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The Impact of Matrix Notes on Textbook Comprehension in a College-level Introductory Psychology Course

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Abstract

This paper examines whether matrix notes, a graphic form of note taking, helped lower ability students in a college level introduction to psychology course develop self-regulation and deep processing skills that would increase exam scores. Throughout the semester, students were surveyed and 16 were interviewed about study habits and perceptions of matrix notes. Exam scores and class averages were also considered. The study supported the hypothesis that students would develop deeper processing skills and earn higher exam scores. While the data shows that students grew in self-regulation ability, it is not clear if they did so as a result of matrix notes or of other interventions.

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Chapter 1: Overview of matrix notes study

Purpose of Study

The purpose of this project was to determine if matrix notes, a graphic form of note taking that visually represents relationships between terms and concepts, would reduce the numbers of students who were not successful in two sections of a first year psychology class at a community and technical college. The matrix notes in this case were designed to be used to help students take notes on their texts. Both psychology courses were taught by the same instructor, who re-worked her traditional study guides into the matrix notes format.

Hypothesis

The hypothesis is matrix notes will increase textbook feature awareness in unsuccessful students, and help students develop the self-regulation, self-monitoring and questioning skills that will lead to deeper, more meaningful processing. This deeper processing will make it more likely that struggling students will successfully complete test items that require them to apply concepts to a novel situation, synthesize information and compare and contrast concepts. In order to test the hypothesis, student participants completed three surveys, some were interviewed face-to-face, and individual exams scores were examined in the context of exam averages.

Significance of Study

This particular study is significant because it addresses a specific concern at the institution where the study occurred as well as contributes to the findings about the impact of

notes and note taking styles on college students. According to Kuehn, (2012) the grade earned by a student on the first exam in a class is highly predictive of the grade earned in the course. In other words, a student who earns a D on the first test is likely to earn a D as a course grade, while a student who earns an A on the first test is likely to earn an A as a course grade. In the case of Central Lakes College, where the current research was conducted, a 2012 study indicated that there are five liberal arts classes that students with poor reading skills were likely to fail. As an institution, Central Lakes was looking for ways to make it more likely that lower-skilled students will persist and complete their course of study. One suggestion was that the college explore new ways to help students develop reading comprehension skills (Kuehn 2012). If instructor-generated matrix notes significantly and positively impacted student success in psychology, they could be adapted for use in other reading-intensive classes.

In addition to providing Central Lakes College with specific information that may help students persist and complete a degree, this study also adds to research on note-taking and comprehension. For example, all but one study created an artificial note-taking scenario for students and studied their responses. In most cases, students were asked to volunteer for a study in which they were pulled out of class and given an isolated text to read and take notes on. Students completed the reading, took notes and often completed a test, but the significant aspect of these studies is that the materials used in the studies were not related to actual course content. The current study focused on note taking students did specifically for the purpose of doing well in their psychology course. It was assumed student motivation would be higher because students know they can use the notes they took to study for a test that would count toward their course grade. Secondly, only two studies accounted for student growth over a semester. Most studies pulled students into a testing situation and evaluated their note-taking skills once. This study examined student progress throughout the entire semester and asked

students to reflect at the end of the semester about what they learned about note taking and how they would apply what they learned to other courses.

The study also contributes to the research on effective note taking on texts. While there is a great deal of research on note taking on lectures, the literature on note taking from texts is more limited. Summaries, partial or guided notes, and matrix notes are the most researched forms of note taking. While the studies on summaries largely focused on processing written text, most of the studies on partial/guided notes and matrix notes focused on helping students better comprehend lectures. The general consensus of most of the studies is lecture note taking provides is more challenging for students than taking textbook notes because lectures are so transient. While this is no doubt true, the fact remains that students, particularly those that struggle, often need guidance in reading texts. They struggle to select main ideas, are oblivious to textbook features and fail to see how chapters are organized. They may not notice the relationships between superordinate and subordinate ideas, and may not have a reasonable plan for preparing for exams. Having a structured system for text note taking might very well provide students with an effective tool to use to make sense of written text.

Finally, this study brings something new to the discussion of multiple-choice exams. Most studies simply divide multiple choice questions into two categories—explicit and implicit (inference). All researchers agree that studying for a test consisting of explicit questions requires a different skill-set than studying for implicit questions, and that the note taking style students select impacts their ability to successfully complete the more complicated implicit questions. However, this study breaks multiple choice questions into four categories. If students are going to successfully complete each of the four kinds of questions on an exam, they need to a) be directly instructed about each question type and b) be directly instructed in how to use notes to successfully prepare for each type of question.

Definitions.

There are seven terms relevant to this study. They are matrix notes, explicit questions, application questions, summary questions, compare contrast questions, discussion groups and three-step study plan.

Matrix Notes

Matrix notes can be set up in many ways based on the skill-level of the students and the goals of the instructor. For this study, matrix notes consisted of a three-column table or grid on 8.5 X 11" paper set to "landscape layout." A set of matrix notes corresponded with each of the 12 chapters students needed to read for the psychology class. The header identified the chapter to which those particular matrix notes referred. The first column simply identified chapter headings. The middle column listed terms significant for students to know and understand, and provided space for them to write definitions. The last column asked students to answer questions about the terms. For example, students may be asked, "If X happens, how will it affect Y?" or "Why is A an important part of B?"

Test questions

The second set of terms relate to the types of questions students might encounter of their exams. For the purposes of this study, there are four types of multiple choice questions. They are:

Explicit questions: These questions require students to simply identify a verbatim definition from the four provided options. A question is considered explicit if the test item and the textbook have at least three words in common that appear in the same order. For example,

Confirmation bias is

A) A belief that bias exists in many studies that prevents them from being confirmed

B) A tendency to belief theories that have been confirmed by empirical data

C) A tendency to accept replicated studies by no accept studies that have not been replicated

D) **A tendency to look for evidence that supports our theory and ignore evidence that contradicts it.**

To answer this question, a student must have a working familiarity with the definition as it is laid out in the text of the book, "the **tendency to look for** and accept **evidence that supports our** pet **theories** and assumptions **and** to **ignore** or reject **evidence that contradicts** our beliefs." (Wade & Tavris, 2011). The correct answer is essentially taken verbatim from the book.

Application Questions: These questions require students to read a brief scenario and select the concept or term that scenario exemplifies. For example:

Janie has found that the number of hours she sleeps each night is related to the scores she receives on quizzes the next day. As her sleep approaches eight hours, her scores improve; as her sleep drops to five hours, her quiz scores show a similar decline. Janie realizes that:

A) There is a positive correlation between the number of hours she sleeps and her quiz grades.

B) Her low quiz scores are caused by sleep deprivation the night before a quiz.

C) Worrying about low quiz scores causes her to have insomnia before a quiz.

D) She should sleep about 10 hours a night to ensure a 100 percent quiz grade.

Summary Questions*:* These questions require students to utilize at least two separate parts of the chapter or chapter section in order to select the correct answer, or they require

students to draw a conclusion about or interpret facts from a section of the text book. Some summary questions require students to do both. For example:

Phrenology is:

A) A theory of mind based on empirical evidence.

B) A theory of mind based on anecdotes and individual case studies

C) Based on the writings of John Locke

D) A pseudoscience relating **bumps** on the head to **personality traits**

The question appears to be an explicit question, but in order to answer it correctly a student needs to combine the bolded definition in the margin: "the now discredited theory that different brain areas account for specific character and **personality traits**, which can be 'read' from **bumps** on the skull," with the description provided in the text, "Phrenologists argued that different brain areas accounted for specific character and **personality traits**, such as 'stinginess' and 'religiosity." Moreover, they said, such traits could be 'read' from **bumps** on the skull" (Wade & Tavris, 2011) Finally, in the last paragraph of the section, phrenology is called a "pseudoscience." If a student did not connect the concept of "pseudo science" with the concept of "phrenology" he or she might not identify the correct answer.

Compare/contrast Questions: These questions may not ask students directly to compare two concepts or terms, but they do necessitate that students differentiate between closely related terms. In order to answer the questions accurately, students must compare and contrast the terms or concepts and fully understand the differences between them. For example:

Which modern psychological perspective emphasizes what goes on in people's heads?

A) Learning

B) Cognitive

C) Sociocultural

D) Behavioral

Since all of the potential answers are modern psychological perspectives, students need to know the similarities and differences between them in order to successfully answer the question.

Discussion groups

Discussion groups were outside-class study help sessions students could attend in the tutoring center. In spring 2013, when the data for this study was collected, the discussion groups helped 113 students, and some instructors required their struggling students to attend. At the discussion groups, a reading instructor and a student tutor helped students develop study plans, trouble shoot what had gone wrong on an exams, develop note taking techniques and evaluate their understanding of course materials.

Three Step Study Plan

The three step study plan was a method of reading and note taking that was explicitly taught to students. It involved helping students select an appropriate strategy for pre-reading, reading and post-reading. Students learned about the three-step study plan if they attended discussion groups, or visited a tutor who had been trained to use it. Reading faculty also made classroom visits to reading-intensive classes and presented the plan there.

Delimitations, Limitations and Assumptions

One limitation in this study was that the researcher was not given copies of exams during the semester because she also conducted discussion groups and did not want to inadvertently "steer" students who attended to the correct answers. Because she did not have access to exams, it was challenging to predict how well the matrix notes prepared students for the exact tasks they needed to do on exams.

Another limitation was that students were not provided with explicit instructions in class or on-line about how to use matrix notes, nor were the notes collected and graded as assignments. As a result, it was difficult to determine how many students filled them out, how completely they filled them out and of what quality their notes were.

The final and biggest limitation was that many psychology students also participated in the discussion groups. There, they may have worked on matrix notes with tutors or peers, or received specific instruction about how to use them. They were also explicitly taught study strategies. Therefore, it is difficult to determine if any study changes students made happened as a result of being exposed to the matrix notes, or it they happened because students participated in the discussion groups. The discussion groups targeted below C- average students, which was the very population the matrix notes were designed to help. This made it even more challenging to determine whether and how matrix notes impacted student study behaviors.

Chapter 2: Literature Review

Most students would likely agree that note taking in college is more challenging than note taking in high school, yet there seems to be little support for students who enter college with poor note taking skills. Notes reflect student understanding of text as well as their ability to make sense of that text. This chapter contains a review of literature that discusses the value of note taking and note review, the differences in cognitive demands between note taking in lecture and note taking on text, the differences in self-regulation between high and low achieving students. Finally, this review contains information about the history and effectiveness of summaries, partial notes and matrix notes, which are the most studied forms of note taking.

Self-Regulating Ability and Note taking in College Students

Note taking and its relationship to college success has been studied for decades. Palmatier and Bennett (1974) conducted a study of college students during which they learned that nearly all students, regardless of their GPA took lecture notes, while almost three-quarters of students took notes while they read textbooks. Note taking was important for college learners because it served two basic functions—it allowed students to encode the material they heard or read, and it acted as a way for students to "store" information for later use (DiVesta & Gray, 1972). Encoding was a more sophisticated process that required students to evaluate information as they received it and connect it to other information they already possessed (DiVesta & Gray, 1972). Kiewra, DuBois, Christian, McShane, Meyerhoffer and Roselky (1991) built on the research of DiVesta and Gray by further exploring the ideas of encoding and external storage. They concluded that a clear line cannot be drawn between encoding and

external storage since the product—a complete set of notes—required students to simultaneously encode and store. The findings of Barnett, DiVesta and Rogozinski (1981) supported the idea that important encoding happened during the act of note taking itself. Taking notes increased a student's ability to remember lectures, even if he or she was not allowed to review the notes at a later time. They concluded that important encoding happened while a student was in the process of taking notes, and that a secondary function of note taking was storage. Barnett et al (1981) conducted a study that examined encoding and storage from a different perspective by developing test questions based on notes students had taken. Students returned a week after they had taken the notes to sit for a test based on their own notes. Students more accurately answered questions that reflected the information from notes they had taken themselves, leading to the conclusion that students performed better when test items closely resembled the information in notes because they "stored and encoded" information they put in their notes. Students who took notes, as a general rule, performed better on exams (Peverly, Brobst, Graham & Shaw, 2003), and they were better able than non-note takers to answer more challenging test questions. Students who did not take notes answered fact recall questions with about the same level of accuracy as students who did take notes. Note takers, however, were better able to answer test questions that asked them to use information in a way that was notably different than how it was presented in the original text (Peper & Mayer, 1978; Peverly & Sumowski, 2012). Even though research indicated that simply taking notes increased comprehension, studies showed that students who took notes and reviewed them gained more benefit (Kiewra et al, 1991; DiVesta & Gray, 1972).

Most researchers concluded that taking and reviewing notes improved test performance (Kobayashi, 2005). Kiewra et al (1991) reviewed 32 studies that examined the effects note

review has on student exam performance. While some of the studies indicated that reviewing notes did not improve grades, the majority concluded that taking and reviewing notes improved student performance, and none of the studies indicated that note review was detrimental to student success. Much of the literature agreed that note taking is a significant part of student success because it provided opportunities for students to process information at the time they heard or read it, and then provided them with a valuable review function.

Differences between Taking Lecture Notes and Text Notes

Note taking on lectures and note taking on texts have generally been perceived as different processes for students. Because lecture note taking required students to engage in two processes simultaneously without opportunities to stop for review or to "catch up," it was generally agreed that note taking on lectures was more difficult for most students. Therefore, the bulk of research on note taking has been directed toward note taking in response to lectures. Kiewra (1991) wrote that taking notes on a textbook and taking notes on a lecture required different cognitive abilities from students. Producing lecture notes required a student to listen and write at the same time, while note taking on texts required students to read, then stop reading to take notes (Kiewra, 1991). However, recent research challenged Kierwa's belief that the process of note taking was fundamentally different between the two contexts. Peverly and Sumowski (2011) built on Peper and Mayer's description of the cognitive demands of note taking process by describing the similarities between lecture note taking and note taking on a text. In both cases, students processed the information coming at them, held it in working memory long enough to determine which information was worth recording, evaluated how the new information related to what they already know, and decided how to write it down. At the same time they continued to pay attention to the lecture or the reading. Whether students

were listening or reading, they needed to actively work with information while it was presented to them—either in written or oral form (Davis & Hult, 1997). Some college students entering their first-year classes did not have the ability to process information, either from lectures or texts, in such a way that it lead to comprehension, or, their notes may have been so incomplete that reviewing them did them little good (Baker & Lombardi, 1985; Katayama and Robinson, 2000). The fundamental difference between taking notes on lectures and taking notes on texts was that lectures move quickly and students cannot return to them for review the way they can a text book. In spite of this difference, the two note taking contexts shared many similarities in terms of the cognitive demands they placed on students.

Differences in high and low achieving students

Note taking differences in high and low achieving students

Research has demonstrated that high achieving students study differently than lower achieving students. Palmatier and Bennett (1974) surveyed 223 students about their study habits and learned that nearly three-quarters of students who had GPA's between 2.0 and 4.0 in college took notes while they read, but the quality of those notes varied widely between A students and C students. Baker and Lombardi (1985) concluded that students received little or no instruction in how to take notes, and as a result struggling students missed as many as half of the main ideas from lecture. Peper and Meyer (1978) determined that high-ability students had such well-established study and note taking systems that even when they were denied the ability to take and review notes after listening to a lecture, they performed as well on the exam as high ability students who had been allowed to take notes. However, when struggling students were allowed to take and review notes, they outperformed the low-ability students

who were denied the ability to do so. Peper and Meyer (1978) concluded that struggling students can benefit from taking and reviewing notes.

Stronger readers also were more likely to notice and use textbook features while struggling readers ignored them. Doctorow, Wittrock and Marks (1978) concluded that higher ability readers were more likely than low ability readers to use headings to maximize comprehension. Winograd (1984) conducted a study in which he asked high and low ability eighth- grade students to read a passage and select sentences from it they felt were important. Next, he asked them to write summaries of the passage. Low ability readers were less likely to use the sentences they identified as important in their summaries. He concluded that poor readers tended to include information they found personally interesting in their summaries, while stronger readers used text structure to write summaries that reflected the goals of the writer.

Differences in study activities and awareness

Students who struggled to take effective notes at the college level may have struggled to self-regulate (i.e. the were unable to make good decisions about how to study, monitor their own understanding and alter their approach if they did not understand) or they may have lacked knowledge of how to structure and organize notes in such a way that they were able to reflect main ideas and supporting details. Differences in study choices revealed differences in students' self-regulation ability (Ruban & Reis, 2006; Zimmerman & Martinez-Pons, 1986; Risemberg & Zimmerman, 1992). Effective readers tended to use strategies that revealed they are "deeply processing" a text. High achieving students re-wrote notes to demonstrate relationships between ideas, and used imagery as a way to remember important ideas or concepts. Lower achieving students focused on review activities that relied on rote memorization, or were passive in nature—such as highlighting or reviewing notes (Ruban & Reis, 2006; Zimmerman &

Pons, 1986; Barnett 2000). Zimmerman and Martinez-Pons (1986) conducted a study in which they interviewed high school students who were low and high achieving in order to determine if it was possible to identify students as high or low achieving based solely on their descriptions of how they study. They concluded that that it was possible to predict with great accuracy if students were high or low achieving based on their own descriptions of how they study. Ley and Young (1998) replicated the Zimmerman-Martinez-Pons experiment, but used first year college students from a university and a community college. They drew the same conclusion—it was possible to determine with great accuracy whether college students were high or low achieving based on their answers to questions about how they study. Higher achieving students reported using more strategies than did their lower achieving classmates. Higher achieving students also reported using strategies with greater consistency. (Zimmerman &Martinez-Pons, 1986; Ley & Young, 1998; Paris, Wixson and Lipson, 1983). One significant difference between the high school students and the college students was that, among college students, students who self-regulated the most reported engaging in many self-evaluation activities, but among high-school students, students who engaged in a great deal of self-evaluation tended to self-regulate less (Ley & Young, 1998).

In addition to have different study habits and awareness, the content and structure of student notes is different between high and low ability students. College students who selected a note taking style that reflected how information in a text related did better on exams (Peverly, Brobst Graham & Shaw, 2003). If student notes demonstrated that students were connecting ideas, terms and concepts, their ability to take exams involving inference questions improves. Peverly, Brobst, Graham and Shaw (2003) conducted a study in which they asked 88 college students to read a brief history text. Half of the students were encouraged to take notes while the other half was forbidden to do so. Then, students were asked to write a summary of the

text and take a multiple-choice test consisting of both implicit and explicit multiple choice items. The study showed that students who took notes consistently outperformed those who did not, but another significant finding was that students whose notes clearly revealed how terms, concepts and ideas related to one another (i.e. a particular event caused something else to happen, or this term is different from another one for the following reason) earned higher test scores. It was possible that students whose notes showed more relationships did better on the exams because they remembered more information and because articulating relationships acted as effective training for answering implicit questions on the text.

It has long been known that struggling students have a hard time selecting and using appropriate strategies for reading new material, and, even when it became clear that their choices were not serving them well (i.e. they consistently earn F's on exams) they could not (or would not) re-evaluate their approach and study differently (Barnet,t 2000). They lacked the ability to self-regulate. Students who self-regulated were able to examine text, use their observations to set reading goals, and decide which strategies are most likely to help them achieve those goals. As they read, they also evaluated whether or not they understood the text (Risemberg & Zimmerman, 1992; Zimmerman Martinez-& Pons, 1986; Fountas & Pinnell, 2006; Dreher & Guthrie, 1990; Paris, Lipson & Wixon, 1983). According to Fountas and Pinnell, (2006) good readers read in three stages—in the first stage, they determined what the text says explicitly. During the second stage, they noticed how what they were reading is like or unlike other texts they have read, or how the information they were learning dovetails with their experiences of how the world works. Finally, effective readers noticed how the text was structured and used this knowledge to make sure they understood it. Dreher and Guthrie (1990) examined the study behaviors of high and low ability high school students and Paris, Lipson and Wixon (1983) studied elementary school children. No matter the age level, higher

ability students were better able to utilize textbook structure to answer questions, and they spent more time at the beginning of a reading task setting goals and establishing purpose than did lower achieving students. Lower achieving elementary students were likely to simply miss text cues, or continue reading even after it became clear they did not comprehend the text (Paris, Lipson & Wixon, 1983).

Evidence suggested that struggling students not only had difficulty reading effectively, but they did not understand what self-regulation was, and lacked enough self or study awareness to make changes. When interviewed about their study and note taking techniques, struggling students were more likely to describe their study habits using vague statements that described how they felt about studying (i.e. "I work hard") as opposed to describing the actual activities they engaged in when they studied (Zimmerman & Martinez-Pons, 1986). Struggling students also did not know how to use their notes or the text to make strong educated guesses about test content, so they did not effectively prepare for exams. Klopfleisch (2102) wrote that effective college readers not only made accurate educated guesses about which terms, concepts and topics will be on an exam, but they also predicted whether they would be asked implicit or explicit questions.

Student ability to alter study activities based on exam knowledge

A great deal of research suggested that, even when students were expressly told how they would be tested, they did not alter their preparation strategies unless they had high levels of prior knowledge. Balch (2007) conducted a study in which he provided college students with terms and told half of them they would be given a multiple choice test over the terms and the other half that they would be given a short-answer exam. In reality, all students were given a multiple-choice test in which they had to answer one definition question and one example question per term. He hypothesized that the students who expected a short-answer exam

would out-perform those expecting a multiple choice test because they would employ more comprehensive strategies than those expecting a multiple-choice test. However, the students expecting the multiple choice test out-performed the short answer group on the definition questions, but both groups performed equally well on the example questions. He concluded that students did not make significantly different choices about studying, regardless of having been told how they would be tested.

Braten and Samuelstuen (2004) conducted a similar study, but they also explored whether students with more prior-knowledge would make different choices than those with little prior-knowledge. Like Balch, they wanted to determine if students would use different study strategies based on their expectations of what learning task (test, summary or discussion) they needed to complete. They provided 269 Norwegian 10th grade students with a short social studies reading, divided the students into three groups and told one group they would be given a multiple-choice test, the second that they would have to write a summary in their own words while the last group was told to prepare for a peer discussion. Before they read, students were asked to complete a prior knowledge inventory. Braten and Samulestuen found that students selected strategies based *both* on their expectations and their prior knowledge. According to their results, students with low topic knowledge who expected an exam relied most heavily on memorization and elaboration (looking for relationships within the text, between their text and other sources like lectures and to their real lives.) Students with higher prior knowledge were more likely to organize and re-organize information in the reading based on relationships between concepts. High prior-knowledge students also developed their own graphic organizers or re-wrote portions of the text in their own words. Braten and Samulestuen's findings were important because they corresponded with those of other researchers in several ways. First, their findings also suggested that struggling students relied on lower level strategies when they

prepared for exams (Ruban and Reis, 2006). Second, they showed that even when students were explicitly told to expect a certain type of test (i.e. short answer vs multiple choice) they did not alter how they prepared (Balch, 2007). Finally, their research provided more evidence that students with prior knowledge were more likely to perform well on exams (Peverly et al, 2003).

Lower-ability students, however, did benefit from specific training in how to take notes. Roberts and Dansreau (2008) trained half of a group of student volunteers how to use concepts maps and the other half how to use summaries. They also measured each student's verbal ability. They concluded that students with low verbal ability found that concept maps helped them see more personal relevance in their readings (2008). Similarly, Kobayashi (2005, 2006) read and analyzed 57 studies written since the 1930's about barriers students face in encoding notes, and another 33 studies that examine the importance of taking and reviewing notes as well as the success of note taking interventions. He concluded that students not only utilized a number of different note taking strategies but that they benefitted from training. DiVesta and Gray (1972) determined that, if students were placed in a situation where they were encouraged to take notes and review them, they would remember more main ideas. Students benefitted not only from learning note taking strategies, but by evaluating them. Paris, Lipson and Wixon (1983) found that elementary children who were encouraged to discuss why a particular note taking strategy was useful and when it should be used outscored children who had not been allowed to participate in the discussions. These findings showed that lower ability students, if they were provided with training in how to take notes, taught how to use those notes as a review tool and were encouraged to use discussion to evaluate study techniques, could become more successful.

Effectiveness of Different Kinds of Notes on Text Comprehension

It is significant to note that a great deal of research on note taking and college students was conducted in the late 1960's through the mid- 1980's, and more current studies are adding to that knowledge. The literature covers approximately four decades of research, but there are common questions that researchers sought to answer—1) Is it possible that struggling students can develop self-regulation behaviors if they are provided instructor generated notes that will make text structure and reading goals more clear ? 2) Is there a particular note taking format that consistently leads to higher comprehension and, consequently, grades?

Additionally, the bulk of the research conducted on college students and note taking focuses on note taking in the context of lectures, as opposed to note taking on texts, which is the focus of this research. However, the basic principles of note taking remain the same whether the student takes them during a lecture or while reading a textbook (Peverly & Sumowski, 2011). Therefore, for the purposes of this study, research on both lectures and texts will be referenced.

Since research has shown that students who take effective notes performed better on exams, it seems reasonable to determine what skills and factors contributed to successful note taking. According to Kobayashi, (2007) students tended to take notes of some kind over text when given the opportunity to do so. These notes included marking important passages with pens or highlighters, writing comments designed to evaluate the writer's argument, or drawing connections between the writer and another source. Kobayashi's findings made it possible to draw the conclusion that students, whether high or low-achieving, believe in the value of note taking. Simply because students perceived the value of note taking does not mean they were up to its cognitive demands. In fact, a great deal of research has shown that students are not (Katayama & Robinson, 2000; Robinson, Odom, Hsieth, Vanderveen & Katayama, 2006,

Stefanou, Hoffman & Vielee, 2008). Note taking has been described as a complex process that involves deciding what is important enough to write down and remembering it long enough to decide how to record it (Peverly & Sumowski, 2011, Kiewra et al, 1991) High achieving students, however, possessed skills and abilities that enabled them to be better at it than lower-achieving peers. One such skill is "transcription fluency," the ability to write quickly and accurately (Peverly and Sumowski ,2011) Because high achieving students recognized and spelled words without expending tremendous energy, students with high transcription fluency captured written or spoken information more quickly. Therefore, they were able to "absorb" more ideas than students who processed words more slowly. Because students with high transcription fluency did not need to devote cognitive resources to spelling or word recognition, they spent more of their energy on comprehension. Students who were proficient at the lower level skill of writing quickly and the higher-level skill of language comprehension produced the best notes (Peverly, Vekaria, Reddington, Sumowski, Johnson & Ramsey, 2013) One way to help struggling learners catch up to their more successful peers is to provide them with note taking structures that minimize their lack of transcription fluency by reducing the amount of writing they need to do, and directing their attention to particular aspects of text or lectures. Reducing the amount of writing a student is required to do reduces the cognitive demands placed on them. There are three basic note taking styles that have been researched partly because they reduce the cognitive demands on students or provide them with a structure that allows them to narrow in on a text or lecture's central ideas. Those note taking styles are summarizing, graphic organizers/ partial notes and matrix notes.

Summaries

When students have summarized what they read, they have engaged in a process similar to the one they use to listen to lectures or take notes on texts. According to Hidi and

Anderson (1986) students first must understand the text, decide what about it is important enough to write down, and then they must abbreviate or shorten the text in some way. Winograd's (1984) views differed slightly from those of Hidi and Anderson because he believed that the act of summarizing is cognitively different than the act of comprehending a text or a lecture. According to Winograd, a student who struggled to write an effective summary may not have a comprehension problem, but a problem with how to reduce a passage to its central ideas. Struggling readers, however, faced essentially the same challenges when they wrote summaries as they did when they read. Longer, more complex expository text was more challenging for them to summarize, and they found it difficult to determine which ideas were important enough to include (Hidi & Anderson,1986).

Some studies have shown that simply asking struggling readers to summarize increased comprehension. When struggling readers were instructed to use text features such as headings to help them write one-sentence summaries after each paragraph, they comprehended more text than students who were simply told to use text headings (Doctorow, Wittrock & Marks, 1978). However, other studies have shown that just including summaries as a course requirement did not increase comprehension. Winograd's (1984) findings suggested that students who struggle have fundamentally different perceptions of the task of summarizing than effective readers did. Nearly all of the students who participated in his study, whether they were poor readers or strong ones, understood that the purpose of a summary was to identify the most important ideas from reading. Struggling readers had a different set of criteria for deciding what was worthy of inclusion in the summary than their more accomplished classmates. Winograd (1984) suggested that struggling readers may need teacher or instructor help in developing a new set of criteria for selecting important ideas. Brown and Day's (1983) study complemented this finding. They examined how students from the fifth grade up to

graduate school made decisions when they summarized. They concluded that older students, who have more practice with summaries, do a better job of combining complex ideas into one paragraph, eliminating irrelevant information and creating, if there isn't one, an appropriate topic sentence. Furthermore, graduate students, when asked to think aloud during the act of summarizing, were articulate about their choices. This study suggested that Winograd's (1984) assessment is true; summary skills develop as students were given opportunities to practice. While some studies suggested that simply requiring students to summarize increased comprehension, most studies suggested that students used summaries more effectively if they were given specific instruction in how to write and use them, and many opportunities to practice writing summaries.

The obvious value of summary writing was to help students identify main ideas, but studies have also shown that the act of writing them helped students remember text even days later, which was important for students who were studying for exams. Davis and Hult (1997) conducted a study in which they broke students into three groups. One group took notes over a taped lecture in whatever way they wished. The second group took notes over the lecture, but every four minutes they were asked to stop and write a summary over what they remembered from the previous four minutes. The final group was asked to listen to the entire lecture and then write a summary. Twelve days later students were tested again to see how much they recalled from the lecture. The students who were asked to write a summary after hearing the lecture in its entirety remembered the most on the posttest. Davis and Hult (1997) attributed the success of this group to the fact that they told students ahead of time they would have to write a summary after the lecture, which they believed may have led students to work harder to generate higher quality notes. To some extent, Davis and Hult's findings contradicted those of other studies that suggested students either would not or could not adapt their studying even

when they were made aware of how they would tested over it (Ruban and Reis 2006, Balch 2006). However, they supported the findings of Kobayashi (2007) who conducted a study in which he asked one group of undergraduate students to read an article and write a summary and a second group of students to read the article and prepare a written evaluation of the writer's argument. Students who were told to prepare an evaluation not only took more notes, but wrote more comments evaluating argument. They adapted their notetaking strategies based on what they needed to do once they finished the reading. One significant point to consider when reviewing these studies is that Kobayashi did not separate high and low achieving students.

Holt and Davis's study focused on lectures, but other studies focused on the value of writing summaries to understand textbooks. In another study involving comprehending textbooks a writing across the curriculum director and a psychology instructor collaborated on a project in which they taught students in an introductory psychology class to summarize portions of the textbook. Students worked together to compare and edit their summaries while the psychology instructor monitored the work to make sure all groups included the major points. After the semester was over, the instructor evaluated overall exam averages of the class that had learned to use summaries vs. the exam averages of the class that had not. Exam one test scores were equivalent, but by the third exam, the summary group's average score was 8% higher (Radamacher & Latosi-Sawin, 1995). One important aspect of the Radamacher/Latois-Sawin study is that students worked together to generate and evaluate summaries, which suggests that higher ability students may have worked with lower ability students throughout the semester. The findings of this study complemented the finding of Wingrod (1984), which indicated that struggling students need guidance and feedback if they are to become better summarizers. The Radamacher/Latois-Sawin study also complemented the finding of Paris,

Lipson and Wixson (1983) who suggested that students improved their classroom performance if they were given opportunities to discuss strategies. Hidi and Anderson's (1986) perception of the value of summary writing was different from Radamacher & Latosi-Sawin's because they argued that summary writing was most useful when students did not write for an audience, but rather for personal understanding. They indicated that students who learned to write summaries for themselves have acquired a life skill that will serve them as students and in the workplace, and they suggested that learning to write summaries for personal use acts a bridge to creating summaries for others to read.

Studies have shown summarizing is a complex skill since it, like any form of note taking required students to actively make decisions about what to include and how to write it. In spite of its difficulty, most studies concluded that students who wrote summaries of lectures or reading comprehended more if they were provided with opportunities to practice writing them, and if they were provided with guidance as they made decisions about what to include in summaries.

Partial Notes and Graphic Organizers

Two other note taking styles that have been studied are partial notes, (sometimes called guided notes) and graphic organizers. Partial notes and graphic organizers can be structured in many ways, but they may contain sentences with important words left out that students can fill in as they listen to a lecture or read a text (e.g. Neef, McCord, Ferreri, 2006; Barbetta and Skaruppa, 1995), they may present notes in a "concept map" format and allow students to complete a percentage of the "bubbles" (e.g. Roberts & Dansreau, 2008), or they may arrange information in a grid-like manner and ask students to fill in definitions or examples (i.e. Katayama and Robinson, 2000). Only one study explored how partial notes or graphic organizers impact how well students read. The remaining studies examined how these note

taking systems could be used in class rooms during lectures. The majority of the studies focused on how partial notes or graphic organizers improved note accuracy and increased student participation during class. (i.e. Barbetta & Skaruppa, 1995; Austin, Lee, Thibault, Carr & Baily, 2002).

Instructor generated Graphic organizers and/or partial notes could be effective because they provided students who struggle with a method for taking and reviewing notes (Kobayasihi, 2006; Barbetta and Skaruppa, 1995), and they prevented them from having to devote cognitive resources to determining the main idea of a lecture or a text. This freed them up to spend their energy comprehending and making connections (Kiewra, 1991). Roberts and Dansreau (2008) concluded that graphic organizers might help students with low verbal ability successfully follow lectures and take notes. Indirectly, Roberts and Dansreau's findings related to those of Peverly and colleagues who determined that students who were unable to write quickly and accurately took poor quality notes because they were unable to "keep up" with lectures (Peverly, et al. 2013). Partial notes would have given such students a "running start" that might have enabled them to catch up.

The visual nature of some kinds of partial notes and graphic organizers made the relationships between ideas more obvious, and that understanding of relationships allowed students to more successfully answer test questions that require synthesis and inference (Kiwera et al, 1988; Robinson, Odom, Hsieh, Vanderbeen, Katayama, 2006). Students who took notes with graphic organizers indicated that they felt more connected to the material they read (Roberts & Dansreau, 2008). Evidence showed that student performance on simple fact-based questions was the same regardless of whether they had studied using outlines or graphic organizers, but that students who used graphic organizers performed better on questions that required application or analysis. In other words, guided notes seemed to help students process

more complicated concepts and apply them to novel test items (Katayama & Robinson, 2000; Katayama & Crooks, 2003; Neef, McCord, & Ferreri, 2006). When students had access to a visual representation of written text, they stored that information in two ways, and may be better able to remember it since they have generated more "pathways" to that information (Robinson, Robinson & Katayama, 1999).

Robinson et al (1999) conducted a study in which they divided students into two groups. The first group received a graphic organizer covering information from an educational psychology course, but the graphic organizer was completely filled out by the experimenters. The second group received the same graphic organizer, but with about 25% of the information missing. The students who received partial notes outperformed the complete notes group on quizzes and tests, leading to the conclusion that graphic organizers might have helped students develop deeper processing skills, such as noticing how the text they are reading fits into the course as a whole (Robinson et al, 2006). Katayama and Robinson (2000) also studied whether students would perform better on exams if they were provided partially completed graphic organizers, completely filled out graphic organizers or skeletal ones. Students who received the partial notes outperformed the other two groups. Once again, this finding complemented other research that suggested students who received complete notes didn't encode because they didn't have an opportunity to search through text looking for answers, and that students who received skeletal graphic organizers were presented with a task that was too difficult. (Katayama & Robinson, 2000; Robinson, Odom, Hsieth, Vanderveen & Katayama, 2006). Partial notes may also have helped students notice how texts are structured, since they made the relationship between subordinate and superordinate concepts clear, and students may have used this information to deepen processing (Katayama & Crooks, 2003).

Partial notes may also have helped students retain concepts in long-term memory. Katayama and Crooks (2003) allowed graduate students to study from either partial or complete notes and then removed them. One week later, students were given a test over the information. Students who studied from partial notes retained more information and answered more questions correctly than the students who studied from complete notes.

The question of what percentage of a graphic organizer should be filled out to facilitate the most understanding is a matter of some debate. The researchers provided between 50% to 75% of the information and left students to complete the rest. (Katayama & Robinson, 2000; Katayama & Crooks, 2003; Robinson, Odom, Hsieth, Vanderveen & Katayama, 2006). No study has decided on the optimal amount to leave for student completion, but two studies suggested that students could benefit from scaffolding. At the beginning of the semester, students could be provided with more complete notes. Over time, notes could become less complete, so that students would assume increased responsibility for completing them (Katayama & Robinson, 2000; Robinson, Beth, Odom, Hsieth, Vanderveen & Katayama, 2006).

When guided notes were combined with overheads or other visuals, students were even better able to record main ideas and retain them. Austin, Lee and Carr (2004) conducted a study in which they provided students with partial notes to fill out during lectures, as well as overheads that reflected the important points in the notes. Students who received guided notes and overheads were able to record nearly 100% of the critical points from the lecture, while students who simply heard a traditional lecture with no notes or visuals recorded only 62% of the critical points. Austin et al (2002) also concluded that students ask more questions and make more comments in classes when they had partial notes, but they wondered if the increase in student participation was actually instructor-driven. They speculated that the presence of the partial notes caused instructors to elicit more student feedback. They concluded that

instructors may have generated more classroom discussion because students spent less time writing notes and were more available to engage in conversation.

When students were surveyed about partial notes, they overwhelmingly agreed that having the notes gave them a sense of having more class time to think about lecture content and encouraged them to participate in class more. The majority of students, if given the choice between taking notes on their own or receiving partial notes, would chose partial notes (Austin et al, 2002).

Matrix notes

Matrix notes are laid out in a grid pattern that reflects the structure of a lecture (Kiewra, DuBois, Christian and McShane, 1988). For example, in an introductory psychology class, a lecture might be devoted to how and why people use the five defense mechanisms. A secondary goal might be to provide students with examples of each mechanism. Matrix notes might arrange the five defense mechanisms along the vertical left-hand margin. Across the top of the paper could be categories such as “definition,” “how and why people use it” and “example.” Studies of matrix notes, with the exception of one study, focused only on note taking during lectures, and this particular form of note taking was the least studied among the various types of note taking. The majority of the studies on matrix notes have been conducted by Kierwa.

In his research, Kiewra (1991) based his studies on matrix notes on the work of Anderson (1983), who explained that people link propositions, or units of meaning, together in such a way that remembering one unit of meaning will cause them to remember the other. The more units of meaning that are “attached” to a particular concept, term or idea the more likely a person is to remember it because he or she will have had more cues to trigger the memory of that term or concept. (Anderson, 1983). Kiewra applied this research into a visual form of note

taking in which each cell on a grid contained a unit of meaning that was connected to the unit of meaning in the cells directly above, below or beside it. That way, each unit of meaning had potentially four retrieval cues to help students remember them (Kiewra 1991, Kiewra, DuBois, Christian & McShane, 1988). Kiewra (1991) suggested that matrix notes helped students notice the structure of a lecture, which heightened their understanding of how the facts they were learning fit into the lecture as a whole, and that matrix notes also highlighted similarities and differences between concepts and terms because the structure of the matrix notes enabled comparisons in a way that traditional, linear notes did not.

Kiewra and colleagues (1988) conducted a study in which they compared three different note taking systems students used to record lecture notes. In the study, one groups of students received "complete notes"—or a verbatim transcript of an entire lecture. The next group received a traditional linear outline that distinguished main ideas from supporting details. The final group received matrix notes. Students who used matrix notes outperformed the other groups when they were asked to recall as much information about particular concept as they could and identify target concepts illustrated in brief examples. In another study, Risch and Kiewra (1990) concluded that matrix notes helped eighth grade students notice the similarities between various concepts if students reviewed the notes they took.

Kiewra, DuBois, Christensen, Kim and Lindberg (1989) conducted the only study that examined if matrix notes were an effective way for students to take notes on text. Students who took notes using the matrix format, but who were denied an opportunity to review those notes performed poorly on an exam that required students to identify patterns in information. Kiewra and colleagues concluded that student cognitive resources were taxed when they had to read, decide what to put in the notes and where those notes would fit in the framework the matrix notes provided them. However, if students were provided with an opportunity to study

and review their notes, their performance was equivalent to students who took notes in other formats. They speculated that time limitation may have impacted a student's ability to take effective notes. Their study also revealed that when students took notes in lectures (regardless of format) they recorded a higher percentage of important ideas than they did while they were reading texts. However, they concluded that students would benefit from training in how to use and review notes, particularly notes with a more rigid framework like matrix notes.

Kiewra's research indicated that matrix notes hold promise for students because they make the relationships between concepts and terms clear for students, but that they have a drawback; students must spend cognitive energy deciding how to work within the relatively rigid format of matrix notes. The combat this drawback, he suggested training students in how to complete and review the matrix notes.

Conclusion

Studies have shown that students value note taking and review and expect them to be a part of their experience as students. However, high ability and low ability students varied widely in the decisions they made about what to include in notes and in the amount of information they were able to record. They also varied widely in their approach to studying. Higher ability students were more likely to use a variety of strategies, and to monitor their own understanding, while lower ability students tended to "stick with" a particular way of taking notes or studying even when it proved ineffective. In addition, successful students were able to write quickly and accurately, and took notes that showed the relationships between concepts and terms. Over time, research has turned to focus on ways to help lower achieving students take better notes, and develop better self-monitoring skills. To date, the most researched forms of note taking are summaries, partial (or guided) notes and matrix notes. The majority of the studies focused on note taking as it related to lectures, while only a handful of studies focused

on notes taken on text. This study will focus on whether matrix notes are an effective way for students to take notes on texts, and it will explore whether this form of note taking will help students develop skills in self-monitoring.

Chapter 3: Methods

Subjects

All subjects in this study were recruited from two sections of Introductory Psychology offered in Spring 2013 at Central Lakes Community and Technical College. Both sections were taught by Martha Kuehn. While all students in both classes had access to matrix notes, only volunteers were surveyed about their use of the notes, and a smaller number of volunteers were interviewed about their study habits as they related to the class in general and the matrix notes in particular. Subjects volunteered to be surveyed and interviewed after the researcher went to their classrooms during the first week of the semester to describe the project and ask for student participation. After the researcher spoke to the students, they were given an IRB-approved consent form to sign. The consent form informed the students that they would be surveyed about their study habits three times during the semester, and some of them would be asked if they would be willing to be interviewed. Finally, it was made clear to them that signing the consent form meant that they were giving the researcher and Kuehn permission to speak specifically about their exam scores and course performance. According to IRB rules, any student under the age of 18 requires parental consent to participate in the study, so this study eliminated any student who was not 18 at the time the study began.

Students ranged in age from 19 to early 50's. A total of 36 students participated, 23 women and 13 men. The two sections together had an enrollment of 63, which means that 57% of the students enrolled in this instructor's sections of Introductory Psychology volunteered for the study. Some students were first year, second semester students while others were in their second year. The study included participants who were enrolled in technical programs such as

Law Enforcement and Business, as well as students who were pursuing an Associate of Arts degree. The age range, sex ratio and variety of academic goals was appropriate for this study because the goal was to determine how effective matrix notes were for the average community college classroom. Demographically, they populated by slightly more women than men, and by people ranging from high school graduates to middle-age.

Students were not differentiated by ability. Grade Point Averages, Accuplacer scores or like measures were not considered in the recruitment of students. Students were also not selected based on their performance in the psychology class. Since students were recruited during the first week of the semester, they had not earned grades for tests, quizzes or other assignments. Academic ability was not used as a criteria because it was assumed that there would be a range of aptitudes and abilities among the 36 students recruited. This range would give the researcher an opportunity to see if matrix notes were more or less effective or appealing to students of varying ability levels. Students who agreed to participate in the study were given extra credit for completing the surveys.

At the end of the semester, 16 out of the 36 students were deliberately selected to be interviewed about their study habits in general and their impressions of the matrix notes in particular. To select interviewees, the researcher worked with the instructor to identify students who represented all achievement levels. In other words, Students earning A's, B's, C's, D's and F's were interviewed to determine if students of varying abilities tended to exhibit patterns in how they studied and/or used matrix notes.

Data Collection

Data was collected in four ways:

1) Kuehn provided the researcher with anonymous average scores and point distributions for both classes after each exam. For example, she would inform the researcher how many students had earned A's, B's etc., and what was the average score per class section.

2) Kuehn provided the researcher with the specific exam scores of the students who had volunteered for the study.

2) The students who volunteered to participate in the study took three pen and paper surveys after the first, second and third exams.

3) Sixteen of the volunteers were invited to have a face-to-face interview that occurred between the last exam and the final.

Instrumentation

Surveys

The researcher and the instructor collaborated to develop the surveys, which were submitted to IRB for approval prior to being used. The surveys were anonymous and designed to provide information in the following areas: student exam performance, whether students' study habits changed during the semester, what they knew about studying, and if students had begun to take notes, predict exam questions or engage in other effective study behaviors. Surveys were also designed to determine specifically how matrix notes had (or had not) helped students improve their study skills and test scores.

Two of the three surveys were amended and re-submitted for IRB approval. Amendments occurred to reflect changes within the course—i.e. the instructor planned to do a class activity but changed her mind. Reference to that activity was removed from the survey. On another occasion a question was re-formatted to make it easier to understand.

Interviews

Interview questions were developed by the researcher and were approved by IRB prior to use. They were designed to determine student perceptions of matrix notes and other course components. Students were invited to talk about how they felt course structure or materials contributed to their success or lack thereof. Students were asked to describe how they study for exams, how they take notes on their textbook, whether they thought the matrix notes were helpful and what they learned about studying during the semester. They were also invited to share what aspects of their personal life they felt enhanced or detracted from their success in the course.

Procedures

Matrix Notes

Prior to the start of the semester, Kuehn, with input from the researcher, re-wrote her traditional, linear study guides into matrix notes. She created matrix notes for each of the 11 chapters students were required to read during the semester and loaded them onto her D2L site (the course website). The notes were not interactive. Students who wished to use them needed to print them out or leave them in electronic form and use them for a reference. Students were not taught how to use the matrix notes in class, they were not formally used in class discussion, nor did students receive grades for them. Rather, students were able to use

matrix notes at their own discretion. Students also had access to power-point lecture notes that were available on-line.

The only formal training in how to use the matrix notes occurred during an outside-class service offered through the Learning Commons, or tutoring center. Students who earned below a C- on the first exam in psychology were given the choice of either writing a paper or attending an outside class service called "discussion groups." Discussion groups were a campus-wide service that any enrolled student could attend, so psychology students might attend groups with students from other classes. During groups, students were encouraged to work with other students who were taking the same class. They were taught how to preview material prior to reading, how to structure study sessions, and were given strategies they could use to monitor understanding. They were lead by the researcher or a student tutor to brainstorm possible text questions, compare their lecture and text book notes, and develop review strategies such as writing 20 words summaries, developing concept maps and explaining important concepts to one another. Even though the groups were designed for students who were struggling, B and A students also chose to attend. Some of the students who volunteered for the study also participated in the discussion groups.

Survey administration

Surveys were given during the class period following the one in which students were tested. This way, students would know their exam scores. Kuehn finished class a few minutes early so that students who were not participants could leave. Students who were participants received their surveys in class and completed them there. All surveys were pen and paper. After completing the surveys, students placed them in an 8 x 13 envelope and signed a cover sheet so the instructor would know which students earned extra credit. The surveys themselves were anonymous. The researcher picked up the surveys in a sealed envelope after the class.

Interviews

The researcher met with Kuehn to select candidates for interviews. Students who were selected to be interviewed agreed to meet with the researcher in the campus library to be interviewed one-on-one. In one situation, when there was confusion about location, the researcher interviewed the student over the phone. Students were first assured that their answers would be kept confidential from the instructor as well as the other students. Next, they were told that one of the questions would ask them to comment on whether they felt circumstances in their personal lives impacted their success in the course, but that they were under no obligation to reveal highly personal information about their disability status, mental health concerns, family situations, addictions or workplace stress unless they wished to. During the interview, students were encouraged to explain themselves further, or clarify points that were confusing via further explanation or examples. Interviews lasted between 20 and 30 minutes.

Statistical Analysis

Survey results were analyzed by calculating percentages (i.e. Fifty percent of the respondents selected a particular answer) and averages, (i.e. The average score for exams) and by looking for patterns between survey questions. (i.e. Respondents who earned a particular grade on the exam were also likely to have the following study habits.)

Interview results were analyzed by examining whether there were connections between student answers and student exam scores and if those connections fit with survey result. For example, since the surveys indicated that A and B students utilized more strategies when they studied, the researcher examined the interview answers to determine if A and B students did, in fact, identify more strategies than the less successful students did.

These statistical tests are appropriate for verifying the hypothesis because our sample size of 36 students is too small to conduct a study to determine if our results are statistically significant, and because the matrix notes were made available to all students enrolled in the two sections, there is not a control group. Finally, Kuehn kept descriptive statistics of her psychology sections for the last two years. She calculated average scores after each test and determined what percentage of students had earned which grades. Using those same kinds of descriptive statistics with this study provided consistency and seemed the most likely way to determine whether or not students who used matrix notes were more successful than students in past classes who did not have access to them. Finally, the purpose of the study was to determine whether matrix notes would increase student awareness of text book features and help them develop self-regulation skills to such a degree that they would become more successful on their tests. Descriptive statistics enabled the researcher to answer these questions.

Chapter 4: Results

This chapter records the results of the three surveys and the interviews that students completed as a part of this project. The first portion of this chapter was devoted to the surveys and was structured as follows: Each survey was discussed separately in a section that was divided into two parts. The first part provided the questions students answered on the survey followed by the results. The second part compared and contrasted student responses to survey questions in an effort to find patterns in how high and low ability students responded. In the next section, each of the 16 interview transcripts were summarized. Finally, there was a brief summary of the results.

Results of first Survey

Introduction

A total of 31 students completed the first survey. In part one, the questions and the responses are written exactly as they appeared on the surveys the student received. Each question is followed by the results in numbers and percentages. Part two examines relationships between questions to determine if there were differences in responses between students who studied from one to three hours and students and students who studied from four to six hours.

Part 1: Survey one questions

Question 1. How many hours did you spend reading the chapter?

a) I don't read the chapter

b) 1-3 hours

c) 4-6 hours

d) More than 6 hours

Out of 31 responses, the majority of the students, 22 (71%) indicated that they spent between one and three hours reading the chapter. Seven (23%) indicated that they spent between four and six hours reading. One student said he or she did not read the chapter at all, while two students said they spent more than six hours reading.

Question 2. Select the answer that best describes how you review for exams. (Circle all that apply)

a) I don't have a review technique

b) Re-reading the chapter

c) Reviewing notes

d) Making flashcards

e) Memorizing terms

f) Other (please describe)_____

Because students were encouraged to select more than one review strategy, they made a total of 71 responses. "Reviewing notes" was the most popular strategy. It comprised 27 (38%) of the responses. "Memorizing terms" made up 13 (18.3%) of the responses, "other" comprised 12 (16.9%) while "re-reading the chapter" comprised 11 (15.5%) of the responses. "Making flashcards" comprised 6 (8.5%) of the strategies. Two (2.8%) of the responses were, "I don't have a review technique."

If a student selected more than one response, the most popular combination was "re-reading the chapter" and "reviewing notes." The second most common combination of strategies was "Reviewing notes" and "memorizing terms." The final most common

combination involved the strategies “re-reading the chapter,” “reviewing notes,” and “memorizing terms.”

Twelve responses were “other.” Eight of the twelve indicated that they used the study guide that was an optional purchase with the textbook. Two students wrote that they watched the on-line videos while another visited a tutor. Two students indicated that they “browse the chapter” and “take notes while reading.”

Question 3. Do you take notes during the lecture?

Thirty out of thirty-one students indicated that they do take notes during lecture.

Question 4. If “yes” Select the answer that best describes your approach

a. I write down whatever the instructor writes on the board.

b. I write down whatever the instructor writes down on the board plus anything he/she says that explains a concept I read about in the book.

c. I write down whatever the instructor writes on the board plus anything he/she says that explains a concept I read about in the book. I also write down answers to any questions I wrote down while reading.

Most students selected “b. I write down whatever the instructor writes down on the board plus anything he/she said that explains a concept in the book.” Nineteen (63%) selected this response. Seven (23%) students selected “c.” Four (14%) students selected option “a.”

Question 5. If you don’t take notes circle the answer that best describes why**.**

a. Lecture moves so quickly I don’t have time to write everything down.

b. I’m not sure what I should write down.

c. I feel like I have a good memory, so I don’t need to take notes.

Three students indicated that they don't take lecture notes. One indicated that he or she is "b. not sure what to write down." Another student selected the answer "a. Lecture moves so quickly I don't have time to write everything down." In handwriting next to that option, the student wrote "sometimes." The final student selected, "c.I feel like I have a good memory, so I don't need to take notes."

Question 6. Do you take notes when you read? Y N

Out of 31 responses, 17 students indicated that they did take notes while they read, while 14 students did not.

Question 7. If "Yes" select the answer that best describes your note taking style.

a. I highlight or underline the things I think are important.

b. I copy down the bolded words and their definitions.

c. I copy down the bolded words and their definitions as well as main ideas.

d. I use headings, subheadings, and graphics to help me figure out main idea and I highlight those or write them in a notebook. If something confuses me, I will mark it so I can ask questions in class.

Some of the 17 students who took reading notes selected more than answer, generating a total of 25 responses. Option "a. highlighting and underlining," was the most popular choice. Twelve students (48%) selected this one. Five (20%) students copied bolded words and main ideas, while another five (20%) used headings and subheadings to determine main ideas. The least popular choice was simply copying bolded words and their definitions—12% of students selected that choice.

Question 8. You have been assigned Matrix Study guides to help you work with the chapter material. Please select the answers that describe how helpful the Matrix Study Guides have been for you (Circle all that apply).

a. I don't think they have helped me because I already had a note taking system.

b. I don't think they helped me because I didn't understand their purpose.

c. I don't think they helped me because I didn't see how they related to the exam questions.

d. They helped me see connections between concepts and terms in the chapter

e. They helped me notice how the textbook was organized

f. They helped me pick out main ideas

g. They gave me a better idea what would be on the exam

Since students could select more than one answer, there were a total of 86 responses. Five students (5.8%) selected option a, b or c—which meant they did not find the matrix notes helpful. Three students selected "a. I already had a note taking system." One student selected "b. I didn't understand their purpose," while the fifth one selected "c. how they related to the exam questions."

Twenty-three (26.7 %) of the students said matrix notes helped them connect concepts and terms, 22 (25.5%) responses said matrix notes helped them pick out main ideas, 20 (23.3%) responses agreed that matrix notes gave them a better idea what would be on the exam, and 16 (18.6%) responses suggested that matrix notes helped students see how the textbook was structured and organized.

Question 9. If concepts in the book are confusing to you, what do you do to resolve your confusion?

a. I tend not to do anything.

b. I ask a friend who is in my class

c. I Google the topic, or use another electronic resource to help me understand something.

d. I make an appointment to see a tutor

e. I make an appointment to see my instructor

Because some students selected more than one response, there were a total of 43 responses. The most popular response was "c. I Google the topic or use another electronic resource," which received 17 of the 43 responses (39.5%). "B. I ask a friend who is in my class" was selected 10 times, which made up 23.3% of the responses. "D.I make an appointment to see my instructor" received the next highest number of responses. It was selected 8 times (18.6%). "A. I tend to not to do anything" was selected five times (11.6%) and "D. I make an appointment to see a tutor" was selected three times (6.9%).

Part 2: Relationships and patterns in student responses

Perceptions of matrix notes: Thirteen of the 31 students indicated in question seven that they did not take notes when they read. Questions six and eight were examined to see if the 13 non-note takers saw the matrix notes differently than the 17 students who did take reading notes. In question six, students were asked if they took reading notes and in question eight, they were asked to select the answers that described the usefulness of the matrix notes. One non-note taker did not select any options in question eight, which meant that 12 non-note takers responded. All 17 of the note takers circled one or more responses to question eight.

Non-note takers and note takers had similar perceptions of the matrix notes. In both groups, 41% (five non-note takers and seven note takers) of the students selected agreed that matrix notes helped them "d. see connections between concepts and terms," "e. notice how the textbook was organized," f. pick out main ideas" and "g. gave them a better idea of what would be on the exam."

Conclusion: While there are similarities between how note takers and non-note takers viewed the usefulness of matrix notes, there was one difference between the two groups. Note

takers were more likely than non-note takers to have selected, as one of the options, "e. Matrix notes helped me see how the textbook was organized." Ten out of the 17 note takers (58.8%) indicated that matrix notes helped them see how the textbook was organized, while only five out of the twelve non-note takers (41.6%) believed that matrix notes helped them see how the textbook was organized.

Differences in study habits between students who study one to three hours vs. four to six. In question one, students were asked to select the number of hours they spent reading the chapter. Out of 31 students, 22 (71%) spent between one to three hours. Only seven students (23%) spent between four and six hours. One student selected "I don't read" and one more selected "more than 6 hours." The following analysis focused on the similarities and differences between the students who reported to spend between one and three hours reading and the students who spend between four and six hours reading.

***Review Techniques*.** For the most part, there were very few differences in how the two groups answered question two, which asked them to select all the options that described how they studied for exams. Students who studied between one and three hours made a total of 50 responses, while students who studied between four and six hours made 17 responses. Because there were so many more students in the one to three hour group, the tables below are represented in percentages rather than raw numbers.

Table 1
Comparison of review techniques used by students

Review Technique	1-3 hours	4-6 hours
a. I don't have a review technique	4%	0%
b. Re-reading the chapter	16%	17.6%
c. Reviewing notes	36%	41.2%

d. Making flashcards	8%	5.8%
e. Memorizing terms	20%	17.6%
f. Other	16%	17.6%

Approach to note taking in lectures. Students who studied between one and three hours made a total of 20 responses to this question. Students who studied between four and six hours made eight responses to this question. Student answers revealed that students who reported to study fewer hours were more likely to engage in deeper processing strategies while they listened to lectures.

Table 2
Comparison of note taking approaches used by students

Approach to note taking	1-3 hours	4-6 hours
a. I write down what the instructor writes on the board.	15%	12.5%
b. I write down what the instructor writes on the board plus anything he/she says that explains a concept I read about in the book.	60%	75%
c. I write down what the instructor writes on the board plus anything he/she says that explains a concept I read about in the book. I also write down answers to any questions I wrote down while studying.	25%	12.5%

***Approach to note taking while reading*.** The 22 students who study between one and three hours made a total of 15 responses to this question, which meant that seven students in this group did not take notes at all. Six of the seven students who studied between four and six hours responded to this question. Students who studied more hours were more likely to engage in deeper processing strategies. For example, they were more likely to use textbook features to guide reading and were more likely to notice if parts of the text confused them. Students who studied fewer hours were more likely to engage in shallow processing strategies.

Table 3
Comparison of study habits students use

Note taking approach	1-3 hours	4-6 hours
a. I highlight or underline things I think are important.	46.7%	33.3%
b. I copy down the bolded words and their definitions.	13.3%	0%
c. I copy down the bolded words and their definitions as well as main ideas.	26.7%	16.7%
d. I use headings, subheadings and graphics to help me figure out main ideas and I highlight those or write them in a notebook. If something confuses me, I will mark it so I can ask questions in class.	13.3%	50%

***Perception of matrix notes*.** Students, regardless of how many hours they studied, had very similar perceptions of the value of the matrix notes. Because they were invited to select more than one option, the 22 students who studied between one and three hours made a total of 60 responses regarding the matrix notes. The seven students who studied between four and six hours made a total of 18 responses.

Table 4
Comparison of how effective students found matrix notes

Opinion of Matrix Notes	1-3 hours	4-6 hours
a. I don't think they helped me because I already had a note taking system	5%	0%
b. I don't think they helped me because I didn't understand their purpose.	1.7%	0%
c. I don't think they helped me because I didn't see how they related to the exam questions.	0%	5.6%
d. they helped me see connections between concepts and terms in the chapter	25%	27.8%
e. They helped me notice how the textbook is organized	20%	16.7%
f. They helped me pick out main ideas	25%	27.8%
g. They gave me a better idea what would be on the exam	23.3%	22.2%

Conclusion. Students who studied more hours were more likely to use deeper processing strategies when they studied, but students who studied fewer hours seemed to process lectures more deeply. Survey one revealed that the majority of students, regardless of how much they studied, or whether or not they took notes, felt matrix notes were helpful, particularly when it came to noticing connections between concepts and terms in the chapter and selecting main ideas from the text.

Results of Second Survey

Introduction

Between the two classes 25 surveys were collected. In part one, the questions and the responses are written exactly as they appeared on the surveys students received. Each question is followed by the results in numbers and percentages. Part two examines survey answers to determine if there were differences in answers between two groups of students; those who earned a test grade average of C and above and those who earned a test grade average of C- or below.

Part 1: Survey two questions and responses

Question 2: Throughout the semester you have had a number of opportunities to learn about new study techniques. What changes have you made to the way you study? (Circle all that apply)

a) I'm happy with my scores and made no changes to my studying.

b) I'm unhappy with my scores, but haven't made any changes to my studying.

c) I began to take notes during lecture

d) I began to take notes when I read

e) I attended reading groups

f) I used the matrix study guide

For this question, there were a total of 40 responses. Below are the raw numbers and percentages that show how many students selected which response. The most popular change students made to their studying was to use matrix notes.

Table 5
Student responses to first exam score

Response (in order of popularity)	Raw number	Percent
I used the matrix study guide.	15	37.5%
I attended reading groups.	7	17.5%
I'm happy with my scores and made no changes to my studying.	7	17.5%
I began to take notes during lecture.	6	15%
I began to take notes when I read.	4	10%
I'm unhappy with my score, but haven't made any changes to my studying.	1	2.5%

Question 3: You have been doing in-class group activities this semester. Please select the answer that best describes how you feel about participating in groups.

a) Very unhelpful

b) Unhelpful

c) Neither helpful or unhelpful

d) Somewhat helpful

e) Extremely helpful

Table 6
Student opinion of class activities

Response in order of popularity	Raw number	Percent
Somewhat helpful	9	37.5 %
Extremely helpful	8	33.3 %
Neither helpful nor unhelpful	3	12.5 %
Very unhelpful	3	12.5%
Unhelpful	1	4.2%

Question 4. If you earned a "C" or below on one or both exams, your instructor recommended that you attend the outside-class reading groups. Are you doing so? Yes No

If "yes," please select the answers that best describe your experiences (Circle all that apply)

a) I don't feel like I learned a useful study technique

b) I don't feel like the sessions addressed my particular study issue

c) I learned what is likely causing me to miss exam questions

d) I learned techniques that will help me study differently

e) I have made changes as a result of this new knowledge

Fourteen of the 25 students attended study groups. This group included people who were required as well as people who chose to attend. The 14 students selected 17 responses describing their experience using the study groups.

Table 7
Student reactions to discussion groups

Response	Raw number	Percent
I have made changes as a result of this new knowledge	7	41.2 %
I learned techniques that will help me study differently	5	35.7 %
I don't feel like the sessions addressed my particular issue	3	17.6 %
I don't feel like I learned a useful study technique	1	5.8 %
I learned what is likely causing me to miss exam questions	1	5.8 %

Question 5. Please indicate how many times you have attended the reading groups

a) Once

b) 2-3 times

c) 4-6 times

d) 7 or more times

Out of the 25 students, 16 attended the study groups.

Table 8
Number of times students attended discussion groups

Number of times attended	Raw number	Percent
2-3 times	9	56.3 %
4-6 times	5	31.2 %
Once	2	12.5

Question 6. One of the purposes of this study is to determine what you entered college knowing about studying and what you have learned about studying while you are here. Below is

a list of statements. Please read each statement and mark the appropriate box—"already knew" means you came to college having already learned this information about studying. "Learned at CLC" means that you learned this information here. "Didn't know" means you don't know this information about studying.

Table 9
Student knowledge of effective study habits

	Already knew	Learned at CLC	Didn't Know
I should divide my study sessions into three parts—first I should "warm-up" by looking over the chapter or reviewing notes. Next, I should read. Finally, I should "cool down" by reviewing what I just read to make sure I understand it.	8 33.3%	10 41.7 %	6 25%
I should read a few pages each day, not try to read the chapter all at once	15 62.5%	7 29.2%	2 8.3%
There are four different kinds of multiple choice questions on exams	6 25%	10 41.7%	8 33.3 %
It is possible to predict test questions	10 41.7%	11 45.8%	3 12.5 %
Chapter headings and subheadings can help me find main ideas	19 79.2%	5 20.8%	0
Learning the definitions of terms isn't enough—I need to also see how those terms relate to heading, subheadings and each other.	13 54.2%	9 37.5%	2 8.3 %
There are different ways to take notes for a class	14 58.3%	9 37.5 %	1 4.2%

Part two: Relationships between questions

Introduction. The results of question one, in which students were asked what their test averages were, and question two, which asked students to record how they changed their studying as a result of their first exam grade, were examined to determine if higher and lower ability students selected specific ways to alter their studying. Next, question one was examined in conjunction with question six, which asked students to record what information about studying they knew and when they learned it.

Questions one and two: Student responses to low test scores. Table 10-14 were designed to determine how students responded to their first exam grade. Students were sorted by the grade they earned on the first exam. The first column refers to the outcome of the second exam. "Improved" means that their second exam grade was higher than their first grade, "stayed the same" means the students earned the same letter grade on both exams and "did worse" means that the exam two score was lower than the exam one score. The second column refers to the number of students who earned each result, and the last column describes which strategies students adopted between exam one and exam two. In situations where more than one student earned the same result, each student's choice of strategy is listed separately.

Table 10
F student responses to test one scores

Result	Number of students	Strategies Selected
Improved	1	Reading groups, matrix study guide
Stayed the same	1	Reading groups, matrix study guide
Did worse	NA	NA

Table 11
D student responses to test one scores

Result	Number of students	Strategies Selected
Improved	1	Reading notes
Stayed the same	1	Reading groups, matrix study guide
Did worse	2	Students 1 and 2: Lecture notes, discussion groups, matrix study guide

Table 12
C student responses to test one scores

Result	Number of students	Strategies Selected
Improved	4	Student 1: Reading notes, matrix study guide Student 2: no changes, matrix study guide Student 3: no changes Student 4: lecture notes
Stayed the same	1	No changes
Did worse	0	NA

Table 13
B student responses to test one scores

Result	Number of students	Strategies Selected
Improved	NA	NA
Stayed the same	4	Student 1: Reading notes Student 2 and 3: discussion groups, matrix notes Student 4: No changes
Did worse	2	Student 1: No changes, matrix study guide Student 2: Lecture notes, reading notes

Table 14
A student responses to test one scores

Result	Number of students	Strategies Selected
Improved	NA	NA
Stayed the same	4	Student 1: Matrix study guide Student 2: No changes Student 3: No changes, matrix study guide Student 4: No changes, lecture notes, matrix study guide
Did worse	2	Student 1: No changes Student 2: Matrix study guide

There did not seem to be a particular strategy that was closely associated with raising exam grades. However, the Matrix study guide and the discussion groups were the most common strategies students employed to improve grades, but it did not seem as though there was a direct connection between those strategies and an increase in grades.

Questions one and six: What students knew about studying before they entered college: In order to determine if there was a relationship between when students learned information about studying and their grades students were sorted into three groups based on their self-reported exam scores.

- Group 1: The “above C average” students had an average grade on both exams that was a C or above.
- Group 2: The “improvers” are students who earned below a C- on their first test and were therefore required to attend discussion groups. However, on the second exam, they improved their scores a grade level or more.
- Group 3: The “below C- average” students have earned a below C- combined average on the first two exams.

Even though 25 students took the survey, two surveys were discarded. In one case, a student had not taken both exams so his or her test scores could not be compared and in the second case, a student did not answer question six.

Group 1. There were 11 students in group one whose average score on both exams exempted them from the reading groups. They are the "above C average group."

Table 15
The above C average students' knowledge of study skills

	Already knew	Learned at CLC	Didn't Know
I should divide my study sessions into three parts—first I should "warm-up" by looking over the chapter or reviewing notes. Next, I should read. Finally, I should "cool down" by reviewing what I just read to make sure I understand it.	5 45.4%	3 27.3%	3 27.3%
I should read a few pages each day, not try to read the chapter all at once	8 72.7%	2 18.2%	1 9.1%
There are four different kinds of multiple choice questions on exams	3 27.3%	2 18.2%	6 54.5%
It is possible to predict test questions	8 72.7%	2 18.2%	1 9.1%
Chapter headings and subheadings can help me find main ideas	11 100%		
Learning the definitions of terms isn't enough—I need to also see how those terms relate to heading, subheadings and each other.	9 81.8%	1 9.1%	1 9.1%
There are different ways to take notes for a class	9 81.8%	2 18.2%	
	53 Total Responses 68.8%	12 Total Responses 15.6%	12 Total Responses 15.6%

Group 2. There were five students whose first exam score required them to attend discussion groups, but who improved at least a letter grade one the next test. They are the "Improved" group.

Table 16
The Improved students' knowledge of study habits

	Already knew	Learned at CLC	Didn't Know
I should divide my study sessions into three parts—first I should "warm-up" by looking over the chapter or reviewing notes. Next, I should read. Finally, I should "cool down" by reviewing what I just read to make sure I understand it.	1 20%	4 80%	
I should read a few pages each day, not try to read the chapter all at once	2 40%	3 60%	
There are four different kinds of multiple choice questions on exams		5 100%	
It is possible to predict test questions		5 100%	
Chapter headings and subheadings can help me find main ideas	4 80%	1 20%	
Learning the definitions of terms isn't enough—I need to also see how those terms relate to headings, subheadings and each other.	2 40%	3 60%	
There are different ways to take notes for a class	1 20%	4 80%	
	10 Total Responses 28.6 %	25 Total Responses 71.4 %	

Group 3. There were seven students who earned below a C- average on both exams. They are the "below C- average" students.

Table 17
The below C- average students' knowledge of study habits

	Already knew	Learned at CLC	Didn't Know
I should divide my study sessions into three parts—first I should "warm-up" by looking over the chapter or reviewing notes. Next, I should read. Finally, I should "cool down" by reviewing what I just read to make sure I understand it.	2 28.6%	3 42.8%	2 28.6%
I should read a few pages each day, not try to read the chapter all at once	4 57.1%	2 28.6%	1 14.3%
There are four different kinds of multiple choice questions on exams	3 42.9%	3 42.9%	1 14.2%
It is possible to predict test questions	2 28.6%	4 57.1%	1 14.3%
Chapter headings and subheadings can help me find main ideas	4 57.1%	3 42.9%	0
Learning the definitions of terms isn't enough—I need to also see how those terms relate to heading, subheadings and each other.	2 28.6%	5 71.4%	0
There are different ways to take notes for a class	3 42.9%	4 57.1%	0
	20 Total Responses 40.8%	24 Total Responses 49%	5 Total Responses 10.2%

Conclusion: As a general rule, students who earned a C average or above on the first two exams entered college knowing more about studying than students in the other two groups. No matter which statement about studying these students responded to, the majority of students entered college already knowing that information about studying. This contrasted to

the “improvers” group and the “below C- average” group. While the majority of “improvers” entered college knowing they could use headings and subheadings to find main ideas, most of them learned the other study information in college. Most of the “below C- average” students already knew that they should read a few pages each day as opposed to the entire chapter at once, and that headings and subheadings can help them find main ideas. However, many students in the “below C- average” learned a great deal of information about studying in college.

Survey 3

Introduction

Between the two classes, there were a total of 25 surveys collected. In part one, the questions and the responses are written exactly as they appeared on the surveys the student received. Each question is followed by the results in numbers and percentages. Part two examines how “above C average” students and “below C- average” students responded differently to questions about matrix notes and study habits.

Part 1: Survey three results

Question 1: Question 1 asked students to circle the grade they earned on each of the three exams they have taken so far. Once the surveys were collected, each student's test GPA was calculated by assigning each grade a number as follows: A= 5; B= 4; C=3; D=2; F=1.

Twelve of the 25 students earned grades high enough to exempt them from having to attend the study groups. The average test grade for this group of students was a 4.3, or a B. Thirteen students earned grades that required them to attend the study groups. Their average GPA was a 2.18, or a D.

Question 2: Throughout the semester you have been given matrix study guides to help you understand chapter concepts and terms. Please circle all the answers that describe your experience using them.

a) I already had a note taking system that I like, so the Matrix study guides didn't help me.
b) I didn't use the matrix study guides
c) Matrix study guides helped me see how the chapter was organized
d) Matrix study guides helped me pick out main ideas from the sections of the chapter
e) Matrix study guides helped to see how terms related to concepts as well as to each other
f) Matrix study guides helped me make better predictions about what topics would be on the exam and how the questions would be asked.

On the following table, the first number represents the raw number of students who selected that response while the second column represents the percentage.

Table 18
Overall student opinion of the matrix notes

	Raw Number	Percentage
a. I already had a note taking system that I like, so the Matrix study guides didn't help me.	3	5.8%
b. I didn't use the Matrix study guides	3	5.8%
c. Matrix study guides helped me see how the chapter was organized	3	5.8%
d. Matrix study guides helped me pick out main ideas from the sections of the chapter	16	30.8%
e. Matrix study guides helped to see how terms related to concepts as well as to each other	12	23.1%
f. Matrix study guides helped me make better predictions about what topics would be on the exam, and how the questions would be asked.	11	21.2%
Total number of responses	7	13.5%
	52	100%

Question 3. Please circle the statement you think most accurately describes your feelings about matrix study guides:

a. Matrix study guides did not contribute to my success in this course.

b. The matrix study guides may have helped me perform better on the exams

c. The matrix study guides definitely made me more successful in this course

Two students did not answer this question, which left a total of 23 responses.

Table 19
Overall student opinion of the usefulness of matrix notes

Statement	Number of Responses	Percent-ages
a. Matrix study guides did not contribute to my success in this course.	6	26.1%
b. The matrix study guides may have helped me perform better on the exams	8	34.8%
c. The matrix study guides definitely made me more successful in this course	9	39.1%
Total number of responses	23	100%

Question 4: In the table below are six study behaviors. In the row after each behavior, indicate how likely you are to engage in each of these behaviors:

a. I studied every day

b. I reviewed my notes

c. I took notes while I read

d. I predicted exam questions when I studied

e. I made an effort to define terms and summarize concepts in my own words

f. I looked over the chapter ahead of time so I could see how it was organized and what ideas would be important.

Once again, the data was broken down into overall results, results for the above C average students and for the C-and below average students. There were a total of 142 responses to the following six prompts.

Table 20
Overall student self-reported study behavior

Study habit	Always	Most of the Time	Some of the time	Never
a. I studied every day	1 4.2%	3 12.5 %	13 54.2%	7 29.2%
b. I reviewed my notes	7 29.2%	7 29.2%	9 37.5%	1 4.2%
c. I took notes while I read	4 17.4%	8 34.8 %	6 26.1%	5 21.7%
d. I predicted exam questions when I studied	4 16.7%	4 16.7%	11 45.8%	5 20.8%
e. I made an effort to define terms and summarize concepts in my own words	4 17.4%	10 43.5%	6 26.1%	3 13%
f. I looked over the chapter ahead of time so I could see how it was organized and what ideas would be important	7 29.2%	9 37.5%	4 16.7%	4 16.7%
Total Responses	27 19%	41 28.9%	49 34.5%	25 17.6%

Question 5. Did your instructor recommend to you that you attend the reading groups? Y N

13 students were required to attend the study groups out of the 25 students who took the survey.

Question 6. Please indicate how many times you have attended the reading groups

a) Never

b) Once

c) 2-3 times

d) 4-6 times

e) 7 or more times

Table 21
Number of times students attended reading groups

a) Never	4
b) Once	0
c) 2-3 times	1
d) 4-6 times	6
e) 7 or more times	2

Question 7. We want to know which techniques students who used the discussion groups found the most useful. Please select "Very helpful," "Somewhat helpful" or "Not helpful" after each technique. Overall, the 15 students who attended the groups made a total of 72 responses.

Table 22
Overall student responses to usefulness of study information

Study information	Very helpful	Somewhat Helpful	Not Helpful
Learning that reading has three stages—pre, during and post reading	8 53.3%	6 40%	1 6.7%
Learning that there are four different types of multiple choice questions	8 57.1%	5 35.7%	1 7.1%
Learning how to predict exam questions	6 40%	8 53.7%	1 6.7%
Learning how to use the matrix study guides	7 53.8%	2 15.4%	4 30.8%
Learning how to find main ideas	11 73.3%	3 20%	1 6.7%
Total Responses	0 5.6%	4 3.3%	8 11.1%

Question 8. This semester, you learned about a variety of study techniques. Please circle all those that you found most helpful

a) I didn't try any

b) I didn't find any of them useful

c) Learning that reading has three stages—pre, during and post reading

d) Learning that there are four types of multiple choice questions and how to use that knowledge to predict test questions.

e) Learning about different note taking strategies such as Cornell, annotating, etc.

f) Learning how to use matrix study guides

g) Comparing my notes with the notes other students wrote during class

Of the students who were required to attend groups, 10 students completed this question and made a total of 23 responses.

Table 23
Student responses to study techniques

Study Technique	Frequency of response
a. I didn't try any	0%
b. I didn't find any of them useful	1 4.3%
c. Learning that reading has three stages—pre, during and post reading	6 26.1%
d. Learning that there are four types of multiple choice questions and how to use that knowledge to predict test questions.	6 26.1%
e. Learning about different note taking strategies such as Cornell, annotating, etc.	3 13%
f. Learning how to use matrix study guides	6 26.1%
g. Comparing my notes with the notes other students wrote during class	1 4.3%

Question 9. One of our goals this semester was to teach you study strategies you could use in your other classes. Have you changed the way you study for any of your other classes?

Yes No

If you answered "Yes" please answer the following questions

What class(es) did you apply these new study strategies to?

_____

What specific strategies did you use?_____

Eight students answered this question. However, some didn't understand the question since two of the students indicated that they were using the strategies in psychology classes while the goal was to determine if they were using them in other classes. One student said he or she was not using strategies in other classes. Students listed the following classes: Ethics, Law (probably law enforcement), Biology, all classes, society and law.

Students were asked to list specific strategies. Here are the comments they wrote: Made more time to study; breaking down the information; Pre, during and post reading; predicting questions, taking notes during reading; I didn't change it. In my other classes I'm getting A's and B's. Used advanced note taking system and pre-reading; Turning notes into key ideas.

Part 2: Comparison of above and below C- average student answers

The answers above C average and below C- average students made to questions about matrix notes and study habits are compared in this section. Specifically, student answers were compared for questions two, three, four and seven.

Question 2: Comparison of above C and below C- average students' opinions of the usefulness of matrix notes. The chart below compares student answers to the question, "Throughout the semester, you have been given matrix study guides to help you understand chapter concepts and terms. Please circle all the answers that describe your experience using them."

Table 24
Comparison of student opinions of the of matrix notes

	Overall- 25 students	Above C average- 12 students	Below C- average- 13 students
a. I already had a note taking system that I like, so the Matrix study guides didn't help me.	3 5.8%	0 0%	3 15%
b. I didn't use the Matrix study guides	3 5.8%	3 9.4%	0 0%
c. Matrix study guides helped me see how the chapter was organized	16 30.8%	7 21.9%	9 45%
d. Matrix study guides helped me pick out main ideas from the sections of the chapter	12 23.1%	9 28.1%	3 15%
e. Matrix study guides helped to see how terms related to concepts as well as to each other	11 21.2%	8 25%	3 15%
f. Matrix study guides helped me make better predictions about what topics would be on the exam, and how the questions would be asked.	7 13.5%	5 15.6%	2 10%
Total number of responses	52	32	20

Students who earned above a C average were more likely to find the matrix notes helpful when it came to selecting main ideas, noticing how concepts related and making predictions about exam questions. Below C- average students felt that matrix notes helped them notice chapter organization, and were less likely to have already had a note taking system.

Question three: Comparison of above C and below C- average student opinion of whether matrix notes made them more successful in the course. The chart compares the answers students made to the following prompt, "Please circle the statement you think most accurately describes your feelings about matrix study guides."

Table 25
Student opinion of matrix notes' impact on grades

Response	Above C average	Below C- average
a. Matrix study guides did not contribute to my success in this course.	2 18.2%	4 33.3%
b. The matrix study guides may have helped me perform better on the exams	2 18.2%	6 50%
c. The matrix study guides definitely made me more successful in this course	7 63.6%	2 16.7%
Total number of responses	11	12

Students who earned higher grades were more likely to have had a favorable opinion of the matrix notes. A majority of "above C average" students were confident that matrix notes contributed to their success, but the majority of "below C- average" students were not sure that matrix notes were helpful. The response that "below C- average" student were least likely to select was "matrix notes definitely made me more successful in this course.

Question 4: Comparison between above C average and below C- students study habits. Students were asked to respond to the following prompt: **"**In the table below are six study behaviors. In the row after each behavior, indicate how likely you are to engage in each of these behaviors." The following charts directly compare above C average and below C- average student behavior on each study habit.

Table 26
Student engagement in study habit one

I studied every day	Always	Most of the Time	Some of the Time	Never
Above C average	0	2 16.7%	6 50%	4 33.3%
Below C- average	1 8.3%	1 8.3%	7 58.3%	3 25%

Table 27
Student engagement in study habit two

I reviewed my notes	Always	Most of the Time	Some of the Time	Never
Above C average	4 33.3%	3 25%	4 33.35	1 8.3%
Below C- average	3 25%	4 33.3%	5 41.7%	0

Table 28
Student engagement in study habit three

I took notes while I read	Always	Most of the Time	Some of the Time	Never
Above C average	3 25%	3 25%	3 25%	3 25%
Below C- average	1 9%	5 45.5%	3 27.3%	2 18.2%

Table 29
Student engagement in study habit four

I predicted exam questions when I studied	Always	Most of the Time	Some of the Time	Never
Above C average	1 8.3%	4 33.3%	6 50%	1 8.3%
Below C- average	2 16.7%	1 8.3%	5 41.7%	4 33.3%

Table 30
Student engagement in study habit five

I made an effort to define terms and summarize concepts on my own words	Always	Most of the Time	Some of the Time	Never
Above C average	2 16.7%	5 41.7%	3 25%	2 16.7%
Below C- average	2 18.2%	5 45.5%	3 27.3%	1 9%

Table 31
Student engagement in study habit six

I looked over the chapter ahead of time so I could see how it was organized and what ideas would be important	Always	Most of the Time	Some of the Time	Never
Above C average	6 50%	1 8.3%	2 16.7%	3 25%
Below C- average	1 8.3%	8 66.7%	2 16.7%	1 8.3%

In order to determine frequency, the “always” and “most of the time” categories were added together for each study habit. Below C- average students and above C average students reported they studied daily and reviewed their notes with equal frequency. Below C- average students self-reported engaging to a greater degree than their more successful peers in the following study habits: taking reading notes, defining concepts in their own words and looking over the chapter ahead of time to determine organization. Students who earned a C average or above were more likely to predict exam questions.

Question 7: Comparison of how above C average and below C- average students felt about study information. Students were asked to respond to the following prompt, "We want to know which techniques students who used the discussion groups found the most useful. Please select "Very helpful," "Somewhat helpful" or "Not helpful" after each technique." Even though above C average students were not required to attend the discussion groups, some chose to do so.

Table 32
Student perceptions of pre, during and post reading strategies

Learning the reading has three stages—pre, during and post reading.	Very helpful	Somewhat Helpful	Not Helpful
Above C average students	3 50%	3 50%	
Below C- average students	5 55.6%	3 33.3%	1 11.1%

Table 33
Student perceptions of learning about multiple choice questions

Learning that there are four different types of multiple choice questions.	Very helpful	Somewhat Helpful	Not Helpful
Above C average students	3 60%	2 40%	
Below C- average students	5 55.6%	3 33.3%	1 11.1%

Table 34
Student perceptions of learning how to predict exam questions

Learning how to predict exam questions.	Very helpful	Somewhat Helpful	Not Helpful
Above C average students	2 33.3%	4 66.7%	
Below C- average students	4 44.4%	4 44.4%	1 11.1%

Table 35
Student perceptions of using matrix study guides

Learning how to use the matrix study guides	Very helpful	Somewhat Helpful	Not Helpful
Above C average students	3 60%	1 20%	1 20%
Below C- average students	4 44.4%	1 12.55%	3 37.5%

Table 36
Student perceptions of finding main ideas

Learning how to find main ideas	Very helpful	Somewhat Helpful	Not Helpful
Above C average students	5 83.3%	1 16.7%	
Below C- average students	6 66.7%	2 22.2%	1 11.1%

As a group, the above C average students were more likely to find study information either "very" or "somewhat" helpful. They were the least likely to select that particular study information was "not helpful." Below C- average students were more likely to select that some study information was not useful at all. However, as a group below C average students were more likely to consider study information "very helpful" then they were to consider it "somewhat" or "not helpful."

Conclusion. Data from survey three showed that overall, above C average students were more likely to find matrix notes useful and attribute their success in the course at least partially to them. However, the remaining questions show that the below C-average students might be developing stronger study habits and better self-regulations skills. Finally, when student opinions of learning study information were compared, above average students were more likely than the below C- average students to find information "very" or "somewhat" helpful. However, if the below C-average students are considered as a group, they were more

likely to consider study information “very helpful” than they were to find it “somewhat” or “not helpful.

Interview Results

Interview responses have been arranged by grade— highest to lowest.

Student 6

Test 1	Test 2	Test 3	Test 4	Final	Average
86%	84%	95%	93%	100%	92%

Questions 1 and 2—what grade are you currently earning in the class and what factors do you feel are contributing to your success or failure in this class? Student six was a woman in her mid-twenties and a full-time college student. She was also active in student senate, and this semester, was elected president of a campus club. At the time of the interview she was earning a 94% in the class. According to her, the discussion groups were a factor in her success because they “taught her the proper way to retain information.” She felt Kuehn provided effective study aids—for example, she liked the power point outlines and the matrix notes that Kuehn gave the class. Student 6 felt that there were also some aspects of the class that have proved challenging. She felt that the on-line quizzes students take prior to taking the test did not adequately prepare students for the text because the questions on the quiz were more basic. This lulled students into a false sense of security because they believed the test would be as easy. The class was surprisingly difficult for student 6 because it was more time-consuming than she expected. While she felt discussion groups were a factor in her success, she felt they could have been more effective if groups were limited to only psychology students, or only ethics students as opposed to having both psychology and ethics students together in one study session.

Question 3: When you are studying for a test, how do you decide you have studied enough and are ready for the exam? Student 6 never felt ready for an exam. She described herself as a worrier who tended to panic before and during exams, but she found she felt more confident if she could describe course concepts and ideas to a person who was unfamiliar with the course. She said that if she could explain something from her class well enough that a person who was not familiar with the course could understand it, she must have mastered the concept. She often explained concepts to her grandmother because her grandmother was unfamiliar with psychology, but was intelligent enough to ask clarification questions. She also tried to apply concepts from the book to her own life. When she did these things she felt ready. She liked to take her notes on note cards, felt she was ready to take the test if she could picture her notes in her mind's eye.

Question 4: Prior to this class what, if any, note taking system did you use when you read textbooks? Student 6 used to highlight important information. She used a pencil to mark things that were important, and would put a dot by things she should know. She also took notes in the book itself. She used to simply read material over and over, but now she has begun to write headings, terms and important concepts in a notebook. She also began to give pretend lectures over the material so she could see how terms related to one another.

Question 5: Do you think the matrix study guides helped you? Why or why not? Student 6 reported she loved the matrix notes and would continue to use them. The third column opened her eyes since it emphasized connections between terms and concepts. Before, she just memorized the definitions of the terms. She also reported the graphic nature of the matrix notes helped her since they were more visual than other kinds of notes. She was able to use matrix notes to identify what she struggled with and felt the layout of the notes helped her

understand what she did not "get." The matrix notes helped her stay organized and she said she hoped to be able to use them for other classes.

Question 6: What, if anything, did you learn about studying that you didn't know before? According to student 6, the three step study plan was new to her. Before learning about it, she used to simply begin reading each day where she left off the day before without previewing or reviewing. She felt employing the three step study plan instantly raised her grade. She reported she did not know about other ways to take notes, but this semester she learned about the matrix notes as well as other note taking options. She also did not know that there were four different types of multiple choice questions or that it was possible to use headings, subheadings ant the matrix notes to predict test questions.

Student 16

Student 16's exam performance:

Test 1	Test 2	Test 3	Test 4	Final	Average
86%	89%	93%	84%	93%	89%

Questions 1 and 2—what grade are you currently earning in the class and what factors do you feel are contributing to your success or failure in this class? Student 16 was a traditional age college woman. She said she had a part-time campus work study job, and a leadership position in a community organization for high school students. She also volunteered. She estimated that her job, her leadership position and her volunteering took between 20 and 25 hours weekly. She guessed her current psychology grade to be a B+. Student 16 felt that there were a number of in-class structures that contributed to her success. For example, she felt the matrix notes were helpful since the third column helped her reflect back on what was important about the reading. She also liked the fact that the lecture power points were available on line and she could fill those out. Finally, she liked the "clicker quizzes" which were

in-class activities during which Kuehn passed out electronic clickers to students and asked them questions. Students used their clickers to select the correct answers. According to student 16, this allowed Kuehn to monitor student understanding of concepts so she could address student needs in subsequent lectures. Student 16 felt this was an effective test review, and said she has gotten a few test questions correct as a result of this review activity.

Student 16 reported that she was also taking Earth Science, another challenging class. But she has chosen to focus her efforts more on psychology. Her grade in Earth Science was a C at the time of the interview.

Question 3: When you are studying for a test, how do you decide you have studied enough and are ready for the exam? Student 16 indicated she was ready for exams when she could look at a term and know what it meant, and where to find it in the book. In her mind, if she could see the term "attached to a person" or if she saw a connection between the term and other terms or people she felt ready. She also felt she was ready for the test if she could connect a broad idea to a term, or if she could do the opposite—connect a term to a broad idea. She also felt ready for an exam if she could condense a broad idea down to a few words.

Question 4: Prior to this class, what, if any, note taking system did you use when you read textbooks? Student 16 learned an outlining system of note taking when she was in a high school geography class. She followed that outlining form, which emphasized organizing notes based on chapter headings. She liked this style of note taking and has adapted it for courses since then.

Question 5: Do you think the matrix study guides helped you? Why or why not? Student 16 liked the matrix notes for psychology, but explained that she felt it would not be appropriate for every class. She liked the fact that the "columns keep things orderly" and that

they "emphasized concepts." She also wondered if there was a way for her to combine her outlining system with the matrix notes.

Question 6: What, if anything, did you learn about studying that you didn't know before? This semester, student 16 learned that there are different ways to take notes and she hoped to use her new knowledge to fill in what she called "gaps" in her current note taking system. She also learned different ways to read the book—for example, she learned to make sure she could answer questions from the chapter. She added frequent reviewing to her strategies—for example, rather than read and take notes on an entire chapter before reviewing, she started to read and take notes on one section of a chapter and then review it before she moved on to the next section of the chapter.

Student 2

Student 2's Exam Performance: 94%

Test 1	Test 2	Test 3	Test 4	Final	Average
90%	8%	80%	82%	82%	84%

Questions 1 and 2—what grade are you currently earning in the class and what factors do you feel are contributing to your success or failure in this class? Student two was a woman in her mid-thirties who was married with a young family. According to her, her life experiences have given her a great deal of prior knowledge about psychology and she felt this contributed significantly to her success in the course. She has dealt with family members who suffered from mental illness so she was familiar with many of the terms associated with mental health. She was studying to become a nurse and recently had a psychosocial nursing class that covered many of the same materials.

Question 3: When you are studying for a test, how do you decide if you have studied enough and are ready for the exam? Student two looked at the matrix notes but did not fill them out. She used them as a guide to help her know what to expect on tests. She looked at

the center column for definitions but the third column for what she called “application.” She defined test readiness as a feeling of “confidence” that she would pass the test. She felt confident when she answered questions without a lot of thinking.

Question 4: Prior to this class, what, if any, note taking system did you use when you read textbooks? Student two reported she did not have a note taking system. She began by explaining how she took notes during class itself. She wrote down what the instructor wrote on the board and if things came up during class that she did not know, she wrote them down as well. Next, she described her note taking process while she read her textbook at home. According to student two, she highlighted what stood out to her, which were often things she did not already know. She also highlighted as a way to make connections between what she was currently reading and what she already read in another section of the textbook. She reviewed by looking over what she highlighted, and she highlighted anything she thought she might confuse. She also said she used the power point notes provided by Kuehn, and took the quizzes that were available on-line. She used them to determine what topics were likely to be on the exam, and used that to guide her studying.

Question 5: Do you think the matrix notes helped you? Why or why not? Student two reported matrix notes were useful because they helped her determine what Kuehn would like students to know, and put information together. She used matrix notes to compliment her lecture notes. For example, if Kuehn said something in class several times and she found it in the matrix notes, she knew it would be on the exam. Student two also indicated that she used clues to figure out what would be on the exam and when she reads, she consciously thought about what questions might be on the text. Student two reported that, if it had not been for the matrix notes, she would have had to come up with a different way to study.

Question 6: What, if anything, did you learn about studying that you didn't know before? Student two explained that the "three step study plan" was very helpful to her. She learned to read a section, and use the matrix notes to decide what was important. She said she chose to use matrix notes in Ethics and will use them in any class in which she does not have a note taking system.

Student Five

Test 1	Test 2	Test 3	Test 4	Final	Average
72%	83%	77%	98%	87%	83%

Questions 1 and 2—what grade are you currently earning in the class and what factors do you feel are contributing to your success or failure in this class? Student 5 was a single mother in her mid-twenties who also worked a job. According to her, she was only able to study after her son went to bed and by then, she was often exhausted. At the time of the interview, she was earning a B. According to student 5, she did not study as much as she should have at the beginning of the semester. For example, she did not review for the first exam, but she did review for test 2, and her grade improved.

Question 3: When you are studying for a test, how do you decide you have studied enough and are ready for the exam? Student 5 claims she never quite felt ready for exams. In order to feel ready, she reported she would have needed an entire week to devote to reviewing. Even though she did not feel she remembered much of what she read, she estimated that she was confident on 45-50 test questions. The remaining 10-15 questions she felt she might answer incorrectly.

Question 4: Prior to this class, what, if any, note taking system did you use when you read textbooks? According to Student 5, she had no note taking system for her textbooks. She self-reported that her GPA was 2.6 but she liked the matrix notes and wished other instructors

created them for their students because in psychology she was earning a higher grades than she normally did.

Question 5: Do you think the matrix study guides helped you? Why or why not? Student 5 felt the matrix notes really did help her. She filled them out and studied them for tests two and three, after she earned a low score on test 1. She reviewed by looking at the key points in the third column of the matrix guides because she felt that that provided a good guide to what she needed to know for each chapter. She also used them to figure out what did not know so she could re-read parts of the chapter that confused her.

Question 6: What, if anything, did you learn about studying that you didn't know before? Student 5 said that she learned to use the three step study plan and that there are four types of multiple choice questions. In her Natural Disasters class, she analyzed the test by looking for the four different types of questions. She reported psychology is her hardest class, but she was getting a better grade now because she has chosen to put more effort into the class.

Student 15

Student 15's exam performance:

Test 1	Test 2	Test 3	Test 4	Final	Average
78%	91%	71%	88%	77%	81%

Questions 1 and 2—what grade are you currently earning in the class and what factors do you feel are contributing to your success or failure in this class? Student 15 was a man in his late 30's. He worked a fulltime job about 45 minutes from the campus. He reported, "If I'm not working or studying, I'm sleeping." He indicated that, if he had more time, he would have devoted it to studying. When the semester began he had more time. He used to read the chapter and apply the strategies he learned in discussion groups. At the very least he would

read the chapters in several sittings. However, his schedule forced him to read the chapters all at once, and he did not have time to utilize the note taking or study strategies he learned.

In addition to his busy schedule, he felt there were class structure issues that impacted his success. For example, he said he could have suffered "death by power point" during the lecture. He also felt that the course was very structured and, even if students were confused about a concept, the class moved on. In Student 15's mind, this prevented him from developing an in-depth understanding of a confusing concept. He wondered if the class would be easier to follow if it met more often. He also believed more discussion would help since it would have given students a chance to try and work through what they did not understand. Student 15 is earning an 86%-- his test scores have ranged from C- to A's.

Question 3: When you are studying for a test, how do you decide you have studied enough and are ready for the exam? Student 15 said that he felt prepared for tests when he had a feeling he described as, "Oh, I know this." He also felt prepared if he thought he could answer questions about the topic. But, he decided that his feelings were not a good gage of how prepared he was because the test had oddly worded test questions. He said, "I think I know the information, but what crazy way will she word this question?" He explained that he often thought he had studied enough but he ended up being wrong. He thought part of the problem might be that he had what he described as an everyday understanding of the vocabulary as opposed to the formal psychological definition.

Question 4: Prior to this class, what, if any, note taking system did you use when you read textbooks? Student 15 indicated that he had no note taking system other than highlighting.

Question 5: Do you think the matrix study guides helped you? Why or why not? Student 15 thought the matrix notes did help him. He noted that he earned an A on the second

test and that was the only one for which he actually filled out the matrix notes. He gave up doing them because he simply did not have time, but he indicated that sometimes he did not see a relationship between the matrix notes and the exam.

Question 6: What, if anything, did you learn about studying that you didn't know before? Student 15 learned that he should break up the reading so he did not have to read the entire chapter at once. At first, he was only reading on Saturdays and Sundays, but now he has started to bring the book to work so he can break up the reading a bit more. While he did not always take notes, he agreed that doing so would be important. Student 15 earned his second highest score—a B+, on the last test because he felt that the chapters they read for the fourth exam incorporated ideas from other chapters, so the concepts "didn't seem like new stuff." Student 15 said he would skim the chapter and take the on-line quiz. He wondered if that would help him focus on main ideas. He also wondered if, over time, he had learned to read and "subconsciously think of test questions."

Student 10

Student 10's test performance:

Test 1	Test 2	Test 3	Test 4	Final	Average
90%	66%	66%	89%	89%	80%

Questions 1 and 2—what grade are you currently earning in the class and what factors do you feel are contributing to your success or failure in this class? Student 10 was a married man in his early 40's who had two small children. He lived about 45 minutes away from campus, and had a job. His employer was very supportive of his desire to earn a degree because it would make him a more valuable employee. This student's wife was currently earning a master's degree, so he felt pressure to keep up with her. Student 10 was an Iraq veteran who took medication for PTSD. He reported that his medication interfered with his ability to

concentrate. He felt his biggest challenge as a student was going beyond simply knowing facts and terms to understanding how they related. He said he was more likely to remember the dates that Freud lived than he would be to remember his contribution to psychology.

Question 3: When you are studying for a test, how do you decide you have studied enough and are ready for the exam? Student 10 did not always feel like he had a good sense if he was ready for a test or not. He had a good feeling going into the first test and ended up doing very well, but the second test was not a success. He did remember knowing while he was taking exam two that he might not pass. He felt more confident about the upcoming exam because it was about mental illness, and he had prior knowledge of it since his brother suffered from bi-polar disorder and he had PTSD. He also thought he would do well on the final since he had already been tested on all the information that would be on that exam.

Question 4: Prior to this class, what, if any, note taking system did you use when you read textbooks? Student 10 had been out of school so long that he did not have a note taking system.

Question 5: Do you think the matrix study guides helped you? Why or why not? Student 10 reported that matrix notes were more helpful to him than the power points designed to help students follow lectures. In fact, he started bringing the matrix notes to class so he could use them as lecture guides. He said they made him a more active listener because he had to select correct answers from the lecture. After he had practiced, he was able to complete third column and he began to see a connection between the matrix notes and the exam questions.

Question 6: What, if anything, did you learn about studying that you didn't know before?

Student 10 has learned to do what he called "stepping back"—which meant that he has learned to recognize that knowledge is not all about facts, but rather the relationships between those facts. He learned that summarizing was important. He liked learning about graphic organizers because they helped him see the relationships between ideas, and he began using them as a study method at home. He also learned that re-reading is not useful, and he was hopeful his grades would improve over time. He also felt he had learned a few techniques about the testing situation itself—for example, he no longer wished to be the first student done with the exam, and he has learned to rule out the obvious wrong answers first.

Student 1

Exam performance

Test 1	Test 2	Test 3	Test 4	Final	Average
72%	83%	73%	86%	76%	78%

Questions 1 and 2—what grade are you currently earning in the class and what factors do you feel are contributing to your success or failure in this class? Student 1 reported that outside stressors impacted his success in his classes. He self-described as a veteran with PTSD. Not only was he in counseling to help with his stress, he was also dealing with a "court case." While he did not elaborate, he did make it clear that he broke the law. According to him, after spring break stress overwhelmed him and he became "lazy." He did not attend class faithfully and put off studying. In addition to these challenges, he was also dealing with financial stress, serving as a volunteer on campus, and participating in a campus-run PTSD support group. He shared that his parents and two older brothers were all high school drop outs. He also was a dropout who later returned to complete his GED. He is hopeful that he broke the cycle of

dropping out of high school because his younger sister enrolled as a PSEO student. Student one would like to study social work.

Student one reported that factors inside class also impacted his success. He indicated that he enjoyed Kuehn as an instructor, but the test questions were confusing. The "wording is off," he reported. He explained that he did not believe that Kuehn intentionally put confusing questions on the exams, but she used different wording than the book does and that threw him off.

Questions 3: When you are studying for a test, how do you decide you have studied enough and are ready for the exam? Student one reported that his approach to studying changed during the semester. He said he used to read the chapter from beginning to end once, but in the discussion groups he learned that he needed to "warm up" (pre-read), "work out " (employ a during- reading strategy) and "cool down" (employ an after-reading strategy to review what he read.)

For his work-out, he read the questions on the matrix notes and tried to keep them in his mind while he read. He answered those questions while he read and then starred answers he felt were complete. For his cool-down, he returned to the matrix notes and re-studied the non-starred material. He also paid more attention to what Kuehn said in lecture and combined main ideas from the lecture with the notes. His grade dropped on his last test because he did not follow this process.

Question 4: Prior to this class, what, if any note taking system did you use when you read textbooks? Student one reported he did not have a note taking system in his Chemistry class because the problems that he did kept him too busy to take notes. He ended up getting help from tutors and friends to pass the class. This was his first experience having a system for note taking.

Question 5: Do you think the matrix study guides helped you? Why or why not? Student one indicated that the Matrix notes were more useful than activities like fill in the blanks. He liked using the center column to write the definitions, and used the third column to test himself.

Question 6: What, if anything, did you learn about studying that you didn't know before? Student one reported that the "three step study" plan was really important for him because the cool down was effective, and the questioning he did during studying was like a "pre-test" that he used to "assure" himself that he was learning. He began the "warm up" with difficult questions and spent a lot of time on the harder ones to make sure he knew them. Prior to this class, he did not spend time connecting terms or asking why the book was organized like it was.

Student Three

Student 3's exam performance:

Test 1	Test 2	Test 3	Test 4	Final	Average
78%	77%	71%	73%	86%	77%

Questions 1 and 2—what grade are you currently earning in the class and what factors do you feel are contributing to your success or failure in this class? Student 3 was a traditional age college student who was earning a C or C+ at the time of the interview. According to her, she worked three jobs and attended school full time. She worked between 20 and 40 hours a week and felt her schedule was one reason why she was not earning a higher grade in the class. She also felt there were some aspects of the course itself that were barriers to her achievement. For example, it was difficult for her to read three chapters for an exam—she felt it would be much easier to have an exam after every chapter so that she would not have to remember all the material from one chapter while she attempted to read and learn another

one. Student three also reported she was a hands-on learner who learned best when she processed information with other people. The lecture-style format of the class did not give her opportunities to do this. She commented that General Psychology required her to "teach herself" the material. When pressed to explain what she meant, student three said that the lectures were very informative and students were expected to read the book. However, during the lecture, she did not "learn anything." In another class, she had opportunities to do group work with other students and she really think that helped her. She indicated that she did not appreciate being told she needed to go to study groups.

Question 3: When you are studying for a test, how do you decide you have studied enough and are ready for the exam? Student three explained that she felt confident when she was ready for an exam. She described a time she went to the discussion group and the goal was to learn the difference between objective and projective tests. She said the fact that she and another student created a graphic organizer and talked through it gave her confidence that she knew that material. However, she did not believe studying in groups was realistic because students tended to have unpredictable schedules. Student three found it perplexing that she was able to successfully answer review questions in the on-line quizzes, but when she took the exam she did not know the answers to the questions. In grade and high school, she had an IEP and had exams read to her. She remembered being pulled out of class and being unable to take the same classes as her peers. She wondered if this was one of the reasons why she struggled with exams and why the questions were not what she expected. She described herself as having terrible test anxiety that had gotten better over the years.

Question 4: Prior to this class, why, if any, note taking system did you use when you read textbooks? Student three took a reading class at Central Lakes College where she learned

to write down main topics and draw diagrams (graphic organizers). She also learned to breakdown the sections of the textbook and figure out questions that might be on the test.

Question 5: Do you think the matrix study guides helped you? Why or why not? Student three said the matrix notes did help her break down the chapter and pick out main ideas, terms and questions. Her problem was that she was too busy to use the matrix notes consistently. She tended to wait until the day of the quiz to fill out the notes and often she did them after the quiz. They helped her "see how things are broken up" and she liked having organized notes She felt graphic organizers would be better for her because she liked to fill them out. However, she did not feel she could come up with her own graphic organizers because she still needed guidance.

Question 6: What, if anything, did you learn about studying that you didn't know before? Graphic organizers were helpful to student three, as was trying to brainstorm text questions. Anticipating text questions was hard for her she was learning to do it at the discussion groups. Learning the three step study plan was also helpful for her, as was learning to summarize.

Student 13

Student 13's exam performance:

Test 1	Test 2	Test 3	Test 4	Final	Average
70%	67%	68%	68%	64%	67%

Questions 1 and 2—what grade are you currently earning in the class and what factors do you feel are contributing to your success or failure in this class? Student 13 was a man in his late 30's. He self-reported that his course grade was a D—a fact he attributed to having taken on "too much this semester." He worked 30 hours a week at a job in a community about 30 miles from the college and another 20-30 hours weekly in a home-based business. He

was carrying 14 credits, as well. If he were not working so much, he would study more. He considered shutting down his home business but needs the money to meet his expenses.

Student 13 felt psychology was very different from his other courses. He was in a program where he felt he was basically "given the answers," so he did not need to study to earn good grades. He said that Psychology was the only class in which he needed to be "accountable." When asked what he meant by that he explained that this was the only class he had for which his study choices directly impacted his grade. He reported that he never had to develop study skills to do well in his classes. When he needed them this semester, he did not have them.

Question 3: When you are studying for a test, how do you decide you have studied enough and are ready for the exam? Student 13 did not feel he was ever ready for exams. He usually recognized the concepts and terms, but was unable to select the correct answers. He reported he usually selected answers that were not specific enough. He indicated that he learned from the test itself, which was not ideal since he should have entered the test having already learned what he would be tested on. Through the test questions themselves, he was able to figure out what the important ideas were supposed to have been.

Question 4: Prior to this class, what, if any, note taking system did you use when you read textbooks? Student 13 used to write down terms, but recognized during the semester that this was a "bad system." He started to write things down in class so he could connect the notes to class.

Question 5: Do you think the matrix study guides helped you? Why or why not? Student 13 tried the Matrix notes for the first test and "got away from it." He said the third column was helpful, and he began to use the matrix notes to compare terms and notes from class.

Question 6: What, if anything, did you learn about studying that you didn't know before? Student 13 learned that he needed to do more than simply learn definitions. Instead, he should have figured out what types of questions were likely to be on exams. He also learned that the end-of-the chapter summary could be a useful place to begin reading the chapter. He was always told as a child not to read the last pages of a book, so he applied that same approach to reading textbooks. However, he had concluded that not reading the chapter in order might help him.

Student 7

Student 7's test performance:

Test 1	Test 2	Test 3	Test 4	Final	Average
78%	47%	63%	59%	70%	63%

Questions 1 and 2—what grade are you currently earning in the class and what factors do you feel are contributing to your success or failure in this class? Student 7 was a Native American woman in her early 20's. In addition to going to school, she worked 35-40 hours a week in a community about 45 minutes from the campus. While she did not have her own children, she played an active role in the lives of her three and five year-old siblings. She reported her family life was very complicated and that, if things were calmer in her personal life, she would have had more time to study. Student 7's scores dropped after her initial exam.

In addition to the fact that her personal life was challenging, she felt there were some in-class barriers as well. She did not believe the on-line quizzes were related to the tests. In class students were given power points they could use to take notes, but according to student 7, they were not very in-depth and she wondered what was important to Kuehn. According to Student 7, lecture sometimes focused on something that did not end up on the test, but it skimmed over something that ended up being important.

Question 3: When you are studying for a test, how do you decide you have studied enough and are ready for the exam? Student 7 felt she knew the material when she could look at the summaries written at the end of each chapter, read them and understand them well enough to explain them to someone else. She used this as a study technique.

Question 4: Prior to this class what, if any, note taking system did you use when you read textbooks? Student 7 used the Cornell notes which she learned in her READ II class. Overall, she earned B's and C's, and she believed the Cornell notes have worked for her.

Question 5: Do you think the matrix study guides helped you? Why or why not? Student 7 did not feel the matrix notes helped her. According to her, nothing on the matrix notes related to the test. Column three helped her the most because answering the questions got her "mind working" and put her in a "real life situation." Even though column three had this benefit, she did not see connections between the matrix notes and the exams because she used the matrix notes mostly to study vocabulary.

Question 6: What, if anything, did you learn about studying that you didn't know before?

Student 7 felt that she learned how to break down the summary in the back of the book to use as a study guide. She felt her grades might be lower if she had not attended study groups, which helped her to focus on this class.

Student 9

Student 9's Test performance:

Test 1	Test 2	Test 3	Test 4	Final	Average
64%	58%	50%	70%	69%	62%

Questions 1 and 2—what grade are you currently earning in the class and what factors do you feel are contributing to your success or failure in this class? Student 9 was a

traditional age college student who was homeschooled and did most of her homework with her mother's help. She also reported she suffered from severe test anxiety and that whenever she sat down to take a test her mind went blank. She has never sought accommodations for her anxiety. She also believed the test questions were "tricky." However, student 9 did not have a job so she had time to study.

Question 3: When you are studying for a test, how do you decide you have studied enough and are ready for the exam? Student 9 felt ready for the test when she was confident that she would pass it. "I stop questioning myself if I am ready," she said. When asked about her study habits, student 9 shifted the focus away from her current habits to new study technique she learned in discussion groups she thought would serve her well in the future. She worked with a classmate to develop a graphic organizer designed to show the similarities and differences between objective and projective tests. After she finished the graphic organizer, she was able to describe it from memory. The idea of testing herself before an exam was new to student 9 and she hoped to do more of this semester.

Question 4: Prior to this class, what, if any, note taking system did you use when you read textbooks? Student 9 never developed a note taking system because as a homeschooled child, she did not need one. As a college student, she decided she needed to develop one so she wrote a composition paper about changing her study habits. Her major conclusion was that she needed to study but take frequent breaks.

Question 5: Do you think the matrix study guides helped you? Why or why not? Student 9 reported that matrix notes did not help her. She did not fill them out because she did not believe she needed to. She said filling them out was boring and she chose not to use them.

Question 6: What, if anything, did you learn about studying that you didn't know before? Student 9 learned to use graphic organizers to study. She liked them because they helped her see the relationships between terms.

Student 11

Student 11's test performance:

Test 1	Test 2	Test 3	Test 4	Final	Average
64%	49%	63%	54%	74%	61%

Questions 1 and 2—what grade are you currently earning in the class and what factors do you feel are contributing to your success or failure in this class? Student 11 was a single woman with no children in her mid-twenties. Although she did not have family responsibilities, she did have a demanding job that interfered with her ability to study. Her boss had given her more hours and responsibilities because another employee quit and another was having medical problems. Student 11 felt she was constantly being asked to choose between work and school. She often chose work because she needed money to pay for school. Student 11 was in the last semester of her program and her program grades were A's and B's. Psychology was an elective and she was not prepared for the demands of the class. In her program faculty worked together to coordinate due dates for major assignments so students did not need to work on more than one major project at a time. However, psychology was outside the program curriculum and not subject to the same coordination. Student 11 prioritized her program classes because she felt they came closer to helping her reach her life goals. Student 11 said she believed community college instructors should work around students' lives and jobs, since, if students had the resources to attend school full-time, they would have attended a university. She felt psychology was very time-consuming and provided little "lee way" for deadlines and due dates, which created problems for students who needed to work. Finally, she

said that students were not given enough time to absorb concepts before they needed to move to the next chapter. Student 11 felt she was slower to grasp concepts than other students and the extra time would have helped her. Student 11 was earning a C at the time of the interview. Her exams have been F's and D's, but her other assignments brought up her grade.

Question 3: When you are studying for a test, how do you decide you have studied enough and are ready for the exam? Student 11 felt she was never ready for exams. She reported that regardless of how long she studied, she did not know how to prepare since the test questions were "tricky" and she could not determine what Kuehn was "looking for."

Question 4: Prior to this class, what, if any, note taking system did you use when you read textbooks? Student 11 learned how to highlight information, so she highlighted terms in her book and went over information until it "stuck." She focused on studying the terms. She also took notes during class and used those to study.

Question 5: Do you think the matrix study guides helped you? Why or why not? Student 11 did not feel the matrix notes helped her. She felt they gave her a general idea of what might be on the exam but did not help her decide what specifically Kuehn wanted her to focus on. The notes required her to summarize, a task she did not feel she could do since the concepts were too complicated for her. Because she found the lectures hard to follow, she did not feel comfortable approaching Kuehn to ask questions. Instead, she asked questions of other students who, she reported, were just as confused as she was. She reported the vocabulary Kuehn used in lecture was too hard for her to understand.

Question 6: What, if anything, did you learn about studying that you didn't know before? Student 11 reported that she benefitted from learning the four types of multiple choice questions and she thought the 20 word summary was an effective exercise. She also felt the three step study plan was useful and she would use that again. She indicated that she did not

care for graphic organizers since they did not help her remember the meanings of important words or terms.

Student 4

Test 1	Test 2	Test 3	Test 4	Final	Average
58%	60%	66%	43%	62%	58%

Questions 1 and 2—what grade are you currently earning in the class and what factors do you feel are contributing to your success or failure in this class? Student four was an African American man in his mid-thirties. According to him, his test scores have improved over the semester. Student 4 was a parent of three children. He reported that his youngest child, an 11 year old daughter, was indifferent to school until he began to take studying more seriously this year. She made the honor roll and earned 49th place overall in an academic competition that involved over one-hundred other students. This student was motivated to improve his studying so he could be a role model for his daughter.

Student 4 was the only student this semester who attended discussion groups last semester when he took Anatomy and Physiology. According to him, the discussion groups opened up his eyes to new ways of studying. For example, he learned he should read a few pages at a time as opposed to an entire chapter at one sitting. He also learned that he should verify that he understood what he read before moving on to the next section. He has begun to do this by imagining what would be in the chapter summaries, and then reading them to see if they matched his expectations. If they did not match he re-reads that chapter. He was using the new strategies he learned in his sociology class and was earning a 78%. Student 4 explained that vocabulary was difficult for him but he was beginning to do a better job of figuring out words he did not know. He indicated that he would be graduating this spring and wished he would have known these strategies sooner.

Question 3: When you are studying for a test, how to you decide you have studied enough and are ready for the exam? Student 4 reported that he often felt ready for exams in the past, but he actually was not. Recently, he decided that he knows the material if it felt like a refresher when he reviewed it. He also has begun to try to figure out test questions it is very difficult. When he used the Matrix notes he focused on the third column because he felt what was in it will most likely appear on the test. He felt the third column helped him "see what she is doing."

Question 4: Prior to this class, what, if any, note taking system did you use when you read textbooks? Student 4 used to re-write definitions over and over because he believed "it would stick" in his mind. He used note cards and largely focused on memorization.

Question 5: Do you think the matrix study guides helped you? Student 4 feels the matrix notes were helpful. At first, he used both the lecture outline Kuehn provided and the matrix notes, but he began to just use the matrix notes.

Question 6: What, if anything, did you learn about studying that you didn't know before? Student 4 reported the most useful thing he learned was to break down words so he could understand their roots, prefixes and suffixes. This helped him to recognize words when he saw or heard them again. He also learned the importance of scheduling time to study in a quiet place. He started to arrive on campus at 7:00 to study.

Student 12

Student 12's Exam Performance:

Test 1	Test 2	Test 3	Test 4	Final	Average
62%	74%	66%	43%	62%	58%

Questions 1 and 2—what grade are you currently earning in the class and what factors do you feel are contributing to your success or failure in this class? Student 12 was a

man in his mid-twenties with two small children under age three. He felt that caring for his children impacted his study time, but he also indicated that he had "no excuse" for not doing better in the class. He explained that he knew the class was going to be difficult but he made made irresponsible personal choices anyway. For example, he spent his study time watching sports playing outside than he should have. Around spring break, he developed what he called a "case of the screw-its." He stopped attending class and his grades suffered.

Student 12 was a program student who had such a passion for his program classes that he put off his general electives until the last semester and then took them all at once. He indicated that he "had an epiphany" when he realized saving all his generals for the last semester was not a good idea.

Finally, he believed being tested on three chapters at a time contributed to his poor scores. He felt he would do better if he had been given a test after each chapter. At the same time, he reported that did not try hard enough because he found some of the material boring.

Question 3: When you are studying for a test, how do you decide you have studied enough and are ready for the exam? Student 12 felt he was ready for an exam when he could actually use the proper terms to describe concepts and explain them to friends and family. He reported that he rarely felt ready for tests in this class because of his poor personal choices.

Question 4: Prior to this class, what, if any, note taking system did you use when you read textbooks? Student 12 did not have a note taking system. In the past he read and focused on terms. He has started to think up test questions by using headings and subheadings.

Question 5: Do you think the matrix study guides helped you? Why or why not? Student 12 reported that he did not use the matrix notes, but they would have likely been helpful if he had. He explained that he "gave up" on the class.

Question 6: What, if anything, did you learn about studying that you didn't know before? Student 12 said that breaking down the chapters by turning headings into questions and using symbols to mark particular types of information (a style of annotating) was helpful. He did use both of these techniques, but he gave up. If he could do it over again, he would use those techniques and do well.

Student 14

Student 14's exam performance:

Test 1	Test 2	Test 3	Test 4	Final	Average
48%	56%	61%	54%	61%	56%

Questions 1 and 2—what grade are you currently earning in the class and what factors do you feel are contributing to your success or failure in this class? Student 14 was a man in his early 40's who reported that he was earning a C- in the class overall. In addition to carrying 21 credits, he worked 15-20 hours weekly at a campus job and worked retail on the weekends. In his neighborhood, he offered free snow removal and home care services for the elderly. He described himself as "overextended," but followed this up by saying that none of his advisors or his program instructors tried to dissuade him when they learned of his credit load. Student 14 had been an A and B student, but he was too busy and psychology was too time-consuming for him to keep his grades up. Student 14 wished tests would each be over one chapter as opposed to over three at a time. He said it was very challenging to keep three chapters in his mind at once.

Question 3: When you are studying for a test, how do you decide you have studied enough and are ready for the exam? Student 14 reported he did not really know when he had studied enough to be ready for an exam. He drew a comparison between studying for psychology and studying for his program courses. He reported that in his program courses he

could look over his notes and have a nearly immediate understanding of how he would be tested. He was able to accurately predict test questions. He reported that the power points he received from his instructor were arranged clearly, so it was easy to see the main point and draw conclusions about the tests. He said psychology tests were different. He took the quizzes, but the same questions did not end up on the exams. He felt he could never be sure what would be on the exam. He felt he had basically "given up on the class" and decided that it was not for him.

Question 4: Prior to this class, what, if any, note taking system did you use when you read textbooks? Student 14 did not have a note taking system for the class. His system historically had been to look for important people and write down what they did. While he read, he asked himself "Will I need this later?" If he thought he would, he wrote it down. During power point presentations, he sometimes wrote information that was not on the slide.

Question 5: Do you think the matrix study guides helped you? Why or why not? Student 14 reported the matrix notes irritated him because there was not enough room to write. He also admitted that he may have gotten lazy and decided not to use them. He did not have the time to fill them out and wondered if they could be completed during weekly quizzes.

Question 6: What, if anything, did you learn about studying that you didn't know before? Student 14 learned to stop at each section of the textbook to verify he understood what he read before he moved on to the next section. He reported he simply needed more time, and indicated that he had learned many useful techniques in discussion groups, but he simply did not have time to implement them.

Student 8

Student 8's Test Performance

Test 1	Test 2	Test 3	Test 4	Final	Average
52%	65%	55%	50%	51%	55%

Questions 1 and 2—what grade are you currently earning in the class and what factors do you feel are contributing to your success or failure in this class?

Student 8 was a woman in her early 30's. She was of African descent and an English Language Learner. She worked 40 hours a week at an area nursing home and had no days off. She believed her work schedule was a factor in her low grades. Since she worked every day, she crammed when she could but did not study at all when she was busy.

In addition to outside-school challenges, she felt there were in-class barriers as well. She reported that the testing environment was very distracting for her. When people got up to leave, she lost focus. Also, student 8 felt she would have earned higher grades if tests covered one or two chapters as opposed to three.

Question 3: When you are studying for a test, how do you decide you have studied enough and are ready for the exam? Student 8 asked herself questions to determine if she was ready for an exam, and after she read the summary. However, she did not feel like she had yet developed a reliable system for studying. When she received the results of her exams she was always surprised by her low scores. She would say to herself, "I suppose I didn't understand it, maybe."

Question 4: Prior to this class, what, if any, note taking system did you use when you read textbooks? Student 8 took READ II at Central Lakes College, and she learned various methods of note taking. However, she did not apply what she learned in her Reading class to note taking for her other classes. She explained that she learned the Cornell method in her reading class and used it on the book she had to read for that class. Later, she took a biology class. While she knew she should have used the Cornell method in her other classes, she did not

see how a note taking system she learned in a reading class would work in a class like biology. After that, she did not take Cornell notes anymore.

Question 5: Do you think the matrix study guides helped you? Why or why not? Student 8 reported the matrix notes did help somewhat because they required her to put information in her own words and that helped her to remember more than simply copying definitions would have.

Question 6: What, if anything, did you learn about studying that you didn't know before?

Student 8 claims that learning the three-step study plan was helpful since, during the warm up she learned what the chapter would be about, during the workout she read and during the cool down, she tried to answer questions without looking back through the book. This helped her determine what she did not understand.

Interpretation of Results

Survey 1

Two significant findings from survey one were that the majority (71%) of students spent 1-3 hours reading the chapter and that reviewing notes was the most popular way for them to study. When students were presented with six review strategies and prompted to select all the strategies they typically used, the 31 students generated a total of 71 responses. The most popular was reviewing notes (38%). The next most popular strategy after that was "memorizing terms" at 18.3%.

Another significant finding was that students were more likely to take lecture notes than they were text notes. Thirty out of the 31 students surveyed took lecture notes, but only 17 out of the 31 reported that they took notes on their text. The most common way for

students to take notes was to highlight and underline (48%). The next most popular strategies were copying bolded words (20%) and main ideas, and using headings and subheadings to determine main ideas (20%). Finally, matrix notes were favorably received among students. Students were presented with seven options about matrix notes and they were told to select all options they felt described their experiences with them. Students generated 86 responses. Only 5.8% of the responses indicated that matrix notes were not useful, while the remaining 94.2% of the responses indicated that matrix notes were helpful in some way. The most common response students selected was "matrix notes helped me see connections between concepts and terms" (26.7%), followed by "Matrix notes helped me pick out main ideas," (25.5%), then "Matrix notes gave me a better idea what would be on the exam" (23.3%) and finally, "Matrix notes helped me see how the textbook was structured and organized" (18.6%).

The study behaviors of students who studied between one and three hours compared to students who studied between four and six hours were compared. As a general rule, students who reported studying between one and three hours used many of the same study strategies as did students who studied between four and six hours, but there were differences in how the two groups took lecture and text notes. The groups used the same study and review activities. Re-reading the chapter, reviewing notes and memorizing terms in order to prepare for tests were the top three activities for both groups. The groups were also similar in how they approached note taking during lecture, although the students who studied less actually seemed to process the lecture more thoroughly. Twenty-five percent of the students who reported to study between one and three hours selected, "I write down what the instructor writes on the board plus anything she says that explains a concept I read about in the book. I also write down answers to any questions I wrote down while studying," while only 12.5% of the students who study four to six hours selected this response.

Seventeen out the 36 students surveyed took notes while they read. Represented in that group were students who studied between one and three hours, and students who studied between four and six. The groups showed differences in terms of how they read texts. Students who studied fewer hours favored underlining and highlighting their books and they were more likely to copy terms and definitions as part of their studying. However, fifty percent of the students who reported to study four to six hours used textbook features to determine main ideas, and marked confusing parts of their text so they could ask questions in class. Only 13.3% of the students who study between one and three hours indicated they engaged in either activity.

The one to three hour students and the four to six hours students saw matrix notes in a similar way. Twenty-five percent of the one to three hour students vs. 27.8% of the four to six hour students felt the matrix notes helped them connect concepts and terms and pick out main ideas. A nearly equal percent of students from each group (23.3% vs. 22.2%) indicated that matrix notes gave them a better idea what would be on the exam. Twenty-percent of the one to three hour students and 16.7% of the four to six hour students reported using the matrix notes helped them notice how the book was organized.

Survey 2

One major conclusion to be drawn from survey two is that students were willing to try new strategies and amend their approach in order to improve grades. When students were asked what strategies they adopted in response to their first test grades, only 2.5% selected option B “I’m unhappy with my score, but have not made any changes to my studying.” Forty-one percent of students indicated that they changed their study habits as a result of attending reading groups, and 35.7% said they “learned techniques” that will help them study differently. The most popular change for students was using matrix notes—37% of students reported they

began using the matrix notes in response to an unsatisfactory test grade. When students were broken down into groups based on whether they had improved, stayed the same or earned a lower score on the second test, there was no clear pattern of effective strategies that led to increased success. The most popular strategy across all groups was using the matrix notes, followed by attending reading groups. It seemed as though simply using the matrix notes did not raise grades.

There seemed to be a clear pattern in what students who earned higher grades vs. students who earned lower grades know about studying. When students were asked to identify what they knew about studying before coming to college, it became clear that students who earned higher grades on the first exam entered college understanding more about how to structure study sessions, take notes and prepare for exams than did students who earned lower grades on the first test. Students were broken up into three groups—group one, the "above C average group" consisted of students whose grades on exam one and two were above a C. Group two, the "improved group," consisted of students whose first grade was below a C-, but who earned a higher grade on the next test. The last group, the "below C group" earned below a C- on both tests. Of the students who earned a C or above on the first test, 81.8% entered college knowing that there were different ways to take notes for a class, while 20% of the improvers knew this, and 43% of the students in the "below C group" entered college knowing that. Forty-five percent of the "above C average" students entered college knowing that when they studied, they should begin with a "warm-up" or pre-reading activity, and then continue with a "work out" or during reading strategy, and should end with a "cool down," or after-reading strategy. Twenty percent of the improvers and 27% of the "Below C group" knew this. All of the "above C" students knew that headings and subheadings could help them find main ideas when they read, while 80% of the "improvers" and 57% of the "below C group" knew this.

The majority of the "above C" students (81%) already knew that memorizing terms was not effective. Rather, they needed to connect terms to headings, subheadings and to one another. Only 40% of the "improvers" knew this and 27% of the "below C" group did. Finally, answers between the groups suggested that students who earned higher grades entered college with a greater awareness of test preparation. Among the "above C" group, 73% entered college knowing it was possible to predict test questions, while none of the "improvers" knew this, and 29% of the "below C" students knew this.

Survey 3

By survey three, it was possible to divide students into two groups; those whose exam averages were C average or higher, and those whose exam averages were C- of lower. Survey three examined the differences in study habits between these two groups. Survey results demonstrated that students who earned lower grades were less likely to see matrix notes as useful. When students were asked to respond to the prompt "The matrix study guides definitely made me more successful in this course," 16.7% of the below C- average students indicated that they agreed, while 63.6% of the above C average students agreed.

Students were also asked to identify particular ways the matrix notes may have been useful for them. Below C average students were less likely to have seen the notes as a useful tool to achieve study goals. Fifteen percent indicated that they already had a note taking system they liked so the matrix notes did not help them, while none of the above C average students selected this option. Likewise, 15% of the below C- average students agreed that the matrix notes helped them understand how terms and concepts related to one another, while 25% of the above C average students agreed. One area where the groups differed is when they were asked if matrix notes helped them see how the chapter was organized. Forty-five percent of the below C- average students said they did, while only 22% of the exempt students did.

Students were asked to read a series of study habits and practices and select how often they engaged in each one. Frequency was determined by adding the percentages in the "always" and "most of the time" categories. For the most part, the above C average students' habits were not much different than the habits of their less successful counter parts when it came to whether they "studied very day" or "reviewed their notes." However, more "Below C- average" students reported that they "took notes" while they read and "looked over the chapter ahead of time to see how it would be organized." The only response the "above C average" students selected more frequently was "I predict exam questions." These results suggest that lower ability students are acquiring study habits.

For the most part, the "above C average" and the "below C- average" groups had similar views of the usefulness of information about studying. Students were asked to read a statement about studying and respond by selecting that learning this information was "very helpful," "somewhat helpful" or not helpful." As a group, "above C average" students were much less likely to indicate that learning any information about studying was "not helpful." Conversely, as a group, the "below C- average" students were more likely to consider the information they learned about studying to be "somewhat helpful" or "unhelpful." The following areas showed notable differences in the responses of the two groups. Thirty-three percent of "above C average" students agreed that "learning how to predict exam questions" was "very helpful," while only 44% of the "below C average" students felt this way. There was also a difference in how the two groups saw learning how to use the matrix study guides. Sixty percent of "above C average" students found them "very helpful" compared to 44% of the "below C- average" students. The two groups also differed in how useful they found learning how to find main ideas. Eighty-three percent of the above C average students found this "very helpful" while 67% of the below C- average students agreed.

Interview Results

One-on-one interviews revealed many of the same patterns the surveys did. A total of 16 students were interviewed; one student was earning an A average on exams, five were earning B's, two were earning C+'s, four earned a D exam average while the remaining four earned an average of F. For the purposes of interpreting answers, students were divided into two groups—successful and unsuccessful. Successful students were defined as earning a C+ or above, while unsuccessful students were defined as earning D's and F's. There were eight successful students and eight unsuccessful ones.

Successful students. As a group, successful students actively connected course components, spent time predicting test questions, and had a system for taking notes. They also adapted the matrix notes to fit their study routine. Successful students spoke about taking study time to actively connect course components, or of having a note taking system that emphasized looking for connections. Each of the eight successful students described a unique way of looking for connections. They noticed where the book and the lecture intersected, or they saw how concepts in one chapter related to concepts in another. They also noted how terms and concepts within a chapter related. Five of the successful students made a conscious effort to predict test questions by either using the textbook structure, information from lecture, the matrix notes or the quizzes. Potentially the most significant difference between successful and unsuccessful students was that they had a note taking system of some kind. While each system varied, students spoke about highlighting information that described a relationship between concepts or course components, or of making graphic organizers to show relationships. They also indicated that they used colors or symbols to mark different kinds of information, such as important ideas or confusing concepts. Two of the students reported that matrix notes represented the first note taking system they had ever had.

Another finding is that only successful students discussed how what they learned psychology applied to their personal lives. Two students either had family members who suffered from mental illness or had mental health challenges of their own. Both students described how prior knowledge of medications and mental illnesses helped them with the chapter on mental illness. Six out of the eight successful students articulated how they worked with concepts by explaining them to someone else or thinking about how what they learned applied to their lives. For example, they might have thought about what unconditioned stimuli they responded to in their work routines, or they might have considered whether they utilized defense mechanisms.

Finally, the successful students all indicated they found the matrix notes useful, but they did not use them in the same way. Several students utilized them to predict test questions, while others used them to identify confusing material. Even though the matrix notes were originally developed as a reading aid, one student used them during lectures and then compared what he learned there to his reading. The two students who indicated that matrix notes were the first note taking system they had ever used said they used them to distinguish between terms and concepts. All successful students found some way to use the matrix notes to enhance their study routines.

Unsuccessful students: As a group, unsuccessful students were more likely than unsuccessful ones to have reported that outside forces, such as jobs or family stress, were barriers to their success. They also either had no note taking system or relied on memorization and they, unlike the successful students, were unwilling or unable to adapt the matrix notes to fit into a study routine.

Six of the eight unsuccessful students said that they worked full-time and went to school full-time, and their schedule prevented them from being successful students. Most of

them seemed to feel their jobs were more important than classes, and if they had to sacrifice a class or a grade to work they would. Several spoke about feeling as though they were under great financial stress.

Unsuccessful students had various responses when asked to describe their note taking system, but the majority of their answers focused on memorizing as a technique. Five reported that they wrote down terms and memorized them. One even wrote out terms repeatedly. However, three of the five indicated that having the matrix notes to study from helped them understand that simple memorization was not an effective study technique, but their busy schedule prevented them from being able to master more effective study strategies. One student described how, as a home schooled child, she was never required to develop a note taking system. The remaining two students took a READ II class at Central Lakes College where they learned a variety of note taking strategies. One did not apply what she learned in her READ class to her other classes. According to her, she was unable to see a connection between what she read there and what she was reading for her other classes. The other student reported she used the Cornell method. While nearly all successful students talked about noticing connections between terms and concepts, only one unsuccessful student did. While several of the unsuccessful students described attempting to put concepts in their own words, they did not go as far as connecting concepts to their lives. Two of the unsuccessful students reported that the concepts in the psychology class were simply too hard to put into their own words.

While all of the successful students liked matrix notes, only one of the unsuccessful ones did. Four of the unsuccessful students did not use them. Three of them reported to be too busy, while the fourth did not want to fill them out because they were not required for the class and she found them boring. Unsuccessful students also did not see a relationship between the matrix notes and the exam. While they recognized that the third column helped them think

about the material and put it in their own words, they reported that it did not prepare them for the exam. For various reasons, the unsuccessful students did not find the matrix notes to be a helpful way to prepare for exams.

However, the dominant characteristic of the unsuccessful students was that they tended to identify individual strategies that helped them study as opposed to articulating a comprehensive study plan. They were much more likely than successful students to believe that the course structure was a barrier to success. Unsuccessful students said they used the strategies of turning headings into questions, writing down terms, learning how to write 20 word summaries or using text book features as being helpful for but they did not they explain how those particular strategies fit into a study plan. Two of the unsuccessful students reported to appreciate graphic organizers as a study technique, but one explained how she would not be capable of developing graphic organizers by herself. If unsuccessful students did identify an approach to studying, it tended to be vague or nonsensical. For example, one student said her approach to studying was to take more breaks.

Even though they were unsuccessful, interviews revealed that these students were trying to improve their studying and their grades. Many reported to have embraced new ways to study, while others were amending strategies they had realized were ineffective. Most were open to changing their habits, but did not feel they had the time or the cognitive resources to do so.

Unsuccessful students were also more likely to bring up course structure issues as factors in their lack of success. They reported that the quizzes and matrix notes had nothing to do with the tests, and the timing of the quizzes was problematic. They complained the test questions had “tricky” wording or it was too much to expect them to read, study and test over three chapters. As a group, unsuccessful students had difficulty describing a comprehensive

study plan. Rather, they described specific strategies that they had used and enjoyed, and tended to blame their lack of success on course structure.

Chapter 5: Discussion

The purpose of this project was to determine if matrix notes would help students take more effective notes on their textbooks, and if those notes would lead to higher grades. The study's hypothesis was that matrix notes would increase textbook feature awareness in unsuccessful students, and help them develop self-regulation skills that would lead to deeper processing and higher exam grades.

Three self-regulating strategies were examined—the presence of or development of deeper processing strategies, the elimination of ineffective study strategies and finally, evidence of a study plan that included specific attention paid to exam preparation, and some reference to pre, during and post reading strategies. The data supported the hypothesis that Matrix notes increased textbook feature awareness. Students did develop deeper processing strategies and eliminated unsuccessful strategies, but it was difficult to tell whether matrix notes or discussion groups, which began that semester, played a bigger role in helping students develop these stronger study approaches. The data did not support the hypothesis that students would use the matrix notes as a tool to prepare for exams. However, there was evidence to support the hypothesis that matrix notes would increase overall exam score averages.

Growth in textbook feature awareness among lower ability students

The surveys suggested that students did grow throughout the semester in their ability to use textbook features to guide studying. Surveys one and three each asked students to reflect on the impact they believed matrix notes had on their studying. One of the seven options they could select was "Matrix notes helped me see how the chapter was organized." Since students were invited to select as many option as they felt applied to them, the 31 students who

responded made 86 responses to this survey one question. The vast majority of the responses (94.1%) said matrix notes were helpful, but only 16 of the total responses (18.6%) indicated that matrix notes helped them notice textbook organization. In the third survey, the 25 students surveyed made a total of 56 responses to this question. The percentage of students who claimed that the matrix notes helped them notice how the chapter was organized increased to 30.8%. These findings suggested that the matrix notes did help students develop an awareness of textbook features.

The patterns of survey answers provided clues about the role the matrix notes may have played in helping students gain text book awareness. By the time students took the second survey they had completed two exams and had received grades for them. They were asked to select all the ways they changed their studying between the first and second exams. Twenty-five students responded to the second survey and made a total of 40 responses. The most popular response (37.5%) was to begin using the matrix notes. It seemed that students who were unhappy with their text scores and were seeking new ways to study looked to the matrix notes as an answer. From the survey, it was not possible to determine how students chose to use the matrix notes. Some may have used it as a review, while others may have simply filled out the second column. However students chose to use them, it was clear that they turned to matrix notes to improve their studying. Since matrix notes featured headings and subheadings and made clear distinctions between concepts and terms, it was possible that using the matrix notes caused students to pay attention to textbook structure in a way they had not before they began to use them.

In two areas, surveys revealed that lower ability students seemed to developing study habits that more closely approximated those of their more successful peers. The third survey suggested that, by the twelfth week of the semester, lower ability students were noticing

textbook organization to a greater degree than the higher ability students. By the third survey, since students had taken three exams, it was possible to sort them into two groups—students who were earning below a C- average on exams, and students who were earning above a C. Forty-five percent of the students who were earning below a C- indicated that matrix notes helped them notice textbook organization, while only 21.9% of the C and above group did. An explanation for this result is that the above C group was already in the habit of noticing how the textbook was arranged. Since matrix notes did not teach them that particular skill, they did not indicate it on the survey. However, the C- and below students, who were not in the habit of noticing how textbooks were organized, may have learned to do so as a result of using the matrix notes.

Responses to another survey three question suggested that lower ability students were acquiring text book feature awareness. On the third survey, students were asked to read a series of statements describing effective study behaviors. Next, they were invited to select how often they engaged in that particular behavior by checking a box next to the words “always,” most of the time,” “some of the time,” or “never.” Out of the six study habits they had to select from, the one that related most closely to textbook feature awareness was, “ I looked over the chapter ahead of time so I could see how it was organized and what ideas would be important.” Among the students who earned a C or above, 58.3% of them said they engaged in this particular study strategy either “always” or “most of the time,” but among the C- and below group, 75% of them used that as a strategy. It seemed counter intuitive that less successful students would be more likely to engage in this effective study strategy than more successful students. There were several possible explanations for this finding. One was that, for successful students, this sort of preview may be so automatic that they do not notice they are doing it. Therefore, they do not record it as a habit. Another possibility was that less successful students

have, throughout the course of the semester, developed this new habit. Since it was a new habit, they were more apt to recognize that they were using this new strategy since they were still working to master it. It is also possible that lower ability students interpreted "ahead of time" to mean "before the lecture" as opposed to "before sitting down to read thoroughly," which was the intended meaning. Once again, it was also possible that the interventions made available to students such as the matrix notes and the discussion groups made them aware of the importance of previewing. This issue will be discussed further later in the chapter.

Evidence of an increase in self-regulation

For the purposes of this study, the use of deep processing strategies, the exchange of ineffective study habits for more successful ones and the presence of a study plan were considered self-regulation. The surveys and the interviews were examined for evidence that students were employing these strategies.

Deep processing strategies

Deep processing strategies were those that required students to actively look for relationships or connections between terms and concepts, use text structure to inform note taking or explain course materials in their own words.

Evidence that students needed to develop deep processing strategies. Early survey responses demonstrated that students had a definite need to develop deeper processing strategies, but by survey three, they had begun to acquire them. The first survey asked students to answer "yes" or "no" to the question, "Do you take notes when you read?" Out of the 31 respondents, 17 took notes while 14 did not. Of the 17 who took reading notes, their processing strategies were more indicative of shallow processing than deep. Students were asked to read four note taking strategy options and select all the ones they felt described how they took notes. The first two options represented shallow options. They were "I highlight or underline

what I think is important" and "copying bolded words and their definitions." The last two strategies were deep. They included "copying down bolded words and their definitions as well as main ideas" and "I use headings and subheadings to help me figure out main ideas and I highlight those or write them in a notebook. If something confuses me, I will mark it so I can ask questions in class." The 17 students generated 25 responses. Sixty percent of the responses suggested students are using primarily shallow processing strategies. Forty-eight percent of students simply highlighted and underlined, while another 12% copied definitions. Forty percent of the responses reflected the deeper processing strategies.

The number of hours a student studied and whether he or she used deep or shallow processing strategies were related. Students who studied fewer hours tended to engage in shallow processing strategies, while students who studied more tended to employ deeper strategies. On survey one, students were asked how many hours they studied for an exam. The vast majority of students responded that they studied either between one and three hours or between four and six. When survey one was administered students had not yet received their first exam grades, so it was not possible to determine if students who studied more earned higher grades. However, it was possible to conclude that students who studied more used more deep processing strategies than students who studied less.

Table 37

Comparison of study habits in students who study more vs. fewer hours.

Note taking approach	Students who study 1-3 hours	Students who study 4-6 hours
a. I highlight or underline things I think are important.	46.7%	33.3%
b. I copy down the bolded words and their definitions.	13.3%	0%
c. I copy down the bolded words and their definitions as well as main ideas.	26.7%	16.7%
d. I use headings, subheadings and graphics to help me figure out main ideas and I highlight those or write them in a notebook. If something confuses me, I will mark it so I can ask questions in class.	13.3%	50%

These survey one results made it clear that many students were engaging in shallow studying techniques. Future surveys made it possible to determine if students had exchanged their relatively ineffective, shallow processing strategies for more effective ones and if the matrix notes played a role in helping students develop those skills.

Impact of the matrix notes. Even though only 17 of the 31 students surveyed took reading notes, many more of the students surveyed used the matrix notes. Early survey results suggested that matrix notes opened students' eyes to new ways to study. Question eight of survey one asked students to identify the ways the matrix notes helped them. A little over half of the survey responses (52.2 %) agreed that matrix notes "helped them see connections between concepts and terms" and "pick out main ideas." The fact that students identified matrix notes as the agent that made them aware of these two deeper processing strategies suggests that they were not doing either prior to being introduced to matrix notes.

Survey two revealed that a number of students had learned important information about deep processing during the semester they were exposed to matrix notes. Students were asked to read seven statements about effective studying and identify what they entered college knowing about studying and what they learned while there. Two of the seven statements related to deep processing. The first was "Learning the definitions of terms isn't enough. I need to also see how those terms relate to headings, subheadings and each other." The second statement was, "There are different ways to take notes for a class." The first statement related to deep processing since it asked students to push past memorization to analyze connections, while the second one related to deep processing because it required students to pay attention to text structure so they could select an appropriate note taking strategy.

By the time they took survey two, students had received scores back on two exams and had recorded their average on the survey. This meant it was now possible to determine if there were significant differences in how low ability and high ability students answered questions about studying. Among students whose exam average was a C or above, 81.8% entered college knowing that it was not enough to simply memorize terms and that there were different ways to study for exams. This was a very different pattern of answers from the low ability students. Only 33.3% of the students who earned below a C- average entered college knowing that learning definitions was not enough and that there was more than one way to take notes. The remaining 66% learned this information about effective studying during the semester they had the matrix notes. These answers suggested that lower ability students were growing in their awareness of effective studying. Once again, it was not possible to determine exactly where they learned this information, but since the surveys also reveal that students who were unhappy with their grades were more likely to turn to matrix notes than they were to make any other

change to their studying, it was possible the matrix notes helped students come to those realizations.

Survey three revealed that, by the time they had taken the third exam, the less successful students had adopted some of the self-regulation habits of the more successful ones. However, the Likert scale questions may have made it more likely students would overestimate their use of study strategies. This possibility will be discussed later in this chapter. Students were asked to read six statements about study habits and select the ones they felt described them. Three of the six study habits related to deep processing, so they were examined here. Below each habit is isolated so it is possible to compare how high ability and low ability students responded to the statement.

Table 38
Study habit 2

I reviewed my notes	Always	Most of the Time	Some of the Time	Never
C average and above	4 33.3%	3 25%	4 33.35	1 8.3%
C- average and below	3 25%	4 33.3%	5 41.7%	0

The same percentage of high ability and low ability students claimed they reviewed notes “always” or “most of the time.” This was an increase from the number of students who claimed on survey one that they reviewed notes as a study technique. On survey one, 38% of students claimed they reviewed notes. On survey three, if all of the responses are considered together without separating the responses of high and low ability students, 58.4% of students claimed to review notes “always” or “most of the time.” One challenge with this question was that it did not ask students to distinguish what sort of notes they were reviewing. They might have meant lecture notes, matrix notes, the lecture guides, or notes they had taken themselves. Given the responses students made to study habit three below, it seems most likely that

students were reviewing lecture notes since the number of students who said they took reading notes did not increase appreciably between the first and third survey. In any case, this finding suggested that students might have been acquiring stronger study habits as the semester progressed since the number of students who engaged in this activity increased.

Table 39
Study habit 3

I took notes while I read	Always	Most of the Time	Some of the Time	Never
Above a C average	3 25%	3 25%	3 25%	3 25%
Below a C- average	1 9%	5 45.5%	3 27.3%	2 18.2%

Here the below C average students were slightly more likely to select that they took notes "always" or "most of the time" than were the above C average students. On survey one, students were asked if they took notes while they read. Seventeen out of 31 said they did. On survey two, students were asked to identify what changes they made to their studying as a result of a bad grade. Only four, 10% of the responses, indicated students had begun to take reading notes. It seemed that the number of students who took reading notes increased very slightly from survey one.

Table 40
Study habit 5

I made an effort to define terms and summarize concepts in my own words	Always	Most of the Time	Some of the Time	Never
Above a C average	2 16.7%	5 41.7%	3 25%	2 16.7%
Below a C- average	2 18.2%	5 45.5%	3 27.3%	1 9%

Here the below C- students were again slightly more likely to than the above C average students to engage in the deep processing strategy of putting course material into their own words.

The conclusion from the surveys was that there appears to be overall growth in deep processing skills among low ability students. Since students did indicate that matrix notes helped them identify main ideas and make connections between terms and concepts, it was possible that matrix notes helped students acquire these more effective study habits. It is also possible that students learned them during discussion groups where those skills were expressly taught.

Interviews provided more direct evidence of student self-regulation abilities because students were able to articulate how they self-regulated and where they learned to do so. The interviews corroborated the surveys in several important ways. First, they demonstrated that successful students engaged in deep processing strategies such as putting concepts into their own words and looking for connections between terms, concepts and course components. Second, they demonstrated that lower ability students tended to engage in shallow processing; they highlighted, memorized definitions or did not take notes at all. The interviews most closely supported the hypothesis when students spoke about how they substituted shallow processes for deeper ones as a result of having been introduced to matrix notes. One student explained that her review strategies had always been to re-read material and memorize terms. She said the matrix notes helped her understand the importance of connecting terms and concepts because the third column helped her think about studying in a way she had not before. She developed different study strategies as a result of this new study knowledge; she began to identify important concepts and give herself “lectures” over them as a way to monitor understanding. She also explained course material to people who were not in the class to see if

they could understand her explanations. This particular student earned an A in the course, but she felt her grades would have been lower had she not learned to use the matrix notes. Her early grades were B's, but as she mastered her new skills, they went up to A's. Another student claimed that she did not have a note taking strategy until the matrix notes came along. The third column provided her with a review structure since it acted as a guide to main ideas. She was a second year students and her self-reported grade point average was 2.6, but in this class, she earned an A. Other students had similar stories. One only highlighted as a note taking strategy until he was introduced to matrix notes. He filled them out in preparation for the second exam and earned an A on it. After that, issues in his personal life prevented him from having the time to complete them and his grades dropped. Finally, one student moved from D's to B+'s once he realized that simply memorizing terms would not earn him a desirable grade. According to him, it took practice to learn how to fill out the third column, but once he learned how to do that he saw how the exam content related to the matrix notes. The interviews with students who improved supported the findings of the surveys to some extent, since the surveys seemed to demonstrate that many students began the semester using shallow strategies, but acquired deep processing strategies throughout the semester.

Other students, even though they earned a C- average or below, began to recognize the value of deep processing and see the limitations of shallow processing. One student reported that she could not see how the matrix notes connected to the exams, but she did recognize how the third column helped her apply concepts. Another student recognized the value of summarizing because the matrix notes frequently asked students to put concepts in their own words. Even though she had come to understand its importance, she simply was not able to summarize because the concepts in the text book were too hard for her to understand. Another low ability student struggled to pass exams, but claimed she would have done worse had matrix

notes not taught her how to put ideas in her own words. Doing so helped her remember more than copying terms and definitions, which was her previous study method.

Interviews revealed that students were willing to substitute less effective strategies for more successful ones, and that they worked toward deeper processing strategies as a result of being introduced to matrix notes. Less successful students described how the matrix notes helped them realize that studying involved more than simply highlighting or memorizing. Even though they understood that what they were doing was not adequate, they were not sure how to bring about the sort of change that led to higher grades. In some cases, students were unable or unwilling to devote the time necessary to hone new study skills. In other cases, students wished they had more direction about how to change or they felt they did not have the skills necessary to adopt new study methods.

Conclusion: Both the surveys and the interviews revealed that successful students either entered college with deep processing skills or they learned them during the semester. Among unsuccessful students, both the surveys and the interviews revealed that there was growth in student understanding of the value of deep processing strategies. While the surveys indicated that students acquired stronger study habits during the semester in which they were introduced to matrix notes, it was not completely clear where they acquired those habits. While the matrix notes could have helped people develop different study strategies, students could have also learned them from attending the discussion groups. The interviews made it possible to draw conclusions about the role of matrix notes in student learning since they were asked directly to reflect on what impact the notes had on their success. In a variety of cases, students indicated that the matrix notes did cause them to see relationships between terms and concepts that they had not thought about before and they did help students discard inefficient strategies such as memorization and replace them with better ones. Some students, once they employed

new strategies, improved their grades on the next exam while others continued to struggle. It is not clear why matrix notes were more successful for some students than others.

Evidence of an increase in test awareness and ability to develop a study plan

In addition to looking for connections between terms and concepts, successful students devoted a portion of their study energy specifically toward thinking about the test, and they had study plans that incorporated pre, during and post reading strategies. The matrix notes did not seem to aid students in exam preparation. The data showed that most students did not see the matrix notes as helpful in predicting exam questions, nor did matrix notes help them develop study plans that involved all three stages of studying.

Exam Preparation: The number of students who saw matrix notes as a tool to they could use to predict exam content and questions decreased throughout the semester. Since students were evaluated with a 60 question multiple choice exam, an appropriate post reading strategy would have been using course materials to predict exam questions. While the most popular review technique students selected on survey one was "reviewing notes," it does not appear that most students were using matrix notes to help them predict test questions or make judgments about how major terms and concepts would be represented on the exam. When students were asked to select the ways matrix notes helped them prepare for exams, students made 86 responses. Only 23.3% of the responses suggested that matrix notes, "helped me get a better idea what would be on the exam." In this instance, there was no differentiation between students who studied more and those who studied less. Of the responses made by students who study between one and three hours, 23.3% said matrix notes helped them determine what would be on the exam, and 22.2% of the responses made by students who studied between four and six hours said matrix notes helped them determine exam content. When students were asked the identical question on the third survey, even fewer responses indicated that matrix

notes helped students make good predictions about exam content. The 25 students who responded to survey three made 52 responses. Only 13.5% of those responses indicated that students found matrix notes helped them make predictions about exam questions. The numbers indicated that the number of students who saw a connection between matrix notes and the exams decreased throughout the semester.

Even though students did not feel that matrix notes helped them predict test questions they still used prediction as a test preparation strategy. They just did so independently of the matrix notes. Students were asked to read statements about study habits and select how often they engaged in that habit. Overall, 33.4% of the students surveyed claimed they predicted exam questions "always" or "most of the time" when they studied. Among the students who earned above a C average, that number increased to 41.6%. Among students who earned a below C- or average, that number decreased to 25%. It is interesting to note what percentage of students from which group claimed they "never" predicted exam questions. Among more successful students only 8.3% claimed they never predicted exam questions, but among the lower ability students that number jumps up to 33.3%. What can be inferred by this data was that students, especially the high ability ones, valued predicting test questions, but they did not believe matrix notes helped them do so.

The sixth question on survey two strongly suggested that very few low ability students entered college having a clear idea that test preparation could involve predicting test questions. Among the students who earned a C or above, 72.7% entered college knowing that they could predict test questions. Among the students who earned a below C- average, only 28.6% knew this. Question six also contained the following statement, "There are four different types of multiple choice questions," but responses to that question did not fit with the rest of the data. Of the students who earned a C or above 27.3% indicated they entered college already

understanding that there are four types of multiple choice questions. Among the students who earned C- or below, 42.9% claim to have known this. While it seemed as though the lower ability students actually had knowledge that the more successful students did not, it was possible that students misunderstood the question or that they thought they were being asked if they knew there were more than one type of test question; for example, in addition to multiple choice, there are also fill-in-the blank, and short answer, etc. Since this particular question was the only one for which the data seemed anomalous, it seemed likely the problem was that the question was not clear to students.

Many students may have assumed that the questions on the exam would be largely explicit and definition based. That expectation may have blinded them to the fact that matrix notes were preparing them to successfully answer summary, compare-contrast and application questions as well as explicit questions. They may have focused on the center column and then been surprised that the questions required a deeper level of processing. Therefore, they concluded that matrix notes were not a helpful tool for predicting exam questions and either quit trying to predict them or quit using the matrix notes to do so. It could be inferred that students did not pick up the "clues" left for them in the third column. For example, in the third column of the chapter one matrix notes, students were asked, "How might you apply each of the critical-thinking guidelines in thinking about the field of phrenology?" This prompt suggested to students that exam questions would ask them to identify the guidelines and apply them to novel scenarios, and/or articulate criticisms of phrenology. Student who did not pick up these "clues" might not have noticed that two questions on the exam required them to identify characteristics of critical thinkers, and that the matrix notes prompt prepared them to do that. One exam question asked them to select the option that best completed the following statements, "An important characteristic of critical thinkers is. . . ." and "Which of the following

is NOT one of the critical thinking guidelines in your textbook?" Because they were expecting direct transfer, students may not have noticed how the third column prompts from the matrix notes prepared them for exam questions.

Interview responses showed that higher ability students were more likely to see a connection between matrix notes and the exam questions, while lower ability students either did not use the matrix notes or did so and did not see a connection to exams. One high ability student used the matrix notes to help her know what would be on the test. While she read, she found herself predicting exam questions. Another used the matrix notes to determine what she needed to know from each chapter. Among the low ability students interviewed, half did not use the matrix notes at all. Two specifically said that there was no connection between test questions and the matrix notes, while the remaining two used the matrix notes, but not to predict exam questions. One student claimed that he began to see a connection between matrix notes and exams after he practiced completing the third column. His response suggested that training might help students use matrix notes more effectively.

Development of Study Plans: There did seem to evidence to suggest the matrix notes and the discussion groups together helped students develop comprehensive study plans. For this study, data was analyzed to determine if students employed pre, during and post reading strategies while they studied.

None of the questions on survey one were helpful in determining if students had comprehensive study plans, but survey two and the interviews provided a picture of how students were studying. Question six of survey two asked students to read seven statements about studying and select what they knew about studying when they entered college and what they learned while they were there. One of the statements related to comprehensive study plans. It was "I should divide my study sessions into three parts—first I should 'warm-up' by

looking over the chapter or reviewing notes. Next, I should read. Finally, I should 'cool down' by reviewing what I just read to make sure I understood it." Of all the students surveyed, 33.3% of them entered college knowing they should divide their studying into three parts and 41.7% of them learned that information in college. Not surprisingly, 45.4% of above C average students knew this information when they started college, while only 25% of the Below C-average students knew that.

Interview responses made it clear that students who were following a study plan either entered college with that skill or they learned it from a source other than the matrix notes. Interview transcripts were examined for references to one or more study plan qualities: references to reviewing, pre-reading, a process for monitoring for understanding, and a plan to resolve confusion. Three C or above average students and one below C average student said they made sure they understood a section before moving on. One successful student said that he completely revised his approach to studying after attending a discussion group where he was explicitly taught that study sessions must incorporate pre, during and post-reading strategies. For a preview strategy, he read the questions posed in the third column of the matrix notes. His during reading strategy involved looking for the answers and writing them down. For a post-reading strategy, he sorted through his reading notes and evaluated the quality of his answers. One unsuccessful student had begun to use summary paragraphs in the textbook to evaluate his understanding. After reading, he considered what might be in the summary, and then he read it. If he was surprised by the information the authors chose to include in the summary, he re-read the chapter. Two high ability students and two low ability students implemented the "Three step study plan," which means they were engaging in a pre-reading activity, a during-reading activity and a review activity. The fact that students referred to this study technique specifically as the "three step study plan" meant that they either attended discussion groups

where they were explicitly it, they were in a class in which their instructor invited a reading faculty person into the classroom to give a short presentation on this strategy, or they visited a reading peer tutor, who was specifically trained to teach it. From the interviews it was possible to conclude that a number of students had become aware of the importance of pre, during and post reading activities and were beginning to implement this knowledge in their own studying, but this was not a skill they learned via matrix notes. Rather, they learned this information elsewhere.

Even though matrix notes did not cause students to restructure study sessions, it was clear that matrix notes supported that re-structuring for a number of students who were able, in interviews, to name where in their study process matrix notes fit. Some used them as part of their preview, while others used them in the during-reading phase. Still others used them for review or used them at more than one stage of the study process. Essentially, students ended up using matrix notes to enhance a study plan that they learned elsewhere.

Evidence that matrix notes increased exam scores

There was evidence that matrix notes increased test scores. The table below compared student performance on F, D and C students in spring 2012, before matrix notes were introduced, and in spring 2013, the semester during which the matrix notes were introduced. In 2012, 86 students enrolled in two sections of psychology. In 2013, 63 students enrolled in two sections of psychology.

Table 41
Comparison of 2012 and 2013 student grades

	2012 Before Matrix notes	2013 After Matrix Notes
Percentage of students who earned F's on the first exam	16%	10%
Percentage of students who earned D's on the first exam	14%	14%
Percentage of students who earned C's on the first exam	10%	14%

After matrix notes were introduced in 2013, the percentage of students who earned F's on the first exam dropped 6%. The percentage of D students remained unchanged, but the number of C students went up 4%. Matrix notes were introduced during the same semester that Central Lakes College made discussion groups available for students. Since many students from the psychology classes attended discussion groups, it was not clear if these improvements were due to matrix notes, discussion group attendance or a combination of the two interventions.

Students were encouraged to attend discussion groups as a result of the grade they earned on the first exam. Discussion groups began during the third week of the semester, and the first exam happened in the fourth week. That means that prior to the first exam students could have only attended one discussion group. The matrix notes were the only intervention available to most of the students when the first exam was given. This was significant because the first test scores in spring 2013 were higher than they were in 2012, when students did not have access either to discussion groups or matrix notes. The group that showed the most improvement was the F students.

F Students who had access to matrix notes earned an average of 53% on their first exam, compared to an average of 47% earned by the F students who did not have access to matrix notes. The score range was also much narrower for students who used matrix notes than

the students who did not. Before matrix notes, students who failed needed to earn an average of 13 points to pass the exam. After matrix notes, students who failed needed to earn an average of seven more points to pass. Even though some 2013 students still failed the exam, there was measurable improvement between 2012 and 2013.

Another analysis of grades indicated that in 2013 the overall exam average for students who earned a C- or below went up. The overall exam average for all 2012 students who earned a C- or below was 64.41 with a standard deviation of 9.67. In 2012, students did not have access to matrix notes, or to discussion groups. The 2013 group fared better. Their average score went up to 68.87 with a standard deviation of 8.51. By 2013, students had access both to matrix notes and reading groups, so it was difficult to determine exactly why grades increased. However, in fall of 2013, Central Lakes College chose to cut discussion groups, but students were still using matrix notes. According to the instructor, student grades on the first exam of fall 2013 were equivalent to the grades students earned in spring 2013. Since matrix notes were the only intervention, it seemed likely that they were the source of the increase in student grades.

Even though students did not seem to see a connection between matrix notes and the exam questions, many attributed their success to them when, on question three of survey three, they were asked to select the statement they felt most closely matched their feelings about matrix notes. They could select, “Matrix study guides did not contribute to my success in this course,” “Matrix study guides may have helped me perform better on the exams,” or “Matrix study guides definitely made me more successful in this course.” Overall, 39.1% of students said matrix notes were definitely helpful, while 34.8% said they may have helped, and 26.1% said they didn’t help at all. Students whose averages were C or above were most likely to find matrix notes helpful; 63.6% of them selected that they definitely made them more

successful, while only 16.7% of students who earned a C- or below believed matrix notes contributed to their success.

More successful students likely already had a study plan, and they simply found ways to "plug" matrix notes into an already existing system. This might explain why successful students found a variety of uses for matrix notes. Some used them to preview, while other used them for review, and yet other used them as a guide for lecture notes. Lower ability students did not have a system, and they may not have had a mental framework for how to work with matrix notes.

Conclusion. Some parts of the hypothesis were supported while others were not. There was evidence that the number of students who used textbook features increased throughout the semester, and that students began to employ deep processing strategies and discard ineffective study methods. While it appeared that matrix notes played a role in these positive developments, they cannot be given full credit because students may have also learned how to improve their study methods as a result of attending discussion groups. However, the data did support the hypothesis when it came to test performance. Exam scores for low ability students did increase.

An analysis of Kuehn's matrix notes

The relationship of Kuehn's matrix notes to the most studied forms of notes

Instructor-generated notes were designed to help students know what to focus on while they listened to a lecture or read a text, but they "leveled the playing field" for students who did not have the transcription fluency necessary to keep up with a lecture or competently face the demands of a college-level text (Peverly & Sumowski, 2011). The three most researched types of instructor-generated notes were summaries, partial (guided) notes and grid-style matrix

notes. The matrix notes Kuehn developed for her psychology students borrow elements from each of these note taking styles.

Summaries. The first and third columns of the matrix notes used in this study provided students with opportunities to utilize summaries to aid in comprehension. The third column asked questions that required summary-like skills; students were asked to articulate differences between concepts, describe why they were important and apply them to new situations. The first column simply contained the headings and subheadings, but the notes were spatially arranged so students were able to see that a particular concept fit within a particular textbook section. The spatial organization of the notes and the fact that the third column required students to write some summaries might have helped students avoid a problem Winograd (1984) identified. He contended that struggling readers, if they were asked to summarize text, tended to include information that was personally interesting but not necessarily relevant to either text structure or to the author's goals. The way Kuehn structured her matrix notes made it more likely that students would avoid using personal interest as a guide to what should be included in summaries. First, the layout of the notes made it possible for students to see the questions they were asked to answer at the same time the heading (in the first column) directed their attention to the section of the chapter they needed to read to find the answer. The layout drew a connection between chapter content and organization, which may have made it more likely students would use the headings, subheadings and the question to guide their summaries as opposed to what they found interesting. Secondly, the questions guided student thinking in specific ways. For example, if a question asked students to explain how two concepts differed from one another students would be more likely to actively look for those differences while they read. Students who use the questions to guide reading were less likely to fall into the trap of including information in their summaries simply because they found it personally interesting.

Kuehn's matrix notes may also have made it more likely students will use summaries effectively. Hidi and Anderson (1986) found that longer, more complex expository text was harder for students to summarize. Kuehn's matrix notes design went some way to relieving this problem as well. She asked students to summarize, but did so without requiring them to work with long portions of text at one time or to synthesize concepts across multiple sections. Therefore, the structure of her notes allowed students to focus on summarizing one small portion of the text at a time, thus eliminating one of the more significant challenges faced by struggling learners.

Partial notes and graphic organizers. Another highly studied form of instructor-generated notes was partial notes and graphic organizers. Partial notes and graphic organizers could be designed in many different ways, but the ultimate goal was to provide students with a graphic representation of how information within a text was organized, and/or to highlight main ideas and supporting details. For example, partial notes might provide students with an incomplete sentence they had to finish using an important term, or it might ask them to fill in the sub-points of an instructor-generated outline. The purpose was to provide a note taking system for students who did not have one (Kobayashi, 2005; Barbetta & Skaruppa, 1995), and to prevent students from having to devote so many cognitive resources to determining lecture or text structure that they did not have the energy left over to identify main ideas, process what they were learning or look for connections between ideas and terms (Kiewra, 1991). Kuehn's matrix notes provided students with many of these benefits because the graphic layout helped them see connections between terms and concepts and determine the relationships between terms. According to Katayama and Crooks (2003), one benefit of graphic organizers was that they helped students see how terms are related. This is also true of Kuehn's matrix notes. For example, in her chapter one matrix notes, she wanted students to understand the similarities

and differences between the jobs of professionals in the field of psychology. To accomplish this goal, she listed each profession in an outline format with the profession flush with the left margin. This arrangement suggested that each profession was equal in importance. To represent subordinate relationships, she indented so the superordinate idea is above and to the left of the subordinate one.

The graphic nature of matrix notes may have made them particularly appropriate for the tests that Kuehn gave her students. A number of studies showed that when students studied from graphic organizers they were better able to answer test questions that required them to analyze concepts and apply them in a new way because they highlighted relationships between terms and concepts (Katayama & Robinson, 2000; Katayama & Crooks, 2003; Neef, McCord, & Ferreri, 2006). Kuehn's exams did contain some explicit questions, but the majority of the test questions required students to analyze concepts, understand how they related and apply them to new scenarios. To a lesser degree, students were asked to compare and contrast concepts or terms, which required them to know exactly how terms were similar and different. In order to be successful on her exams, students needed recognize relationships between term and concepts. The structure of the matrix notes allowed students to do that.

One important difference between Kuehn's matrix notes and partial notes/ graphic organizers was that the matrix notes provided less guidance for students, which may have made it more difficult for them to see how the matrix notes related to exams. In her center column, Kuehn simply listed terms without providing any more information to students about what she hoped they would write. For example, in the second column she listed "Wundt," "James" and "Freud." It was up to the students to determine whether to include the dates they lived, where they were from, where they practiced and/or their contributions to psychology. One struggling student made the comment during a discussion group that he initially just wrote down the dates

they lived and died because he assumed dates would be o9n the test. Later, it dawned on him that he should have written down other information, so he went back and did so. The structure of partial notes removed this cognitive burden for students since it requires them only complete a sentence with an important word or phrase. From this standpoint, the matrix notes challenged students to a greater degree.

Leaving students to make their own judgments about what to include and what to leave out had both advantages and disadvantages. According to a number of studies, there was a fine line between providing students with so much information that they could avoid active processing, and providing them with so little that they had no guidance. Students benefitted the most when they were required to actively search through text for answers, but when doing so was not so cognitively taxing that students became overwhelmed (Katayama & Robinson, 2000; Robinson, Odom, Helsieth, Vanderveen & Katayama, 2006). Kuehn's matrix notes may not have provided adequate guidance for some of the lower ability students, who may have been left wondering what kind of information they should pull out of the text. On the other hand, they worked very well for higher ability students and medium ability students who benefitted from the level of guidance the notes did provide.

Matrix notes. Matrix notes, like graphic organizers and partial notes, could be set up in many ways. They also were designed to highlight relationships between concepts and ideas by mapping them out in a grid. Kiewra, DuBois, Christian and McShane (1988) conducted a study in which students took notes on a lecture using matrix notes that were divided up into 121 individual cells, but matrix notes can be set up with far fewer cells. The majority of the studies on matrix notes applied specifically to note taking on lectures but one study was conducted to determine their usefulness as a strategy for reading texts. Kiewra, DuBois, Christensen, Kim and Lindberg (1989) concluded that matrix notes, when they were used for reading, posed

challenges for many low ability students who struggled first to decide what information was worth recording and then which column or cell to put it in. Kiewra and colleagues (1989) concluded that matrix notes could be just as effective as any other note taking system provided that students reviewed them and received special training in how to use them.

Conclusion. Matrix notes, as they were structured by Kuehn, combined the strong points of other well-researched form of note taking. A combination of the first and third columns helped guide student thinking as they summarized. This guidance increased the chances that they would use text book features to guide reading instead of personal interest. Since the third column questions rarely asked students to work with more than one section at a time, they helped students break the chapter down and use summaries in a manageable way. The overall graphic nature of the matrix notes and the fact that students were directly asked to define words in the central column borrowed from graphic organizers and partial notes because they reduced the cognitive burden on students who might not have known how to focus their attention while reading. Even though Kuehn's matrix notes did help students understand that their exams would consist of more than just explicit questions, it was possible that they did not provide enough guidance for some students. Even though they were a departure from Kiewra's matrix notes because they had fewer discrete cells, they still provided students with an opportunity to both visually and cognitively "see" relationships between terms, concepts and ideas. However, they may have been difficult for some lower ability students to fill in and review.

An analysis of the effectiveness of Kuehn's matrix notes as a tool for exam preparation

Even though Kuehn's matrix notes incorporated effective structures and encouraged students to engage in deep processing strategies such as writing summaries, they did not prepare low ability students adequately for exams. They prepared students very directly for

explicit questions, but it was difficult for lower ability students to see the connection between the matrix notes and summary, compare-contrast and application questions.

In the interviews, there was a clear line between the successful and the unsuccessful students when it came to the usefulness of the matrix notes. The successful students, without exception, indicated that the matrix notes helped them. The unsuccessful students, for the most part, indicated that they were not useful. One reason for this sharp contrast between the two groups could be that successful students were better at using the "clues" in the third column to predict test questions while the less successful students were unable to do this. The exam questions that made up the tests were a combination of explicit, summary, application and compare-contrast, but the majority of questions fell into one of the last three categories. Explicit questions were largely based on vocabulary, while the summary, application and compare-contrast questions required students to synthesize information from more than one part in the chapter, transfer knowledge to novel scenarios and be aware of the similarities and differences between terms and concepts. The relationship between the matrix notes and the remaining three kinds of questions was less apparent and may have "thrown off" unsuccessful students.

The way Kuehn's matrix notes were set up best prepared students for explicit questions. The matrix notes were constructed on a three-column grid. The first column simply listed the headings of chapter sections. The center column listed significant terms from that section and required students to write down definitions. The third column asked questions that required students to distinguish between or explain the relationships between two or more terms, think up an original example to illustrate concepts or explain their significance. When test items came from information in the second column, they required students to do essentially what they were asked to do on the matrix notes. For example, in the matrix study guides for chapter one,

section one, there were two terms in the center column. One was "Psychology" and the other was "empirical." On the exam, students were asked a question over each term that directly related to its definition. They were asked to select the answer that best completed the statement "Psychology is . . . ." Later, they were asked to complete the statement, "Empirical findings are those that . . . ." In both cases, the matrix notes prepared students directly for the task they must do on the exam.

The questions in the third column did prepare students for exam tasks, but not as directly. For example, in the fourth section of chapter one, the center column asked students to define the terms "biological perspective," "learning perspective," "cognitive perspective" and "sociological perspective." In the third column, students were asked to "Think of a key word that you can use to remember each of the perspectives." This question definitely suggested to students that being able to distinguish between the perspectives was important, and it invited students to select a word that is personally meaningful to them. On the exam, students were asked to distinguish between the perspectives, but they were asked to do so using two kinds of questions that did not relate directly to the task they were asked to do on the matrix notes. First, students were asked two questions that were very similar in structure. The first question was, "Which modern psychological perspective is concerned with how the environment and experience affect a person's actions?" and students could select their answers from the following four options, " A) Learning B) Psychodynamic C) Sociocultural D) Cognitive." The answer to this question is "learning," but the question might have become confusing to a student who had not associated the word "learning" with "environment and experience." Since "sociocultural" also dealt with environment and experience, a student must have made a careful distinction between the two terms so he or she understood how they were different from one another. Simple memorization would not have helped students answer this question. The

second question was “What modern psychological perspective emphasizes what goes on in people’s heads?” Students could have chosen from the following options, “A) Learning, B) Cognitive C) Sociocultural D) Behavioral.” The answer to this question was “cognitive.” To a student who had not carefully distinguished between terms, “in people’s heads” could have also referred to learning, which certainly involved what goes on in people’s heads. Once again, simple memorization would not have set a student up for success. Both questions required knowledge of the textbook definition but also of how those terms were similar and different from one another. Next, students had to answer an application question over the perspectives; “Which perspective explains anxiety as being due to hidden rewards, such as being excused from exams?” Once again, in order to successfully answer this question, students must have been able to distinguish between the different perspectives. However, in this case, they applied what they knew to a novel situation.

Successful and unsuccessful students potentially had different reactions to these prompts. Successful students likely would have looked at the third column directive to “think of a key word you can use to remember each of the perspectives” and recognized that “remembering the perspectives” could translate into several possible types of test items. That clue led them to compare and contrast the perspectives, or to spend study time imagining how they might have to identify which perspective a particular scenario exemplified. Unsuccessful students, on the other hand, when they read the third column task to “think of a key word” they did exactly what was asked of them. However, that clue did not inspire them to imagine how that third column task might lead to test questions. This may explain why unsuccessful students claimed there was not a connection between the matrix notes and the test. They were looking for a direct connection that was not there. Lower ability students may have seen a more direct connection between the notes and the exam had the third column activity been

"Write a sentence about each perspective that shows why and how it is unique from the other perspectives." The thinking involved in that task would be closer to the kind of thinking they had to do on the exam, so the transfer would not have been as great.

The fact that struggling students did not see a connection between the notes and the exam is not surprising in light of the findings of Barnett, DiVesta and Rogozinski (1981). They asked students to take notes and then collected them. Barnett and colleagues developed a separate exam for each student by basing questions on each individual set of notes. When students took the tests based on their own notes they performed very well. Barnett and colleagues concluded that students remembered what they encoded, or took notes on. Potentially, the present study illustrated this concept in a different way. Unsuccessful students, because they did not see the third column as relevant to exams, may not have utilized it for note taking. Therefore, they would not be in a position to encode that information. Rather, they encoded what they had taken notes on, which happened to be terms. Or they did the exact task asked of them in column three and encoded that, which did not prepare them for the exam. Successful students may have taken more thorough notes and, as a result of that fact alone, encoded more and were more ready for the exam questions. By contrast, less successful students may have used the notes very literally and were unable to see how they connected to exam questions, or they did not use the notes and missed out on the benefits of encoding.

As a general rule, unsuccessful students favored highlighting and memorizing as study techniques while successful students favored looking for connections between course components, terms and concepts. The matrix notes may have worked better for successful students since the third column provided a tool they could use to think about connections and distinctions, which they were prepared to do anyway. Unsuccessful students, on the other hand, were not as capable of using the matrix notes effectively since they asked them to do

something (look for connections, make distinctions, think up original examples) which was not currently in their skill-set. While all successful students interviewed indicated that they used matrix notes, only half of the unsuccessful students claimed to have used them. Among those unsuccessful students who did use them, only half used the third column. Overall, less successful students did not or could not utilize the matrix notes to select main ideas and accurately predict test questions. However, the successful students were able to do both things. Peverly, Brobst, Graham and Shaw (2003) found that students who took notes were more likely than students who did not to be able to answer more difficult implicit questions and questions that required them to use information much differently than they did while they were studying. If unsuccessful students were confused about how to use the third column then they likely had not gone through the sort of work that would enable them to answer the more complex summary, application and compare/contrast questions presented to them on the exam.

Successful students were more likely to see matrix notes as helpful because they provided them with guidance for doing work they already perceived as important, making connections between terms and concepts. They saw connections between the third column and the exam because they were already inclined to think in terms of connections and relationships. Therefore, they encoded those notes and were more prepared for the exam. Unsuccessful students, however, were less likely to find the matrix notes helpful. While they agreed that the notes helped them understand terms and see relationships, they were much less likely to see how the third column tasks connected to the test because they expected test items that related very directly to the tasks required to complete the matrix notes.

Evidence from the surveys suggested that students who were already more successful on exams were better able to utilize matrix notes to become even more successful. In survey two, question two, students were asked to identify whether they responded to their first exam

grade by changing their study approach. Six of the 25 students who responded to the survey self -identified as having earned either a D or an F on the first exam. Out of those six students, five claimed that they responded to their grade by starting to use the matrix notes. Students took survey two just after they learned what grade they received on the second exam, so it was possible from the survey to determine if their grades increased or decreased between the first and second exams. Out of those six students, only two improved. The students who earned C's on the first exam were more likely to improve on the second test. Five of the students who responded to the survey earned C's on the first exam and four of them improved. Two of the five claimed to have begun to use matrix notes between the first and second exam. What is not clear from the surveys is whether the remaining three students had already been using matrix notes. It was possible to conclude that matrix notes worked better for students who already had a basic idea of how to study. The matrix notes may have simply enhanced an already present skill-set. Unsuccessful students did not seem to benefit as much from using the matrix notes. Possibly, this was because unsuccessful students did not infer with any accuracy how the questions in the third column could translate into exam questions. C students, however, were already able to make accurate judgments about how the third column would lead to exam questions. Kiewra and colleagues' (1989) assessment that students could benefit from training in how to use the matrix notes might have been applicable here. If F and D students had received training, it is possible they would have "caught up" to their more successful peers.

How the findings of the current study compare to other research

This study corroborated the findings of much of the research on self-regulation and student response to interventions. The fundamental difference between this study and the other self-regulation studies was that the majority examined students at one point in time while the current study was designed to measure student growth over the course of a semester.

Other studies either interviewed students to determine what self-regulation choices they made or they examined student responses to a contrived study situation. Both kinds of studies essentially revealed that high ability students used more strategies more consistently than their lower ability peers. Even though the current study was designed to measure growth over time, its findings essentially corroborated those of the other self-regulation studies. However, it also showed that students were likely to alter study habits as a result of interventions. The current study was most similar to the Radmacher and Latosi-Sawin (1995) study, which also examined how a students' ability to self-regulate changed when they were provided with interventions.

Self-Regulation

The current study had significant differences from the research because it provided opportunities for students to learn a new strategy and practice it over the course of a semester. The other self-regulation studies acquired a "snap shot" of what successful and unsuccessful students were doing at a particular point in time. These studies can be divided into one of two categories. The first category of studies (Balch, 2007; Peverly et al, 2003) pulled students out of their regular classes to read and respond once to a short reading that was out of the context of their course work. The general goal of these studies was to determine if students altered their study strategies based on how they would be tested over the material they were given. In other words, would students make different study choices if they knew they would be tested with a multiple-choice vs. an essay exam? The general conclusion of both of these studies was that students did not self-regulate by taking into account exam type and altering their study strategies accordingly.

The second category of studies was designed to find out what behaviors students engaged in when they studied and determine if there was a discernible pattern between high and low achieving students (Zimmerman & Martinez-Pons 1986; Ley & Young, 1998; Ruban &

Reis, 2006). In these studies, the researchers interviewed students in general about their study behaviors and looked for patterns that would distinguish high and low ability students. These three studies concluded that high ability students did make different study choices than low ability students. For the most part, high ability students employed deep processing strategies such as re-organizing notes, and lower ability students employed shallow processing strategies such as memorizing.

The current study corroborated the afore-mentioned studies because it also determined that lower ability students were more likely to engage in shallow processing strategies and that there was a clear distinction between the behaviors of high and low ability students. The first survey indicated that 60% of students utilized shallow processing strategies. Interview transcripts in particular revealed that higher ability students not only used more strategies but they had a plan for preparing for exams, resolving confusion and reviewing course materials while lower ability students did not seem to have a consistent study approach. A significant similarity between the Ruban and Reis (2006) study and the current one was the finding that lower ability students who were interviewed do not have a note taking system. According to Ruban and Reis (2006), none of the lower ability students they studied articulated a study plan. The interviews in the current study revealed essentially the same information. Lower ability students tended to say they liked to high light or underline, but they did not articulate how that strategy fit into a larger study plan. For example, they did not say, “I highlight information that explains a main concept.” Or “I underline ideas that answer questions I posed when I read the headings.” Higher ability students explained a clear study process that included information about why and when they used particular strategies.

Ley and Young (1998) wanted to discover if they could distinguish between high and low ability college students based solely on how they answered questions about their own studying.

They discovered that it was possible to identify a pattern of answers that accurately differentiated the two groups. They determined that students who described a greater variety of strategies and said that they used them consistently were invariably regular admission students while developmental students tended to have a small number of strategies they used inconsistently. The interviews conducted for the present study revealed essentially the same pattern. High ability students were able to articulate a study plan and were much more likely to describe how they put course materials into their own words or explained course concepts to someone else. They also, without exception, had worked matrix notes somehow into their study system while many of the lower ability students claimed matrix notes were unhelpful. The current study was similar to the Ley and Young study since it would have been possible to differentiate high and low achieving students from their interview answers.

While interview transcripts corroborated the findings of Ruban and Reis (2006) and Ley and Young (1998), the current study's surveys do not. The surveys revealed a low ability student who engaged in and consistently used a number of effective study habits and strategies to a much greater degree than the students who participated in the Ruban and Reis study or the Ley and Young study. This section will explore reasons why the current study's surveys revealed a picture of low ability students that was markedly different than the low ability students in other studies.

The high and low ability students surveyed in the current study seemed to participate in nearly equal numbers in effective study behaviors. In some cases, low ability students reported engaging in effective study behaviors to a greater degree than their more successful counterparts. Question four of the current study's third survey asked students to read six statements about studying and determine how often they engaged in that particular study habit or activity. The percentages that follow were calculated by adding the number of responses in

the “always” and “most of the time” categories. Survey results indicated 16.7% of high ability students and 16.6% of low ability students claimed they studied every day “always” or “most of the time.” The same percentage of High and low ability students (58.3%) each claimed to review notes. The only measure where high ability students outscored lower ability students was in their willingness to predict exam questions (41.6% vs. 25%).

What seemed even more anomalous is that lower ability students actually reported engaging in good study habits to a greater degree than the higher ability students did on four of the six criteria. A higher percentage of low ability students (54.5% vs. 50%) claimed to take reading notes, summarize course material in their own words (63.7% vs. 58.4%)and look over the chapter ahead of time (75% vs. 58.3%). Based only on these numbers, it would seem that the lower ability students were actually better students.

There are several possible reasons why the surveys and the transcripts provided such a different picture of low ability students. Ley and Young (1998) collected data by asking open-ended questions such as “Assume a teacher is discussing a topic with your class, such as the history of the civil right movement. He or she says that you will be tested on the topic. Do you have a particular method to help you learn and remember what was discussed in class?” (p. 49-50). Ley and Young explained that they chose open-ended questions because they did not want the survey question to inadvertently prompt inaccurate responses. They feared Likert-style questions would encourage students to select “socially appropriate” responses as opposed to accurate ones (1998). The current study potentially falls into the trap Ley and Young sought to avoid. The surveys in the current study presented the strategy and asked students to respond to it by selecting a frequency. It was possible that this method did encourage students to overestimate how often they actually used a given strategy. Because the interviews in the current study featured open ended questions the same way the Ley and Young study did,

students may have responded by providing a more accurate picture of how they studied. This might have explained why the current study and the Ley and Young study revealed similar trends when students were interviewed.

It was also possible that the timing of the survey may have impacted the results. The Ley and Young study did not indicate when in the course of the semester it was given. In the current study, survey three was given in April, after many lower ability students had spent nearly a semester attending discussion groups. It is possible that these students had been introduced to these strategies and were using them to the best of their ability, but because they were new strategies, they had not mastered them sufficiently and their grades had not improved, or had not improved enough to move them into the "above C average" category. Since these students were still in the process of working these new strategies into an effective study approach, the interviews depicted students who had not yet developed a working, serviceable study plan.

Unlike the Balch and Peverly and colleagues studies, this study did not attempt to determine if students altered study strategies based on how they would be tested. However, it can be inferred from the interview transcripts that students would not have altered their study strategies had they not been introduced to the matrix notes and had an opportunity to participate in the discussion groups. For example, five of the eight successful students interviewed claimed that the matrix notes and/or the discussion groups changed how they studied. Several indicated that they had been engaged in study activities such as memorizing terms, but they replaced those study habits for ones that emphasized looking for connections between concepts and terms, or putting course materials into their own words. Students explained that through using matrix notes or attending discussion groups, they learned they needed to change their study behavior and received insight into how to do so. The interview

responses suggested that these students, had they not been exposed to intervention, would not have altered how they studied for exams or replaced ineffective strategies for better ones.

The current study has significant differences from the current research. The other self-regulation studies focused on acquiring a "snap shot" of what successful and unsuccessful students did differently when they read and prepared for exams, but this study introduced an intervention in an effort to see if self-regulatory skills improved or changed over the course of the semester. The conclusion to be drawn from this study is that the surveys revealed a low ability student who engaged in many effective study habits while the interviews revealed a low ability student who tended to use ineffective strategies, or who was still struggling to develop a study plan that worked. The disparity between the two groups could be due to the assessment tool (i.e. the Likert- style survey questions may have encouraged students to overestimate how often they engaged in particular study behaviors) or students were truly to learning to self-regulate, but simply had not yet become proficient at it.

Intervention and training

Even though this study was designed to focus on the efficacy of matrix notes, it is perhaps impossible to separate their effects from the effects of the discussion groups. Since so many psychology students participated in them they required special mention. Discussion groups provided an opportunity for students to learn a variety of note taking and study strategies. Roberts and Dansreau (2008) conducted a study in which they trained students in a variety of note taking strategies and evaluated their performance on exams. Students who were trained how to take notes performed better and claimed to have a better understanding of the text. A major difference between the studies is that Roberts and Dansreau (2008), like Balch and Peverly and colleagues, pulled students into a study where they read material that had nothing to do with their classes and were tested once.

This study explored student growth throughout the semester and allowed them to practice a particular strategy multiple times. From that standpoint, it was potentially the most similar to the Radmacher and Latosi-Sawin (1995) study in which a writing across the curriculum director and a psychology instructor gave students the assignment of writing a weekly summary over a portion of the textbook. Students evaluated one another's summaries and revised them in class. When the test scores of the summary class were compared to the test scores of the control class the researchers discovered that the summary class's scores were 8% higher. This suggested that student ability to self-regulate increased, and that writing the summaries made them more aware of main ideas and taught them the deep processing skill of putting course material into their own words. The current study has similar elements except students were asked to fill out matrix notes as opposed to writing summaries. (However, the matrix notes, as Kuehn designed them, did require limited summary-writing.) Matrix notes were not a part of class activities, but some students chose to compare and contrast them during discussion groups. On a smaller, less formal scale, the discussion groups approximated the class discussions students had in the Radmacher and Latosi-Sawin study. Finally the current study was similar to the Latosi-Sawin study because student grades were also measurably higher than they were prior to the introduction of matrix notes and reading groups.

Conclusion

Even though this study was designed to measure student growth and change over time as opposed to taking a "snap shot" of student study behavior, this study corroborated the findings of other researchers who found that there are distinct differences in how high and low ability students approached course material. For the most part, high ability students engaged in deep processing strategies while low ability students engaged in shallow processing. However, this study also corroborated the findings of other studies that suggested students could learn

deeper processing strategies if they were supported and provided with opportunities to practice them over time.

Conclusions, recommendations and ideas for further study

Conclusions

Even though matrix notes borrow positive qualities from the most studied forms of notes and even though they have the potential to help students develop deep processing skills, they are not an adequate intervention for true low ability students. Interview and survey results showed students who were already successful incorporated matrix notes into their studying and felt they were a significant factor in their overall success. Other students who earned a C- or below on the first test received training in how to develop study sessions and substitute unsuccessful strategies for deep processing strategies. While they attribute the matrix notes to their success, they also gained knowledge as a result of attending reading groups. However, surveys and interviews reveal a different trend for unsuccessful students. They claimed that matrix notes were unhelpful and they did not play a role in their success. Even though exam scores went up after the matrix notes were introduced, and there were fewer F and D students, unsuccessful students did not see the matrix notes as useful. In spite of their negative opinion of the matrix notes, the survey results and interview transcripts revealed that many unsuccessful students did change how they studied. In some cases, students simply recognized that what they were doing was not useful. In others, they actually began to alter their studying. Unfortunately for many of them, they did not improve enough to earn a C average or above, or they were still in the process of mastering their new academic habits and strategies and did not reap the benefit of the changes they made.

Recommendations

If they are going to see the matrix notes as useful, lower ability students need to be more specifically trained in how to fill them out and use the third column to predict exam questions. Preferably, this training should occur within the structure of the course itself so lower ability students have the support of the higher ability students and the instructor can see where students struggle. One way to do this would be to set aside one day each week where students can bring matrix notes to class. The instructor could target several of the third column questions and have students work in groups to compare and contrast answers. Each group would be charged with taking the best parts of each answer to develop a collaborative answer. Groups could work together until ultimately the class had written a collective answer that could be posted to the class web site. This final answer would not only be a study aid, but would provide an opportunity for the instructor to discuss the elements of effective answers and model how to write them. An addition to helping students understand the expectations of filling out matrix notes, they would learn the deep processing strategies of putting concepts into their own words and separating main ideas from supporting details.

Another major problem the lower ability students identified was an inability to see a connection between the matrix notes and exam questions. This problem could also be solved with an explicit, in-class discussion on test taking. Before the first exam, students could be introduced to the four different types of multiple choice questions and provided with an example of each. After that, the instructor could do a think-aloud in which she could help students see how the questions in the third column lead up to the exam questions. For example, one third-column question is “What is the difference between the science of psychology and the practice of psychology?” The instructor could work through that third-column question in the following manner:

"When I read this question and look back at the four types of multiple choice questions there are, I don't think there will be an explicit question on the exam over this material because it is asking for more than just facts. I don't think that I will be asked an application question since this question doesn't ask me to apply this idea to a new scenario. I don't think it will be a summary question since the questions doesn't say 'explain' or 'describe,' which are words associated with summary questions. I do think it could be a compare-contrast questions since, when you compare and contrast, you are definitely looking for similarities and differences. Those words suggest to me in that I might need to compare and contrast psychology and the practice of psychology on one or more of the test questions."

After students saw a number of examples of this kind of think-aloud, they could work in groups to examine the third column for clues about what kinds of questions they would be asked on the exam. Student test questions could be read aloud for consideration and the best ones could be loaded onto the course website. Activities like this could be done a week or two prior to the test, so students could begin thinking in ways that will likely help them study successfully. Most classes have review days and activities and this exercise could replace what is currently being done.

"Graduated matrix notes" might be another way to help low ability students more effectively use this study aid. The first matrix notes that students received in the semester could be more directive. Right now, the third column contains open-ended questions. However, those could be replaced with statements that would require students to simply fill in a missing word or phrase. This would not only reduce the cognitive burden on students, but would make it more clear what kind of information they need to focus on. For example, rather than simply writing "Wundt," "James" and "Freud," in the second column and leaving it to students to decide what to write about each man, students could be directed about what to include. A

directive such as “Name the place where each early psychologist practiced and name his most significant achievement,” would provide students with guidance about what kind of information would be important. Over time matrix notes could become less directive. Open-ended questions could replace directives. Class time could also be devoted to helping students understand what to include. The instructor could ask students to identify what kind of information they thought was important enough to be on the exam. An instructor at Central Lakes College is currently experimenting with this idea. By the end of the semester, she hopes her students will develop their own matrix notes. For now, she is providing them with the notes and they are discussing why she included these particular terms and questions, and how they might be tested.

Ideas for further study

This study lays the groundwork for several future studies. From this one, it is possible to conclude that interventions such as the matrix notes are helpful, but it should not be assumed that lower ability students will know how to use them. Further research could explore various ways of training students to use them. For example, in a control class, students could simply be provided with matrix notes while in another, students could receive training in how to use them to predict exam questions. Surveys, interviews and test scores would make it possible for researchers to determine if students who received training had more favorable opinions of the matrix notes and if they helped them earn higher grades.

Other information that emerged through this study is that many unsuccessful students enter college without knowing the basics of studying. For example, they are unaware that they must break up study sessions and that memorizing terms is not adequate preparation for a college level exam. In another possible study, first year students could be surveyed to determine what they know about studying. Students whose survey answers reveal that they know little

about studying could be divided up into two groups. The first group could act as a control while the members of the second group could be invited to attend discussion groups where they would be explicitly taught how to structure study sessions, evaluate the quality of their notes and predict exam questions. At the end of semester, students could be evaluated to determine if receiving explicit instruction in studying helped them raise grades.

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Appendix A: Survey one

Survey 1: February 6-8

Directions for completing survey one:

Please only take an exam if you signed a consent form during the first week of school. You may

- Complete the survey right now and place it in the envelop provided
- Bring the survey to your discussion group to hand directly to Kathryn
- Bring it to the information desk and ask to have it placed in Kathryn Klopfleisch's campus mail box.

To receive your extra credit for taking this survey, please sign the sign in sheet attached to the envelope. If you return the survey directly to Kathryn or have it placed in her box, please attach a post-it or other removable note to the survey so Kathryn can let Martha know you have completed the survey.

Survey

1. How many hours do you spend reading the chapter?

A. I don't read the chapter
B. 1-3 hours
C. 4-6 hours
D. More than 6 hours

2. Select the answers that best describe how you review for exams. (circle all that apply)I don't have a review technique

A. Re-reading the chapter
B. Reviewing notes
C. Making flashcards
D. Memorizing terms
E. Other (Please Describe)_____

1. Do you take notes during lecture? Y N

A. If "yes," select the answer that best describes your approach
B. I write down whatever the instructor writes on the board
C. I write down whatever the instructor writes on the board plus anything he/she says that explains a concept I read about in the book
D. I write down whatever the instructor writes on the board plus anything he/she says that explains a concept I read about in the book. I also write down answers to any questions I wrote down while I was reading.

2. If you don't take notes circle the answer that best describes why

   A. Lecture moves so quickly I don't have time to write everything down.
   B. I'm not sure what I should write down.
   C. I feel like I have a good memory, so I don't need to take notes.

3. Do you take notes while you read? Y N

4. If "Yes" select the answer that best describes your note taking style

   A. I highlight or underline things I think are important
   B. I copy down the bolded words and their definitions.
   C. I copy down the bolded words and their definitions as well as main ideas.
   D. I use headings, subheadings and graphics to help me figure out main ideas and I highlight those or write them in a notebook. If something confuses me, I will mark it so I can ask questions in class.

5. You have been assigned Matrix Study guides to help you work with the chapter material. Please select the answers that describe helpful the Matrix Study Guides have been for you (Circle all that apply)

   A. I don't think they have helped me because I already had a note taking system
   B. I don't think they helped me because I didn't understand their purpose
   C. I don't think they helped me because I didn't see how they related to the exam questions.
   D. They helped me see connections between concepts and terms in the chapter.
   E. They helped me notice how the textbook was organized
   F. They helped me pick out main ideas
   G. They gave me a better idea what would be on the exam

10. If concepts in the book are confusing to you, what do you do to resolve your confusion?

   A. I tend not to do anything.
   B. I ask a friend who is in my class
   C. I Google the topic, or use another electronic resource to help me understand something.
   D. I make an appointment with a tutor
   E. I make an appointment to see my instructor

Appendix B: Survey two

Survey 2: March 5-19

Directions for completing survey two:

Please only take an exam if you signed a consent form during the first week of school. You may

- Complete the survey right now and place it in the envelop provided
- Bring the survey to your discussion group to hand directly to Kathryn
- Bring it to the information desk and ask to have it placed in Kathryn Klopfleisch's campus mail box.

To receive your extra credit for taking this survey, please sign the sign in sheet attached to the envelope. If you return the survey directly to Kathryn or have it placed in her box, please attach a post-it or other removable note to the survey so Kathryn can let Martha know you have completed the survey.

1. By now, you have had two exams in this class. Below, please circle the score you earned on each test.

Exam 1: A B C D F

Exam 2: A B C D F

2) Throughout the semester, you have had a number of opportunities to learn about new study techniques. What changes have you made to the way you study? (Circle all that apply)

a) I'm happy with my scores and made no changes to my studying.
b) I'm unhappy with my score, but haven't made any changes to my studying.
c) I began to take notes during lecture
d) I began to take notes when I read
e) I attended reading groups
f) I used the matrix study guide

3) You have been doing in class group activities this semester. Please select the answer that best describes how you feel about participating in groups

a) Very unhelpful
b) Unhelpful
c) Neither helpful or unhelpful

d) Somewhat helpful
e) Extremely helpful

4) If you learned a "C" or below on one or both exams, your instructor recommended that you attend the outside-class reading groups. Are you doing so? Yes No

If "yes," please select the answers that best describe your experiences (Circle all that apply)

a) I don't feel like I learned a useful study technique
b) I don't feel like the sessions addressed my particular study issue
c) I learned what is likely causing me to miss exam questions
d) I learned techniques that will help me study differently
e) I have made changes as a result of this new knowledge

5) Please indicate how many times you have attended the reading groups

a) Once
b) 2-3 times
c) 4-6 times
d) 7 or more times

6) One of the purposes of this study is to determine what you entered college knowing about studying and what you have learned about studying while you are here. Below is a list of statements. Please read each statement and mark the appropriate box—"already knew" means you came to college having already learned this information about studying. "Learned at CLC" means that you learned this information here. "Didn't know" means you didn't know this information about studying.

	Already knew	Learned at CLC	Didn't Know
I should divide my study sessions into three parts—first I should "warm-up" by looking over the chapter or reviewing notes. Next, I should read. Finally, I should "cool down" by reviewing what I just read to make sure I understand it.			
I should read a few pages each day, not try to read the chapter all at once			

There are four different kinds of multiple choice questions on exams			
It is possible to predict test questions			
Chapter headings and subheadings can help me find main ideas			
Learning the definitions of terms isn't enough—I need to also see how those terms relate to heading, subheadings and each other.			
There are different ways to take notes for a class			

Appendix C: Survey three

Survey 3: April 11-15

Directions for completing survey two:

Please only take an exam if you signed a consent form during the first week of school. You may

- Complete the survey right now and place it in the envelop provided
- Bring the survey to your discussion group to hand directly to Kathryn
- Bring it to the information desk and ask to have it placed in Kathryn Klopfleisch's campus mail box.

To receive your extra credit for taking this survey, please sign the sign in sheet attached to the envelope. If you return the survey directly to Kathryn or have it placed in her box, please attach a post-it or other removable note to the survey so Kathryn can let Martha know you have completed the survey.

1. A. Please circle the grade you earned on the FIRST test

A B C D F

B. Please circle the grade you earned on the SECOND test

A B C D F

C. Please circle the grade you earned on the THIRD test

A B C D F

2. Throughout the semester, you have been given matrix study guides to help you understand chapter concepts and terms. Please circle all the answers that describe your experience using them:

a) I already had a note taking system that I like, so the Matrix study guides didn't help me.
b) I didn't use the Matrix study guides
c) Matrix study guides helped me see how the chapter was organized
d) Matrix study guides helped me pick out main ideas from the sections of the chapter
e) Matrix study guides helped to see how terms related to concepts as well as to each other
f) Matrix study guides helped me make better predictions about what topics would be on the exam, and how the questions would be asked.

3. Please circle the statement you think most accurately describes your feelings about matrix study guides:

a) Matrix study guides did not contribute to my success in this course.
b) The matrix study guides may have helped me perform better on the exams
c) The matrix study guides definitely made me more successful in this course

4. In the table below are 6 study behaviors. In the row after each behavior, indicate how likely you are to engage in each of these behaviors:

	Always	Most of the time	Some of the time	Never
a. I studied every day				
b. I reviewed my notes				
c. I took notes while I read				
d. I predicted exam questions when I studied				
e. I made an effort to define terms and summarize concepts in my own words				
f. I looked over the chapter ahead of time so I could see how it was organized and what ideas would be important				

5) Did your instructor recommend to you that you attend the reading groups? Y N

6) Please indicate how many times you have attended the reading groups

a) Never
b) Once
b) 2-3 times
c) 4-6 times
d) 7 or more times

The remaining questions are for students who participated in outside-class discussion groups.

7) We want to know which techniques students who used the discussion groups found the most useful. Please select "Very helpful," "Somewhat helpful" or "Not helpful" after each technique.

	Very helpful	Somewhat Helpful	Not Helpful
a. Learning that reading has three stages—pre, during and post reading			
b. Learning that there are four different types of multiple choice questions			
c. Learning how to predict exam questions			
d. Learning how to use the matrix study guides			
e. Learning how to find main ideas			

8)This semester, you learned about a variety of study techniques. Please circle all those that you found most helpful

a) I didn't try any
b) I didn't find any of them useful
c) Learning that reading has three stages—pre, during and post reading
d) Learning that there are four types of multiple choice questions and how to use that knowledge to predict test questions.
e) Learning about different note taking strategies such as Cornell, annotating, etc.
f) Learning how to use matrix study guides
g) Comparing my notes with the notes other students wrote during class

9) One of our goals this semester was to teach you study strategies you could use in your other classes. Have you changed the way you study for any of your other classes? Yes No

If you answered "Yes" please answer the following questions

What class(es) did you apply these new study strategies to?

What specific strategies did you use?

Appendix D: Interview Script

Interview Questions

To be read to the interviewee before the interview:

"We are conducting interviews because sometimes it is helpful to ask students directly what they think and feel. Interviews allow us to ask follow-up questions and get into more depth than a survey would, so we are really glad you agreed to be interviewed. We're attempting to get a variety of perspectives from students who are earning A's and B's down to D's and F's, so not matter what your grade is, we really value your input. Finally, we want you to know that you are under no obligation to reveal embarrassing or personal information to us. One of the questions will ask you to explain how your personal or family life is affecting your performance in the class. You don't need to reveal anything about your family, your health, disability status or habits that you don't want us to know. You might say, for example, that your family places many demands on your time, but you don't need to explain why.

Finally, I will take notes on what you say and use your information to do two things 1) complete my Master's thesis and 2) to share with faculty here on campus who may be interested in what we discover about student learning. You will not be identified by name at any time."

Interview questions:

1. What grade do you think you are earning in this class right now?

2. Lots of factors go into success or failure in a class. Some of these things happen in the course itself—like how the instructor organizes class time. Some of these things happen outside school altogether—for example, your work schedule, or demands of family members. Can you explain what factors have either contributed to your success in the class or have been barriers to your success in this class?

3. When you are studying for a test how do you decide you have studied enough and are ready for the exam?

4. Prior to this class what, if any, note taking system did you use when you read textbooks?

5. Do you think the matrix study guides helped you? Why or why not?

6. What, if anything, did you learn about studying that you didn't know before?

Appendix E: Sample Matrix notes

Matrix Study Guide for Chapter 1: What is Psychology?

Topic	Details/ Definitions	Concepts/ Application
Psychology, Pseudoscience & Popular Opinion	Define *psychology* What does *empirical* mean?	What is the difference between popular opinion and the science of psychology? What is the difference between the science of psychology and the practice of psychology?
Critical Thinking Guidelines	1. 2. 3. 4. 5. 6. 7. 8.	Why is critical thinking so important in psychology? How might you apply each of the critical thinking guidelines in thinking about the field of *phrenology?*
Psychology's	Phrenology	What schools of psychology have

past	Wundt James Freud	disappeared, and which are still around today?
Psychological Perspectives	Biological Learning Behavioral Social-Cognitive Cognitive	Think of a key word that you can use to remember each of the perspectives.
What Psychologists Do	Basics research Applied research Experimental Educational Developmental	Describe what each of these psychologists might do during a typical workday.
Psychological Practice	Counseling psychologists Clinical psychologists	How are these practitioners different from each other? Which degrees would you have to

	Psychotherapist Psychoanalyst Psychiatrist LCSW or MFCC	earn to hold each of these titles?
Taking psychology with You: The Nine Secrets of Learning	Describe the two secrets of learning that most appeal to you.	How can you use these secrets to do well in this class? Describe your plan to actually use these two secrets.