LASSI Norming Sample: Sample Size by Type of Institution (Weinstein & Palmer, 2002, p.18)

	Number of Schools	Number of Students
University	3	201
Community College	5	495
State College	3	348
Technical Institute	1	48
Total	12	1,092

Demographics of the LASSI Norming Sample: GPA by Gender (Weinstein & Palmer, 2002, p.18)

GPA	Male	Female	Total
Below 2.0	6	20	26
2.0 - 2.5	70	76	146
2.5 - 3.0	120	182	302
3.0 - 3.5	131	260	391
3.5 - 4.0	50	177	227
Total	377	715	1,092

Demographics of the LASSI Norming Sample: Ethnicity by Gender (Weinstein & Palmer, 2002, p.18)

Ethnicity	Male	Female	Total
White, non-Hispanic	235	474	709
African-American	58	95	153
Hispanic	54	95	149
Asian or Pacific Islander	7	9	16
Other	23	42	65
Grand Total	377	715	1,092

Demographics of the LASSI Norming Sample: Age by Gender
(Weinstein & Palmer, 2002, p.19)

Age	Male	Female	Total
17 or younger	32	52	84
18-19	225	403	628
20-21	45	56	101
22-23	16	37	53
24-25	12	31	43
26 or older	47	136	183
Total	377	715	1,092

Appendix D

Student Consent Form

I hereby consent to have my results from the Learning and Study Strategies Inventory be used in the research study conducted by Andrea Kosling. I understand that my name will not be used in the study and that my name and individual results will not be released without my permission.

_____ _____

Student Name Date

_____

Contact Information (e.g. email or phone number)

Appendix E

Explanation of the Study

The Learning and Study Strategies Inventory, also called LASSI, measures your current use of learning strategies. You will have to rate yourself on a five-point scale, ranging from very typical of me to not at all typical of me. To give you a bit of guideline,

- ***Very typical of me*** means that the statement is true **almost all** the time.
- ***Fairly typical of me*** means that the statement is **generally** true.
- ***Somewhat typical of me*** means that the statement is true **about half** the time.
- ***Not very typical of me*** means that the statement is **generally not** true for you.
- ***Not at all typical of me*** means that the statement is true only in **rare** instances.

The LASSI is currently the most accurate and most widely used test available, and the results will come up immediately, and we will go over what the results mean in general afterward. If you would like a more detailed analysis, please come and see me after the workshop. Just remember, try to arte yourself according to how well the statement describes you, not in terms of how you think you should be or what others do; there are now right or wrong answers here. This is simply a guideline that will show your strengths and weaknesses in comparison to other students.

Now, the other aspect before we start is I am currently taking my Master in Curriculum and Instruction from Gonzaga University in Spokane, Washington. As part of my degree requirements, I have to conduct research, and I would like to use the LASSI results of this group. My goal is to gain a better understanding of the student population here at Selkirk College in order to create a three-credit course that would be offered as an elective for the associate degrees here at Selkirk College. It would also help me, of course, to make this workshop better. What I would like to do is have you complete the LASSI now and then again in January after you have completed one semester here at Selkirk College. I would be

looking for any trends within in the group by comparing the means of the different scales, and by investigated whether or not there are any changes between prior to the semester and after the semester. This would mean that I would contact you in the first week in January once the semester has started again and that you would write the LASSI again some time during the two weeks following. Of course, if you are interested, I would should you the result.

As you can see, this data would be invaluable for me, and I hope you will allow me to use your results in my research project. Since your results will not be anonymous, it is standard procedure for me to obtain written consent from you. I want you to understand that your names will not be used in the study and that I would not release your individual results to anybody else without your permission.

Do you have any questions?

Okay, here is the form.

Thank you.

Appendix F

Letters of Permission

7 July 2002

Dear Maggie Killoran,

As the Learning Assistance Practitioner here at Selkirk College as well as a graduate student, I find myself in a doubly useful situation. I would like to collect and analyze Selkirk College data regarding entry-level students' readiness for college studies. I believe my findings will be beneficial for the college as well as my on-going professional development. However, before I begin, Gonzaga University requires me to obtain formal permission for this study in order for me to use the data in my master's project.

I am currently taking my Master of Arts in Curriculum and Instruction through Gonzaga University, and as part of the graduation requirement, I will have to complete a master's project that includes some level of research at the institution in which I work. In order to maximize the benefit to Selkirk College, I have chosen a curriculum project – the development of a three-credit, first-year, university-transfer course on study/college success skills, which would become an elective for the associate degrees offered by Selkirk College (because the University of Northern BC has already agreed to establish transfer credit as soon as the course is developed).

In preparation for the development of this course, I would like to establish a profile of students who are attracted to this kind of course by using the Learning and Study Strategies Inventory (LASSI). I was hoping to give this inventory to students who will be attending the workshops, "Student Success Skills," offered at the end of August (which I will be delivering). I would also like to find out how the learning and study strategies' use changes by having the participants retake the LASSI in January 2003. The cost of the LASSI is $2.50 US per test.

As you can see, this data would be highly valuable. With the increased emphasis on accountability, this study would provide valuable data for the need of our department's existence. No study (of which I am aware) on college readiness has been done at Selkirk College. Secondly, the data would function as a needs assessment preceding the curriculum development of the university-transfer course, which would ensure that the course content is tailored to the specific needs of Selkirk College students. Working with the LASSI in the context of the entire workshop will also give me an indication of its usefulness in future. And finally, the data would give some insight into the effectiveness of the current workshops.

I hope you will also support me in this endeavour and allow me to go forward with this research project. If this project meets your approval, then please sign at the bottom of this letter and return this letter to me via campus mail.

Thank you for your time and consideration.

Sincerely,

Andrea Kosling

Andrea Kosling
Learning Assistance Practitioner

I hereby give permission to Andrea Kosling to conduct research at Selkirk College as outlined in her proposal. Any changes to the research design need to be approved by me before they are implemented.

Maggie Killoran
Department Head of Student Access and Support

July 8/02
Date

8 July 2002

Dear Gerry Gauthier,

As the Learning Assistance Practitioner here at Selkirk College as well as a graduate student, I find myself in a doubly useful situation. I would like to collect and analyze Selkirk College data regarding entry-level students' readiness for college studies. I believe my findings will be beneficial for the college as well as my on-going professional development. However, before I begin, Gonzaga University requires me to obtain formal permission for this study in order for me to use the data in my master's project.

I am currently taking my Master of Arts in Curriculum and Instruction through Gonzaga University, and as part of the graduation requirement, I will have to complete a master's project that includes some level of research at the institution in which I work. In order to maximize the benefit to Selkirk College, I have chosen a curriculum project – the development of a three-credit, first-year, university-transfer course on study/college success skills, which would become an elective for the associate degrees offered by Selkirk College (because the University of Northern BC has already agreed to establish transfer credit as soon as the course is developed).

In preparation for the development of this course, I would like to establish a profile of students who are attracted to this kind of course by using the Learning and Study Strategies Inventory (LASSI). I was hoping to give this inventory to students who will be attending the workshops, "Student Success Skills," offered at the end of August (which I will be delivering). I would also like to find out how the learning and study strategies' use changes by having the participants retake the LASSI in January 2003.

As you can see, this data would be highly valuable. With the increased emphasis on accountability, this study would provide valuable data for the need of our department's existence. No study has been done in this context of which I am aware. Secondly, the data would function as a needs assessment preceding the curriculum development of the university-transfer course, which would ensure that the course content is tailored to the specific needs of Selkirk College students. Working with the LASSI in the context of the entire workshop will also give me an indication of its usefulness in future. And finally, the data would give some insight into the effectiveness of the current workshops.

I hope you will also support me in this endeavour and allow me to go forward with this research project. If this project meets your approval, then please sign at the bottom of this letter and return this letter to me via campus mail.

Thank you for your time and consideration.

Sincerely,

Andrea Kosling

Andrea Kosling
Learning Assistance Practitioner

I hereby give permission to Andrea Kosling to conduct research at Selkirk College as outlined in her proposal. Any changes to the research design need to be approved by me before they are implemented.

Gerry Gauthier

Gerry Gauthier
Director of Student Services/Registrar

July 9/02

Date

Appendix G

LASSI Result Handout

This is the handout was given to students after having completed the LASSI (LASSI – Scales , 1996-2002).

The LASSI Scales	
Scale: ATT	The **Attitude Scale** assesses students' attitudes and interest in college and academic success. It examines how facilitative or debilitative their approach to college and academics is for helping them get their work done and succeeding in college (sample item: I feel confused and undecided as to what my educational goals should be). Students who score low on this scale may not believe college is relevant or important to them and may need to develop a better understanding of how college and their academic performance relates to their future life goals.
Scale: MOT	The **Motivation Scale** assesses students' diligence, self-discipline, and willingness to exert the effort necessary to successfully complete academic requirements (sample item: When work is difficult I either give up or study only the easy parts). Students who score low on this scale need to accept more responsibility for their academic outcomes and learn how to set and use goals to help accomplish specific tasks.
Scale: TMT	The **Time Management Scale** assesses students' application of time management principles to academic situations (sample item: I only study when there is the pressure of a test). Students who score low on this scale may need to develop effective scheduling and monitoring techniques in order to assure timely completion of academic tasks and to avoid procrastination while realistically including non-academic activities in their schedule.
Scale: ANX	The **Anxiety Scale** assesses the degree to which students worry about school and their academic performance. Students who score low on this scale are experiencing high levels of anxiety associated with school (note that this scale is reverse scored). High levels of anxiety can help direct attention away from completing academic tasks (sample item: Worrying about doing poorly interferes with my concentration on tests). Students who score low on this scale may need to develop techniques for coping with anxiety and reducing worry so that attention can be focused on the task at hand.
Scale: CON	The **Concentration Scale** assesses students' ability to direct and maintain attention on academic tasks (sample item: I find that during lectures I think of other things and don't really listen to what is being said). Low scoring students may need to learn to monitor their level of concentration and develop techniques to redirect attention and eliminate interfering thoughts or feelings so that they can be more effective and efficient learners.

Scale: INP	The **Information Processing Scale** assesses how well students' can use imagery, verbal elaboration, organization strategies, and reasoning skills as learning strategies to help build bridges between what they already know and what they are trying to learn and remember, i.e., knowledge acquisition, retention and future application (sample item: I translate what I am studying into my own words). Students who score low on this scale may have difficulty making information meaningful and storing it in memory in a way that will help them recall it in the future.
Scale: SMI	The **Selecting Main Ideas Scale** assesses students' skill at identifying important information for further study from among less important information and supporting details (sample item: Often when studying I seem to get lost in details and can't see the forest for the trees). Students who score low on this scale may need to develop their skill at separating out critical information on which to focus their attention. Tasks such as reading a textbook can be overwhelming if students focus on every detail presented.
Scale: STA	The **Study Aids Scale** assesses students' use of supports or resources to help them learn or retain information (sample item: I use special helps, such as italics and headings, that are in my textbooks). Students with low scores may need to develop a better understanding of the resources available to them and how to use of these resources to help them be more effective and efficient learners.
Scale: SFT	The **Self-Testing Scale** assesses students' use of reviewing and comprehension monitoring techniques to determine their level of understanding of the information to be learned (sample item: I stop periodically while reading and mentally go over or review what was said). Low scoring students may need to develop an appreciation for the importance of self-testing, and learn effective techniques for reviewing information and monitoring their level of understanding or ability to apply what they are learning.
Scale: TST	The **Test Strategies Scale** assesses students' use of test preparation and test taking strategies (sample item: In taking tests, writing themes, etc., I find I have misunderstood what is wanted and lose points because of it). Low scoring students may need to learn more effective techniques for preparing for and taking tests so that they are able to effectively demonstrate their knowledge of the subject matter.

Appendix H

Post-LASSI script

Thanks for taking the LASSI again. Unfortunately, I will not be able to talk to you before the test in order to keep the procedure the same for everyone, but I'll be happy to do so afterward. Just to refresh the procedure, you will have to rank yourself on how applicable a statement is to you.

- ***Very typical of me*** means that the statement is true **almost all** the time.
- ***Fairly typical of me*** means that the statement is **generally** true.
- ***Somewhat typical of me*** means that the statement is true **about half** the time.
- ***Not very typical of me*** means that the statement is **generally not** true for you.
- ***Not at all typical of me*** means that the statement is true only in **rare** instances.

Remember, try to arte yourself according to how well the statement describes you, not in terms of how you think you should be or what others do; there are now right or wrong answers here.

Do you have any questions?

Okay, let's start.

Appendix I

Conversion Calculations of Raw-score means to Percentile Means

In order to convert raw score means to percentile means, I used LASSI conversions from raw scores to percentiles provided by the publishers (Weinstein & Palmer, 2002) (Appendix B). Since percentiles are only given in increments of five and scores are only given in whole numbers, I had to devise a way to calculate mean percentiles from the mean scores. I find it very difficult to explain this using words, but the calculation is based on that I let the decimal of the score mean equal the "x" percentile I was going to calculate, and I let the change in the whole number score equal to the change in the equivalent percentile ranks.

For example, the Information-Processing Scale had a pre-LASSI mean of 27.6. I would look at the conversion chart and find the closest equivalent percentiles for the raw scores that are directly below and above 27.6. In this case, the raw scores directly below and above 27.6 are 27 and 28, and the equivalent percentiles are 50 and 55 respectively. I would then take the decimal of the raw score (0.6) and divide this by the change in score (28-27=1), and I would let that equal to "x" divided by the change in percentiles (55-50=5). So the formula would look like this: $0.6/1 = x/5$. Then, I would solve for "x", and the answer is 3, and finally I added the 3 to the 50 in order to get the 53 percentile, which is equivalent to a raw score of 27.6.

Appendix J

Raw Scores and Percentiles and Descriptive Data Analysis of Raw Scores

Raw Scores

Overall Score		Anxiety		Attitude		Concentration		Information Processing		Motivation		Self Testing		Selecting Main Ideas		Study Aids		Time Management		Test Strategies	
before	after	before	after	before	after	before	after	before	after	before	after	before	after	before	after	before	after	before	after	before	after
293	322	28	34	36	36	30	37	27	32	30	33	21	19	32	30	28	31	32	38	29	32
247	288	20	26	31	33	19	28	35	32	26	33	23	29	22	27	26	24	18	28	27	28
186	259	16	24	26	38	17	14	12	23	9	35	22	24	25	11	15	29	19	34	25	27
228	313	19	28	28	32	23	30	24	35	18	33	19	30	31	33	26	31	19	27	24	34
302	286	27	17	34	35	32	33	30	26	34	34	34	31	31	31	22	25	27	29	31	25
303	278	31	21	33	27	29	28	27	28	38	37	25	20	24	21	36	34	31	34	29	28
243	286	18	21	35	33	19	26	24	36	30	29	22	31	20	28	28	31	23	25	24	27
279	298	33	34	33	36	32	36	22	30	28	31	15	22	27	25	35	28	25	28	29	28
236	239	21	20	32	30	25	26	21	23	25	24	22	23	23	25	25	23	17	20	25	25
277	331	32	38	32	37	29	34	29	32	30	31	24	28	32	34	21	31	19	30	29	36
306	345	26	30	35	29	29	34	32	35	35	37	30	40	23	34	34	34	29	34	33	38
187	220	29	31	25	27	17	18	15	30	16	17	10	17	25	24	14	16	13	15	23	25
273	309	24	33	36	34	22	25	35	36	27	33	27	32	25	31	28	29	24	29	25	29
331	300	35	35	37	33	35	29	29	28	38	35	31	24	32	30	31	22	26	26	37	38
203	233	20	27	28	31	12	18	32	29	24	23	18	21	15	23	22	26	17	12	15	23
321	373	28	37	35	35	28	39	23	33	38	40	30	40	27	38	39	40	38	35	26	36
296	339	13	30	36	39	28	37	38	39	38	39	22	25	30	32	33	34	39	39	19	25
310	331	33	36	37	37	31	31	36	37	33	31	25	30	34	38	26	32	22	27	33	32
279	301	40	39	31	29	29	32	34	34	23	28	18	19	26	33	31	28	20	24	27	35

Raw Percentiles

Anxiety		Attention		Concentration		Info Processing		Motivation		Self-testing		selecting main ideas		study aids		time management		test strategies	
before	after	before	after	before	after	before	after	before	after	before	after	before	after	before	after	before	after	before	after
60	85	70	70	65	95	50	75	35	60	25	15	70	60	65	80	80	95	45	70
20	50	20	40	10	50	90	75	15	60	40	75	15	40	55	40	10	60	30	40
5	45	5	85	5	1	1	20	1	70	35	45	30	1	1	75	10	85	20	30
15	60	10	30	25	65	30	90	1	60	15	80	65	75	55	80	5	55	15	80
55	10	50	60	75	80	70	40	65	65	90	85	65	65	25	45	55	65	60	20
75	25	40	5	60	50	50	55	90	85	55	20	25	10	95	90	75	85	45	40
15	25	60	40	10	40	30	90	35	30	35	85	5	45	65	80	30	40	15	30
85	85	40	70	75	90	15	70	25	45	5	35	40	30	95	65	40	60	45	40
25	20	30	15	35	40	10	20	10	10	35	40	20	30	45	30	5	15	20	20
80	95	30	80	60	85	60	75	35	45	45	70	70	80	20	80	10	70	45	90
50	70	60	10	60	85	75	90	70	85	80	99	20	80	90	90	65	85	75	95
65	75	1	5	5	5	1	70	1	1	1	10	30	25	1	1	1	1	10	20
40	85	70	50	20	35	90	90	20	60	65	85	30	65	65	75	35	65	20	30
90	90	80	40	90	60	60	55	90	70	85	45	70	60	80	25	45	45	90	95
20	55	10	20	1	5	75	60	10	5	10	25	1	20	25	55	5	1	1	10
60	95	60	60	50	95	75	80	90	99	80	99	40	95	99	99	95	90	25	90
1	70	70	95	50	95	95	95	90	95	35	50	60	70	90	90	95	95	1	20
85	90	80	80	70	70	90	90	60	45	55	80	80	95	55	85	25	55	75	70
99	95	20	10	60	75	85	85	5	25	10	15	35	75	80	65	15	35	30	85

Descriptive Data Analysis

Total Score -- before	
Mean	268.4210526
Standard Error	10.16251448
Median	279
Mode	279
Standard Deviation	44.29737362
Sample Variance	1962.25731
Kurtosis	-0.66173729
Skewness	-0.62328696
Range	145
Minimum	186
Maximum	331
Sum	5100
Count	19

Total Score -- after	
Mean	297.4211
Standard Error	9.163976
Median	300
Mode	286
Standard Deviation	39.94485
Sample Variance	1595.591
Kurtosis	-0.192933
Skewness	-0.28387
Range	153
Minimum	220
Maximum	373
Sum	5651
Count	19

Anxiety -- before	
Mean	25.94736842
Standard Error	1.655177389
Median	27
Mode	28
Standard Deviation	7.214750971
Sample Variance	52.05263158
Kurtosis	-0.70596314
Skewness	0.012390602
Range	27
Minimum	13
Maximum	40
Sum	493
Count	19

Anxiety -- after	
Mean	29.52632
Standard Error	1.518634
Median	30
Mode	34
Standard Deviation	6.61957
Sample Variance	43.81871
Kurtosis	-0.966448
Skewness	-0.378067
Range	22
Minimum	17
Maximum	39
Sum	561
Count	19

Attitude -- before	
Mean	32.63157895
Standard Error	0.841922495
Median	33
Mode	36
Standard Deviation	3.669855073
Sample Variance	13.46783626
Kurtosis	-0.37564155
Skewness	-0.77903098
Range	12
Minimum	25
Maximum	37
Sum	620
Count	19

Attitude -- after	
Mean	33.21053
Standard Error	0.832733
Median	33
Mode	33
Standard Deviation	3.629799
Sample Variance	13.17544
Kurtosis	-0.91756
Skewness	-0.267405
Range	12
Minimum	27
Maximum	39
Sum	631
Count	19

Concentration -- before	
Mean	25.57894737
Standard Error	1.44755448
Median	28
Mode	29
Standard Deviation	6.309743695
Sample Variance	39.8128655
Kurtosis	-0.54119544
Skewness	-0.64248639
Range	23
Minimum	12
Maximum	35
Sum	486
Count	19

Concentration -- after	
Mean	29.21053
Standard Error	1.584979
Median	30
Mode	37
Standard Deviation	6.908762
Sample Variance	47.73099
Kurtosis	0.02569
Skewness	-0.749929
Range	25
Minimum	14
Maximum	39
Sum	555
Count	19

Information Processing -- before	
Mean	27.63157895
Standard Error	1.624394671
Median	29
Mode	27
Standard Deviation	7.080572217
Sample Variance	50.13450292
Kurtosis	-0.06314903
Skewness	-0.62210925
Range	26
Minimum	12
Maximum	38
Sum	525
Count	19

Information Processing -- after	
Mean	31.47368
Standard Error	1.041166
Median	32
Mode	32
Standard Deviation	4.538336
Sample Variance	20.59649
Kurtosis	-0.484488
Skewness	-0.397136
Range	16
Minimum	23
Maximum	39
Sum	598
Count	19

Motivation -- before	
Mean	28.42105263
Standard Error	1.856418909
Median	30
Mode	38
Standard Deviation	8.091942422
Sample Variance	65.47953216
Kurtosis	0.341208438
Skewness	-0.77274641
Range	29
Minimum	9
Maximum	38
Sum	540
Count	19

Motivation -- after	
Mean	31.73684
Standard Error	1.308636
Median	33
Mode	33
Standard Deviation	5.70421
Sample Variance	32.53801
Kurtosis	1.269982
Skewness	-1.02913
Range	23
Minimum	17
Maximum	40
Sum	603
Count	19

Self-testing -- before	
Mean	23.05263158
Standard Error	1.340929424
Median	22
Mode	22
Standard Deviation	5.84497585
Sample Variance	34.16374269
Kurtosis	0.290739771
Skewness	-0.16234446
Range	24
Minimum	10
Maximum	34
Sum	438
Count	19

Self-testing -- after	
Mean	26.57895
Standard Error	1.520457
Median	25
Mode	19
Standard Deviation	6.627517
Sample Variance	43.92398
Kurtosis	-0.138443
Skewness	0.613459
Range	23
Minimum	17
Maximum	40
Sum	505
Count	19

Selecting Main Ideas -- before	
Mean	26.52631579
Standard Error	1.12486106
Median	26
Mode	32
Standard Deviation	4.903155685
Sample Variance	24.04093567
Kurtosis	0.053696432
Skewness	-0.46672155
Range	19
Minimum	15
Maximum	34
Sum	504
Count	19

Selecting Main Ideas -- after	
Mean	28.84211
Standard Error	1.479417
Median	30
Mode	30
Standard Deviation	6.448627
Sample Variance	41.5848
Kurtosis	1.969964
Skewness	-1.061936
Range	27
Minimum	11
Maximum	38
Sum	548
Count	19

Study Aids -- before	
Mean	27.36842105
Standard Error	1.541265764
Median	28
Mode	28
Standard Deviation	6.718221708
Sample Variance	45.13450292
Kurtosis	-0.17407166
Skewness	-0.33621186
Range	25
Minimum	14
Maximum	39
Sum	520
Count	19

Study Aids -- after	
Mean	28.84211
Standard Error	1.240786
Median	29
Mode	31
Standard Deviation	5.408462
Sample Variance	29.25146
Kurtosis	0.889157
Skewness	-0.376586
Range	24
Minimum	16
Maximum	40
Sum	548
Count	19

Time Management -- before	
Mean	24.10526316
Standard Error	1.643514165
Median	23
Mode	19
Standard Deviation	7.163912159
Sample Variance	51.32163743
Kurtosis	-0.116005
Skewness	0.702926775
Range	26
Minimum	13
Maximum	39
Sum	458
Count	19

Test Strategies -- before	
Mean	26.84210526
Standard Error	1.157894737
Median	27
Mode	29
Standard Deviation	5.047146145
Sample Variance	25.47368421
Kurtosis	0.940415279
Skewness	-0.30798558
Range	22
Minimum	15
Maximum	37
Sum	510
Count	19

Time Management -- after	
Mean	28.10526
Standard Error	1.625626
Median	28
Mode	34
Standard Deviation	7.085939
Sample Variance	50.21053
Kurtosis	0.461307
Skewness	-0.67354
Range	27
Minimum	12
Maximum	39
Sum	534
Count	19

Test Strategies -- after	
Mean	30.05263
Standard Error	1.119925
Median	28
Mode	25
Standard Deviation	4.88164
Sample Variance	23.83041
Kurtosis	-1.296501
Skewness	0.358287
Range	15
Minimum	23
Maximum	38
Sum	571
Count	19

Appendix K

Hypothesis Testing for Pre- and Post-LASSI Results

Hypothesis Test for the Mean Difference : Matched Pairs

Claim:

1) Pop. Mean Of Difference = 0

Significance, α: 0.05

	Total Score	
1	293	322
2	247	288
3	186	259
4	228	313
5	302	286
6	303	278
7	243	286
8	279	298
9	236	239
10	277	331
11	306	345
12	187	220

Clear | Copy | Paste

Evaluate | Help | Plot

Claim	$\mu_d = 0$
Null Hypothesis	$\mu_d = 0$
Sample Size, n	19
Difference Mean, $\bar{x}_d$	-29.00
Difference St Dev, s_d	30.15
Test Statistic, t	-4.1932
Critical t	±2.1009
P-Value	0.0005

95% Confidence Interval:

$-43.53 < \mu_d < -14.47$

Reject the Null Hypothesis

Sample provides evidence to reject the claim

Hypothesis Test for the Mean Difference : Matched Pairs

Claim:

1) Pop. Mean Of Difference = 0

Significance, α: 0.05

Information Processing

9	21	23
10	29	32
11	32	35
12	15	30
13	35	36
14	29	28
15	32	29
16	23	33
17	38	39
18	36	37
19	34	34
20		

Clear | Copy | Paste

Evaluate | Help | Plot

Claim	$\mu_d = 0$
Null Hypothesis	$\mu_d = 0$
Sample Size, n	19
Difference Mean, $\bar{x}_d$	-3.842
Difference St Dev, s_d	5.679
Test Statistic, t	-2.9490
Critical t	±2.1009
P-Value	0.0086

95% Confidence Interval:

$-6.579 < \mu_d < -1.105$

Reject the Null Hypothesis

Sample provides evidence to reject the claim

Hypothesis Test for the Mean Difference : Matched Pairs

Claim:

1) Pop. Mean Of Difference = 0

Significance, α: 0.05

Selecting Main Ideas

9	23	25
10	32	34
11	23	34
12	25	24
13	25	31
14	32	30
15	15	23
16	27	38
17	30	32
18	34	38
19	26	33
20		

Clear | Copy | Paste

Evaluate | Help | Plot

Claim	$\mu_d = 0$
Null Hypothesis	$\mu_d = 0$
Sample Size, n	19
Difference Mean, $\bar{x}_d$	-2.316
Difference St Dev, s_d	5.907
Test Statistic, t	-1.7088
Critical t	±2.1009
P-Value	0.1047

95% Confidence Interval:
$-5.163 < \mu_d < 0.5314$

Fail to Reject the Null Hypothesis

Sample does not provide enough evidence to reject the claim

Hypothesis Test for the Mean Difference : Matched Pairs

Claim:

1) Pop. Mean Of Difference = 0

Significance, α: 0.05

Test Strategies

9	25	25
10	29	36
11	33	38
12	23	25
13	25	29
14	37	38
15	15	23
16	26	36
17	19	25
18	33	32
19	27	35
20		

Clear | Copy | Paste

Evaluate | Help | Plot

Claim	$\mu_d = 0$
Null Hypothesis	$\mu_d = 0$
Sample Size, n	19
Difference Mean, $\bar{x}_d$	-3.211
Difference St Dev, s_d	4.250
Test Statistic, t	-3.2926
Critical t	±2.1009
P-Value	0.0040

95% Confidence Interval:

$-5.259 < \mu_d < -1.162$

Reject the Null Hypothesis

Sample provides evidence to reject the claim

Hypothesis Test for the Mean Difference : Matched Pairs

Claim:

1) Pop. Mean Of Difference = 0

Significance, α: 0.05

	Attitude	
9	32	30
10	32	37
11	35	29
12	25	27
13	36	34
14	37	33
15	28	31
16	35	35
17	36	39
18	37	37
19	31	29
20		

Clear | Copy | Paste

Evaluate | Help | Plot

Claim	$\mu_d = 0$
Null Hypothesis	$\mu_d = 0$
Sample Size, n	19
Difference Mean, $\bar{x}_d$	-0.5789
Difference St Dev, s_d	4.207
Test Statistic, t	-0.5998
Critical t	±2.1009
P-Value	0.5561

95% Confidence Interval:

$-2.607 < \mu_d < 1.449$

Fail to Reject the Null Hypothesis

Sample does not provide enough evidence to reject the claim

Hypothesis Test for the Mean Difference : Matched Pairs

Claim:

1) Pop. Mean Of Difference = 0

Significance, α: 0.05

	Motivation	
9	25	24
10	30	31
11	35	37
12	16	17
13	27	33
14	38	35
15	24	23
16	38	40
17	38	39
18	33	31
19	23	28
20		

Clear | Copy | Paste

Evaluate | Help | Plot

Claim	$\mu_d = 0$
Null Hypothesis	$\mu_d = 0$
Sample Size, n	19
Difference Mean, $\bar{x}_d$	-3.316
Difference St Dev, s_d	6.864
Test Statistic, t	-2.1056
Critical t	±2.1009
P-Value	0.0495

95% Confidence Interval:

$-6.624 < \mu_d < -0.007361$

Reject the Null Hypothesis

Sample provides evidence to reject the claim

Hypothesis Test for the Mean Difference : Matched Pairs

Claim:

1) Pop. Mean Of Difference = 0

Significance, α: 0.05

	Anxiety	
9	21	20
10	32	38
11	26	30
12	29	31
13	24	33
14	35	35
15	20	27
16	28	37
17	13	30
18	33	36
19	40	39
20		

Clear | Copy | Paste

Evaluate | Help | Plot

Claim	$\mu_d = 0$
Null Hypothesis	$\mu_d = 0$
Sample Size, n	19
Difference Mean, $\bar{x}_d$	-3.579
Difference St Dev, s_d	6.458
Test Statistic, t	-2.4158
Critical t	±2.1009
P-Value	0.0266

95% Confidence Interval:

$-6.691 < \mu_d < -0.4664$

Reject the Null Hypothesis

Sample provides evidence to reject the claim

Hypothesis Test for the Mean Difference : Matched Pairs

Claim:

1) Pop. Mean Of Difference = 0

Significance, α: 0.05

Time Managment		
9	17	20
10	19	30
11	29	34
12	13	15
13	24	29
14	26	26
15	17	12
16	38	35
17	39	39
18	22	27
19	20	24
20		

Clear | Copy | Paste

Evaluate | Help | Plot

Claim	$\mu_d = 0$
Null Hypothesis	$\mu_d = 0$
Sample Size, n	19
Difference Mean, $\bar{x}_d$	-4.000
Difference St Dev, s_d	4.749
Test Statistic, t	-3.6712
Critical t	±2.1009
P-Value	0.0017

95% Confidence Interval:

$-6.289 < \mu_d < -1.711$

Reject the Null Hypothesis

Sample provides evidence to reject the claim

Hypothesis Test for the Mean Difference : Matched Pairs

Claim:

1) Pop. Mean Of Difference = 0

Significance, α: 0.05

	Concentration	
9	25	26
10	29	34
11	29	34
12	17	18
13	22	25
14	35	29
15	12	18
16	28	39
17	28	37
18	31	31
19	29	32
20		

Clear | Copy | Paste

Evaluate | Help | Plot

Claim	$\mu_d = 0$
Null Hypothesis	$\mu_d = 0$
Sample Size, n	19
Difference Mean, $\bar{x}_d$	-3.632
Difference St Dev, s_d	4.400
Test Statistic, t	-3.5980
Critical t	±2.1009
P-Value	0.0021

95% Confidence Interval:

$-5.752 < \mu_d < -1.511$

Reject the Null Hypothesis

Sample provides evidence to reject the claim

Hypothesis Test for the Mean Difference : Matched Pairs

Claim:

1) Pop. Mean Of Difference = 0

Significance, α: 0.05

Study Aids

9	25	23
10	21	31
11	34	34
12	14	16
13	28	29
14	31	22
15	22	26
16	39	40
17	33	34
18	26	32
19	31	28
20		

Clear | Copy | Paste

Evaluate | Help | Plot

Claim	$\mu_d = 0$
Null Hypothesis	$\mu_d = 0$
Sample Size, n	19
Difference Mean, $\bar{x}_d$	-1.474
Difference St Dev, s_d	5.358
Test Statistic, t	-1.1989
Critical t	±2.1009
P-Value	0.2461

95% Confidence Interval:

$-4.056 < \mu_d < 1.109$

Fail to Reject the Null Hypothesis

Sample does not provide enough evidence to reject the claim

Hypothesis Test for the Mean Difference : Matched Pairs

Claim:

1) Pop. Mean Of Difference = 0

Significance, α: 0.05

Self-testing

9	22	23
10	24	28
11	30	40
12	10	17
13	27	32
14	31	24
15	18	21
16	30	40
17	22	25
18	25	30
19	18	19
20		

Clear | Copy | Paste

Evaluate | Help | Plot

Claim	$\mu_d = 0$
Null Hypothesis	$\mu_d = 0$
Sample Size, n	19
Difference Mean, $\bar{x}_d$	-3.526
Difference St Dev, s_d	5.146
Test Statistic, t	-2.9867
Critical t	±2.1009
P-Value	0.0079

95% Confidence Interval:

$-6.007 < \mu_d < -1.046$

Reject the Null Hypothesis

Sample provides evidence to reject the claim