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ABSTRACT

This study sought to generate a grounded theory of the role of metacognitive self-regulation in the completion of daily academic tasks by college students. Thirteen female students in an upper-division education class completed qualitative interviews concerning studying for exams, writing papers, and taking notes. Twelve different metacognitive self-regulation themes emerged from the interviews: awareness of self, task, and memory/memory strategies; planning/organizing of time, tasks, and materials; monitoring/evaluation when studying for exams, writing papers, and taking lecture notes; and self-regulation of attention, comprehension/understanding, and learning/memory. The study also found that the participants were more likely to engage in self-regulation when they were interested in or enjoyed a class, when the professor was well-organized and/or enthusiastic, or when their time permitted. A list of interview questions is included. (Contains 57 references.) (MDM)

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Running Head: METACOGNITION AND DAILY ACADEMIC TASKS

Examining Metacognitive Self-Regulation Within the Context of Daily Academic Tasks

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Examining Metacognitive Self-Regulation Within the Context of Daily Academic Tasks

Abstract

Educational researchers have become interested in metacognition as an important component of intelligence and academic success. The present study attempts to generate a grounded theory of the role of metacognitive self-regulation in the completion of daily academic tasks. From qualitative interviews with thirteen college students (concerning studying for exams, writing papers, and taking notes), twelve different metacognitive self-regulation themes emerged: awareness of self, task, and memory/memory strategies; planning/organizing of time, tasks, and materials; monitoring/evaluation when studying for exams, writing papers, and taking lecture notes; and self-regulation of attention, comprehension/ understanding, and learning/memory. Participants are more likely to engage in self-regulation when they are interested in or enjoy the class, when the professor is well-organized and/or enthusiastic, and when time permits. In addition, the findings suggest that students' own understanding of metacognitive self-regulation exists in a contextualized or situated state.

Examining Metacognitive Self-Regulation Within the Context of Daily Academic Tasks

In recent years, researchers in the fields of educational and cognitive psychology have become increasingly interested in metacognition (Garmer & Alexander, 1989; Osman & Hannafin, 1992). One reason for the increased interest is the belief that metacognition is an important component of intelligence and academic success (Borkowski, 1985; Brown, 1978; Sternberg, 1984). Borkowski, Carr, & Pressley (1987) have suggested that the concept of intelligence is no longer necessary since researchers have learned about the underlying metacognitive processes which comprise intelligent behavior.

Flavell (1979, 1981, 1987) makes the distinction between metacognitive knowledge and metacognitive experience based on his research with memory performance in children. The knowledge component of metacognition is comprised of long-term memory representations that relate to sensitivity, person knowledge, task knowledge, and strategy knowledge, the last three of which are in continuous interaction with each other. These four metacognitive knowledge areas are explained in the Flavell-Wellman taxonomy (Flavell, 1981). Sensitivity involves knowledge about what cognitive processes are most appropriate for particular situations with particular cognitive goals. Person knowledge includes knowledge and beliefs concerning how people, in general, learn and process information as well as how self learns and processes information. Task knowledge involves knowledge about what requirements are needed to complete tasks successfully and what cognitive processes will help meet these requirements. Strategy knowledge involves knowledge about what methods (cognitive and metacognitive strategies) will help to achieve particular cognitive goals

The second aspect of metacognition, metacognitive experience, in Flavell's (1979) model has diminished in importance, while the idea of metacognitive self-regulation has become the area of emphasis in most metacognition research. According to one of Brown's (1978) early definitions, metacognitive self-regulation involves "predicting, checking, monitoring, reality testing, and coordination and control of deliberate attempts to learn or solve problems" (p. 78). These processes result in efficient thinking, which Brown equates with intelligence. Later, she chose a broader definition of metacognition: understanding of knowledge that can be reflected in either effective use or overt description of that knowledge. Brown (1987) states that metacognition is not an optional extra but is central to learning.

Osman and Hannafin (1992) agree with the knowledge and regulation components of metacognition. They suggest that self-regulation involves strategic adjustments based on the monitoring of one's own performance. Both Osman and Hannafin (1992) and Brown (1987) suggest that metacognitive self-regulation is an important characteristic of "good" learners. Studies which have used spontaneous strategy use to examine differences between good and poor learners have found that many of the differences between good and poor learners seem to be explained by differences in metacognitive awareness and resulting strategy use (Ames & Archer, 1988; Brown & Smiley, 1977, 1978; Diener & Dweck, 1978; Franks, Vye, Auble, Mezynski, Perfetto, Bransford, Stein, & Littlefield, 1982; Owings, Petersen, Bransford, Morris, & Stein, 1980; Shuell, 1983).

Glaser (1984), however, believes that self-regulation is less important to intelligent performance in specific content areas where individuals have access to a broad span of learned schemata and procedures. The general self-regulative processes may be more important in

unfamiliar domains in which the learner does not have pre-existing schemata.

In spite of the increasing interest in metacognition as an important contributor to intelligence and academic achievment, no one has attempted to learn from students the importance that they place on metacognitive self-regulation in their day-to-day experiences in an academic environment. What better way to understand metacognitive self-regulation and determine its importance for students than to let students "make sense" of the concept within the context of their own daily activities as Von Wright (1992) suggests?

Jacob (1992) has suggested that there has been a major void in cognitive research in terms of the context in which cognition occurs. She believes that researchers investigating cognition have not placed enough emphasis on the daily situations in which cognition occurs or on the meaning that participants give to the situations and the cognition. The present study attempts to remedy that by addressing metacognitive self-regulation (i.e., planning, monitoring, evaluating, and adjustment activities) within the framework of daily academic activities, as well as by allowing participants to discuss the most salient features of the situation and their cognition. Not only does this study provide evidence of the existence and form of metacognitive activities in daily academic activities, but it also paves the way for future studies to use non-traditional methods to examine metacognition.

Previous studies in the area of higher education to use truly qualitative data, as well as qualitative methods of data analysis, have been performed in an attempt to classify study behaviors as deep versus surface approaches to studying (Marton & Saljo, 1976), classify study skills as holistic versus atomistic (Svensson, 1977), examine the reasons high school drop-outs give for leaving high school (Dudley, 1993), examine attributions of success and failure in college

among black students at a predominantly white university (Kraft, 1991), examine the affect of surface, deep, and strategic study approaches to learning on studying for final exams (Entwistle, 1994), and to examine the importance of note-taking in the world of college undergraduates (Van Meter, Yokoi, & Pressley, 1994). Studies in the field of metacognition that have used qualitative methods have traditionally used structured interviews which require students to respond to hypothetical problem situations (Lehrer & Randle, 1987; Swanson, 1992), or think-aloud protocols and retrospective reports concerning a specific cognitive task that has been performed during the experimental session (Lester, Carafalo, & Kroll, 1989; Swan, 1993). In all of these cases, the resulting transcripts have been coded according to some scale; a quantitative variable is then formed which is subjected to statistical analyses. More recent studies of metacognition have used structured interviews concerning real academic activities as the primary method of data collection or in conjunction with quantitative measures (Chamot, 1987; Evans, 1991; Malone & Speaker, 1994; van Kraayenoord & Paris, 1993). In these studies, the qualitative data has been categorized into themes or has been used as anecdotal data to support the results of statistical analyses.

The present study is one of the first studies to use qualitative interviewing and the resulting qualitative data in an emerging design (i.e., hypotheses are generated and tested during data collection) to examine metacognition. Qualitative data is examined without any attempt to convert it to quantitative variables. Resulting themes and interpretations of those themes are based on the factors which were found to be important to participants based on their responses rather than on pre-specified categories based on metacognitive theory. The result is a grounded theory of metacognitive self-regulation that has been developed from the perspective of the

student participants (Glaser & Strauss, 1967).

Interviews with student informers were to provide answers to the following questions: what terms do students use to describe metacognitive self-regulation and how do they define it?; what activities are seen as being self-regulatory and under what conditions are these activities performed?; do students at different achievement levels place different amounts of emphasis on metacognitive self-regulation and do they define it differently? The advantage of using qualitative data to provide answers to these questions is that the context of the student's daily academic activities and educational experiences is maintained (Jacob, 1992; Patton, 1991). This method of collecting data is consistent with the constructivist movement in cognitive psychology, as well as the findings which suggest that knowledge is situated within a particular learning environment or context (Brown, Collins, & Duguid, 1989; von Glasersfeld, 1995).

Method

Participants

The participants were recruited from an upper level education class (the investigator was not the instructor) at a state college located in an industrial, Northeastern city. Choosing participants from one class and one program of study was done to minimize differences in prior knowledge (Glaser, 1984); all of these students had taken a 100-level education course in which metacognitive self-regulation was covered.

Early in the fall semester, these students were told that the research concerned study behaviors and attitudes rather than metacognitive self-regulation since they might not have a practical definition of the term that would allow them to reflect on the activities of interest. In addition, this description alleviated the problem of participants responding according to the text-

book definition of metacognition rather than according to what they actually do (Hayes & Flower, 1983).

The details of the study, including the fact that they would receive $10 per hour for participation, were explained to the students in class. Of the 19 students who were in attendance that day, 14 chose to participate. Data from only thirteen of the participants was included in the final analysis The participant who was not included is the only male in the sample and the only graduate student. Because he was so different from the other participants in terms of demographics, the focus of the data analysis is on the other thirteen participants.

In addition to being female undergraduates, all participants are white except for one African American student. All of the participants are sophomores, juniors, or seniors in the same degree program, exceptional education, except for one, a general studies major with minors in exceptional education and art therapy. Since the general studies major had all of the exceptional education classes except for the practicums, these participants should be roughly equivalent in terms of the types of courses they have taken and the prior knowledge they have about education. The grade point averages (GPA's) of the participants ranged from 2.32 to 4.00. (In the text below and in the tables, participants are referred to by the initials of self-chosen pseudonyms.)

Data Collection

One week after the class visit, a questionnaire was mailed to each of the participants. The purpose of the questionnaire was to provide background information about the participants and was administered to save time during the initial interview. Responses to the questionnaire also served as a rough measure of reliability since data gathered in one way can be used to check the accuracy of data gathered in another way (LeCompte & Preissle, 1993).

The primary method of data collection for the study was in-depth interviewing as described by Seidman (1991). With this approach, open-ended questions are used in a series of three interviews. The purpose of the first interview is to allow the interviewee to discuss the topic under study as it relates to past experiences. The second interview is meant to elicit details of the person's experiences in the present. In the final interview, the interviewee is to reflect on the importance of past and present experiences for his/her life.

The interview process. Initial interviews were arranged with all of the participants once the completed questionnaire had been received. These interviews were recorded on audio tape. Questions were specified ahead of time to be covered during each of the three interviews. (See the Interview Guide in the Appendix). However, interviews were more of a conversation, similar to the procedure used by Kraft (1991). Each interview was to begin with the participants talking freely about the topic at hand (i.e., study behaviors in the past, study behaviors in the present, and conclusions about study behaviors). Once the participants had addressed the main topic to their satisfaction, the interview guide was checked to make sure that everything was covered. Follow-up questions were used to address uncovered information or to expand on comments made by participants.

Before each of the first interviews, the questionnaire data for each participant was examined, and follow-up questions were developed based on this information. The interviews began with these questions. Once these questions were answered, the participants discussed how they learned and studied in the past. Follow-up questions were generated during the interviews based on their responses.

Prior to the second interview, a preliminary domain analysis was performed (Spradley,

1979) on the data collected in the first interview. Questions were developed for the next interview based on this analysis. The second interview began with follow-up questions from the first interview. Then, each participant discussed her studying and learning in the present. The interview guide was again used to ensure that relevant information was covered.

Before the third interview, another domain analysis was performed on the data collected from the second interview, and follow-up questions were developed. The third interview began with follow-up questions from the second interview. The participants then summarized their learning and developed some conclusions about themselves as studiers. Then, the participants were asked to respond to each of the remaining three questions on the interview guide.

There were two participants who, due to scheduling problems, did not adhere to this general interview process. For one of these exceptions, the second and third interviews were completed on the same evening with a short break between them. During the break, I reviewed my notes from the second interview to formulate follow-up questions for the third interview.

The other exception was a participant who was unable to schedule interviews until the end of the data collection period (the end of the semester). Because time was short and we both had very busy schedules, we scheduled all three interviews on one day. For this participant, the interviews proceeded in the same way as for the others, but with only short breaks between each interview rather than a few days. During the breaks, I examined my notes and developed follow-up questions.

These two participants were not dropped from the study for two reasons. First, Seidman (1991) has suggested that it is better to do conduct an interview under slightly modified conditions than to conduct no interview at all. Second, the number of self-regulation themes

mentioned during their interviews was not different from those of the other participants (based on the data in Figure 1). The average number of themes mentioned was around 6 (11 was the most and 4 was the fewest). The first exception, EI, mentioned 7. (She was in the high GPA group.) The second exception, EL, mentioned 6. (She was in the medium GPA group in which every participant mentioned 6 themes.)

Once the third interview had been completed for all participants, the questionnaire and interview data was used to compile a short profile of each participant. The participants were to read the personal profile and indicate whether or not they accepted the profile as an accurate personal depiction. This was a form of "member checking" in order to ensure that they agreed with the investigator's interpretation of their reality (Lincoln & Guba, 1985). Everyone accepted their profiles as written, except for one participant, who indicated that her age was wrong.

Data Analysis

When the interviewing was complete, each of the interviews was transcribed verbatim. Once the data were ready for final analysis, the transcripts were "tidied up" and reviewed (LeCompte & Preissle, 1993). Sections of the text that represented a single concept were identified and labeled according to what they seemed to be describing. These final themes emerged quite easily since Spradley's (1979) method of analyzing data and testing hypotheses was used throughout data collection. As a result, related statements were generally located at one point in the transcripts.

After identifying and labeling themes for each participant, each theme was transferred to a 5" x 8" card for each participant. All of the cards representing one theme were placed in a pile. These cards were then placed in descending order according to the GPA of the participants. Once

all of the cards were sorted, a case-ordered display matrix was constructed to assist in the process of organizing the data (Miles & Huberman, 1994). The themes were the headings of the columns of a large chart, and the participants names were the headings for the rows. The participants were in descending order according to GPA on this chart. Participant comments representing each of the theme areas was then entered into the matrix in a condensed form. An example of one column of this case-ordered meta-matrix is shown in Figure 2.

The main themes of interest were then examined in more detail. Further condensation and interpretation of data occurred, and several cross-case meta-matrices were developed to help answer the research questions. These cross-case meta-matrices are shown in Figures 3-6. Final interpretation and condensation of these meta-matrices resulted in the taxonomy of metacognitive self-regulation shown in Table 1.

Reliability of the Interview Data

In order to ensure the reliability and the validity of the study, information was collected by the participants using two methods, a paper-and-pencil questionnaire, completed outside of the interviewer's presence, and open-ended interviews. In addition, before students were chosen to participate, they were asked to provide their overall GPA to serve as a separate piece of data with which to compare interview comments to ensure consistency. (According to Reynolds and Miller [1989], self-reported GPA is a reliable measure of achievement.) Comments made on the questionnaire were very similar in content and tone to those made during the interviews. This provides evidence that responding in my presence did not unduly influence their comments as compared to their written responses.

The participants were also consistent in their verbal reports concerning grades. The

people who had reported very high GPA's responded in ways that suggest that they work hard to get those grades. Those with lower reported GPA's were very frank in the interviews about their overall grades, as well as with individual grades that may have been better or worse than their typical performance. Since they were very candid and very consistent in their reports concerning grades, which are a very important and a very personal matter, it seems likely that their comments about less personal matters (e.g., study behaviors, interest in classes, etc.) are a true reflection of what the participants do rather than a reaction to what they believed the study was about, especially since they had such a vague notion of what things were of real interest. In addition, the investigator was from another institution and was not affiliated with their program in any way.

Results and Discussion

Terms Used to Describe Metacognitive Self-Regulation

In the course of three interviews with thirteen participants, there was not a single use of the term metacognitive self-regulation or metacognition. Does this mean that these students do not regulate their cognitive activities? Based on what the participants were saying about their academic tasks, they did seem to be planning, monitoring, evaluating, and adjusting their cognitive activities. However, the term that educational psychologists use to describe these activities (i.e., metacognitive self-regulation) was not used.

Because no one had explicitly mentioned metacognition or metacognitive self-regulation during the first two interviews, in the final interview, participants were asked if they knew what metacognition was and, if so, to provide a definition. If they were not capable of providing a definition or if the definition given was not consistent with popular definitions, there was a brief discussion to clarify the concept. They were then asked to discuss ways in which metacognition

plays a role in their academic activities.

To make comparisons easier, the participants were divided into three groups based on GPA. However, these groupings are arbitrary and may or may not reflect true differences in the achievement levels of the three groups. The top third represents the "high" group (3.30 to 4.00); the bottom third represents the "low" group (2.32 to 2.60); and the middle third is the "medium" group (2.70 to 3.15).

Out of the thirteen participants, only three (23%) knew what metacognition is. Two of these participants were in the high achievement group (EI and JS), and one was in the medium achievement group (EL). Of these three, only JS provided a thoughtful answer rather than the pat definition, "thinking about thinking." Four participants (31%) knew that it involved "thinking about something" or "prior knowledge," and the other seven participants (54%) had no idea what it was, even though five of them knew that they had heard the term before. (Table 2 summarizes these results.)

It is not surprising that these participants do not use the term metacognition to describe their own cognitive activities since they do not know what the term means. The three who had definitions, however, also did not apply the term to their own cognitive activities, although JS knew that it was a "big teaching word" and was related to cognitive strategies. The fact that all of these participants are teachers in training makes these results even more surprising since metacognition is such a popular "buzz" word in education.

When participants were told what metacognition is, all of them except for EL (92%), could name at least one way in which metacognition is relevant to their own academic and cognitive activities or, as in JF's case, at least believed that it is important to regulate one's own

cognition even if an example was not readily available. From the third column in Table 2, it becomes apparent that the high achievement group could talk about specific strategies or specific cases when metacognitive self-regulation is important for their academic activities. Only two participants in the medium achievement group mention specific examples (SL and JO). All of the responses by participants in the low achievement group were vague and lacked specific examples. Three of the participants in this group (EO, JH, and JT) mention that it is important to "know how you are." However, they give no indication of what about themselves they need to know. JG indicates that "you have to plan," but does not discuss what things need to be planned or why. Finally, JF cannot provide any example of how metacognitive self-regulation is involved in her academic activities, although she does agree that it probably does play a role.

Summary and discussion. The participants in this study did not spontaneously discuss metacognitive self-regulation when they discussed completing their academic activities, and only a very small percentage of the participants were able to define metacognition. However, when provided with a definition and/or an example, all of them except for one could see the relevance of metacognition for academic activities, but only the high achievement group and two members of the medium achievement group were able to provide specific examples. These findings are surprising since all of these students are in the department of education, where metacognition is a concept covered in a 100-level, required education course. Several of the participants who did not know what metacognition is indicated that they had heard the term before and should know what it meant. Presumably, they had learned about the importance of metacognition as it relates to students they were going to be teaching. However, the majority of these successful college students did not incorporate knowledge about metacognition into their own academic activities

without being prompted to do so This finding has implications for metacognitive training programs which provide information about metacognitive knowledge and human cognition in the hopes that this knowledge will result in metacognitive self-regulation (e.g., Kurtz & Borkowski, 1984; Paris & Oka, 1986). Declarative knowledge does not necessarily relate to procedural knowledge (Brown et al., 1989), as these participants have shown. Programs are more likely to be successful when students are allowed to practice self-regulation with actual academic tasks. (See Livingston [1996] for a review of such programs.)

The difference in the degree of specificity of the examples provided by the participants in the different achievement groups is consistent with research previously performed in this area (Bouffard-Bouchard, Parent, & Larivee, 1993; Pressley, Borkowski, & Schneider, 1987; Sternberg, 1984; Swanson, 1992) which has found that "good" learners have more metacognitive awareness and are able to translate this awareness into specific strategies. "Poor" learners, on the other hand, may have some degree of metacognitive awareness, but they have difficulty translating this awareness into specific strategies that can be applied to a problem situation.

Self-Regulatory Activities and the Conditions under which They are Performed

To examine the activities students see as being self-regulatory, a case-ordered display of each category pertaining to metacognitive self-regulation was developed (Miles & Huberman, 1994). The main themes, as well as the categories within each theme, were derived from the data, although they may correspond with those identified in previous quantitative research. From this matrix, the entries were further condensed to develop five cross-case meta-matrices for each of the major theme areas. (See Figures 3 through 6.) Not all participants had data for all categories since the categories were based on what was said spontaneously in the interviews rather than on

questions or categories developed before the interviews were conducted. These meta-matrices were then further summarized into the taxonomy shown in Table 1.

Awareness of self, task, and human memory. Although examining Flavell's (1979, 1981, 1987) concept of metacognitive knowledge was not the main focus of this research, it became apparent from analyzing the data that metacognitive knowledge or awareness is important to these participants. When participants were speaking about specific academic activities, there was a great range in the amount of awareness of important variables (i.e., self, task, and memory/memory strategies) by the participants. CC was the most aware of all the participants. She uses her knowledge of how she learns best, as well as her knowledge of what tasks require, to preplan her academic activities to ensure success. From organizing lecture notes in a way that facilitates her use of a favorite mnemonic to writing her own review questions on the textbook, she is very methodical in her academic activities and has achieved great success.

The other participants exhibit similar types of awareness but not to the same degree. In addition, they seem to be more aware of their own cognitive needs and preferences than they are of the task demands or the ways that people remember things in general. Two individuals (15%) expressed no comments that could be considered awareness of self, task or memory/memory strategies (JG and JF). The remaining participants (85%) expressed some form of awareness, although it was mainly self-awareness. The participants seem to know how they learn best, whether by writing things over and over or explaining concepts to someone else. There were only two individuals besides CC who spontaneously mentioned things that could be considered task-awareness, however, and both expressed awareness regarding exams.

When explicitly asked about differences in the type of studying required for different types

of tests (e.g., essays versus multiple choice), almost everyone indicated that they did study differently for different types of tests. Seven individuals (54%) indicated that their studying was different when it was an essay as compared to a multiple choice test. Eight people (62%) also indicated that they study differently, or at least put in more time, when it's a final or a midterm as compared to a chapter test. Only JG indicated that she studies the same whether it's a chapter test or a final. Although all but one of the participants did discuss awareness of type of test and importance of test, greater specificity of strategies was seen in the high achievement group. For example, CC indicates that with essay tests, she'll do library research, as well as ask other people who may have pertinent information to provide a broader base of knowledge about each essay topic.

Only two people (15%) expressed awareness of how people, in general, remember. Strategy awareness is included within this category as well, since all of the strategies mentioned were mnemonics or elaboration strategies used to help the participants remember information for an exam. Four participants (31%) mentioned mnemonics, while only EI also mentioned elaboration strategies.

Planning and organizing to complete academic activities. Three different types of planning and organizing activities emerge from the data. These participants attempt to organize and plan their time. They also attempt to organize and plan academic tasks, and they attempt to organize academic materials. Five of the participants (38%) emphasize time factors when they discuss their attempts to manage academic activities. They generally use a calendar or a datebook to monitor what projects are due when and how they need to divide up their time between tasks. Eight of the participants (62%) emphasize task factors. They all mention dividing up their academic activities

into discreet tasks and making a list of these activities. In addition, several of them mention that they feel rewarded or reinforced when they are able to cross off items that have been completed. Four of the participants (31%) discuss both time and task factors (CC, HO, EL, and JT). They not only monitor the amount of time they have to complete academic activities, but they also break down these activities into discrete tasks that must be accomplished within a particular amount of time.

The final type of planning and organizing involves course materials. Only three participants (23%) spontaneously mentioned the importance of organizing course materials (EI, JF, and CC). However, when they were explicitly asked about taking lecture notes, these three and seven more (a total of 77%) indicated that it was important to organize lecture notes in some way.

Monitoring/evaluating progress in academic activities. Since monitoring and evaluation were always discussed together by the participants during the interviews, they are considered together here. The monitoring/evaluation activities that are mentioned can be categorized according to the academic task that is involved: tests, papers, and lecture notes. The greatest amount of monitoring and evaluation is related to tests and determining test readiness. Nine of the participants (69%) indicate that they use at least one form of monitoring and evaluation to determine if they are ready for an exam. These forms are quizzing oneself, being quizzed by others, telling the information to oneself without looking at it, telling the information to someone else without looking at it, and feeling confident about the material. It is interesting that all of the participants who mention feeling confident about course material as a way of assessing readiness for an exam are in the low achievement group. However, only JT, with the lowest GPA, uses

feelings of confidence exclusively.

For papers, the main type of monitoring and evaluation involves proof-reading for grammar and syntax errors, as well as assessing how well the ideas are conveyed to the reader. Six participants (46%) mention some form of monitoring and evaluation when writing papers, but JO is the only participant who mentions using the professor's assignment sheet for the paper as an aid in monitoring and evaluating her work.

Four participants (31%) discuss monitoring and evaluating their lecture notes. These activities take the form of trying to determine what is important information based on what is also in the textbook or what the professor seems to be emphasizing. In two of the four cases (EO and CC), recopying the notes after class is an integral part of the process.

Adjustment in academic activities. Adjustment can be classified according to the cognitive process that students are attempting to adjust. The three areas that were evident in the interview data were attention, comprehension and understanding of course materials, and learning and memory. Only two participants (23%) mention attempts to adjust their attention to lecture, one in the high achievement group (HO) and one in the low achievement group (EO). In both cases, they indicate that they will read the text in class if they find that they are not engaged in the lecture.

When attempting to adjust their understanding or comprehension of course materials, the participants often turn to an external source for help. Some turn to the text book for information they need, this process may involve reading and rereading passages until the concept is understood (JF). It may also involve using a glossary or dictionary to provide definitions of unfamiliar words (HO and JO).

Participants may also turn to classmates. In general, this seems to occur the most when it involves material in lecture notes. Professors are also a source to aid in comprehension and understanding. Those who mentioned professors did so when discussing papers or projects. Only JO mentions going to the professor when she does not understand something from the lecture notes.

The final cognitive processes which participants attempt to adjust are learning and memory. Only three participants (23%) specifically mentioned regulation in this area, however. Of these three, two (JO and JH) indicate that they keep going over information that they have not learned or remembered in a type of maintenance rehearsal until it "sinks in" (JH). Only one participant mentions using a strategy when unable to learn or remember important information: EI uses mnemonics or elaborative rehearsal to aid her in learning and remembering information. These strategies appear to be effective since she says that she "doesn't study much," and she still manages to have the third highest GPA of the participants in this study.

Conditions affecting self-regulation activities. There are four conditions that affect the extent to which participants self-regulate their academic activities: intrinsic interest in the content, enjoyment of the class, the teacher/professor, and time factors. Seven of the participants (54%) indicate that they are willing to put more time, effort, and thought into academic activities when they believe that the course is related to their profession. They are also able to put time, effort, and thought into academic activities when they like a course. If they don't like the course, however, they often do just enough to "get by" (e.g., EO, SL, SJ, JF, and EL).

The professor also plays an important role in the degree to which the participants find the class useful and enjoy it. There is less interest in completing the academic activities for a class

when the professor is not motivating or is not an effective teacher (e.g., JO and JS). An effective professor who can clearly convey the course concepts and shows enthusiasm for the course material, however, can encourage participants to become engaged in the class whether it is relevant for their profession or not (e.g., EL and EO).

Time is also a factor in determining whether or not students put time, effort, and thought into academic activities. For the majority of participants who mentioned time as a factor, being too busy results in less engagement with each class. JT is the only participant who discusses lack of time as a good thing since it forces her to avoid procrastination.

Summary and discussion. Many researchers in the area of metacognitive self-regulation (e.g., Brown, 1987; Flavell, 1979; Garner & Alexander, 1989; Osman & Hannafin, 1992; Von Wright, 1992) believe that some type of knowledge about self, task requirements, and human learning and memory is required for effective self-regulation. The participants in this study do exhibit awareness of self, task, and human memory. Almost all of the participants exhibit self-awareness and task awareness. Only 15%, however, showed an awareness of how humans remember best. They also did not indicate an awareness of different cognitive strategies to any great degree. Only 31% mentioned mnemonics or other cognitive strategies as an aid to learning and memory.

Evidence of planning and organization can be found in three areas: time, tasks, and materials. Monitoring and evaluation takes place as participants are studying for tests, completing papers, and taking lecture notes. However, it is most frequently found when studying for tests and involves an attempt to determine if learning has occurred and to what degree. Adjustment of attention, comprehension/understanding, and learning/memory was mentioned the least in the

interviews as compared to awareness, planning/ organizing, and monitoring/evaluating.

In addition, the degree to which this metacognitive self-regulation occurs is influenced by intrinsic interest in the class content, enjoyment of the class, the teacher/professor, and time factors. These findings are supported by Ames and Archer (1988), Archer (1994), Brown (1987), Nolen (1988), and Tuckman (1994) who all suggest that the classroom context influences motivation which, in turn, influences the degree to which students regulate their own learning. Although the majority of the participants indicated some level of metacognitive awareness, they differ in the number of examples of self-regulation found in their interview transcripts, presumably because of these contextual factors which influence metacognitive self-regulation. As Schraw (1994) suggests, metacognitive awareness is a prerequisite of metacognitive self-regulation, but it does not guarantee that self-regulation will occur.

Variation in Metacognitive Self-Regulation Among GPA Groups

Participants from each of the three achievement groups exhibited awareness of self, task, and memory, organization and planning activities, monitoring and evaluating activities, and self-regulation. Figure 1 shows these twelve metacognitive factors. A mark has been placed in the grid to indicate which participants show evidence of each factor. The total number of marked cells for the high achievement group is 35. In the medium achievement group, this number drops to 24, with each participant mentioning six themes. In the low achievement group, there are 26 marked cells, with five or six marked for each person.

In the high achievement group, however, two participants are responsible for 22 of the 35 references to metacognitive factors. These two students are CC (who has a GPA of 4.0) and HO (who has a GPA of 3.90) with eleven marked cells each. The rest of the undergraduate

participants, including the others in the high achievement group, have from four to six marked cells. The main difference between these two high achievers and the other participants appears to be the pervasiveness of metacognitive factors in their descriptions of their overall approaches to academic activities. In addition, they mention a greater number of different factors than the other participants. These two students seem to be more "in tune" with themselves as seen in their statements when they were asked to summarize or come to some conclusions about themselves as studiers. Not only are these students aware of their own needs and preferences as learners, but they also know what activities are required by different academic tasks.

Summary and discussion. Although most of the participants could not define metacognition, participants from each of the three achievement groups exhibited awareness of self, task, and memory, organization and planning activities, monitoring and evaluation activities, and self-regulation. However, only two participants are responsible for the difference in the number and variety of metacognitive factors mentioned by each of the achievement groups. The main difference between these two high achievers and the other participants appears to be the pervasiveness of metacognitive factors in their descriptions of their overall approaches to academic activities. In addition, they mention a greater variety of factors than the other participants.

These findings are not inconsistent with quantitative studies which have found a very slight, positive relationship of metacognitive self-regulation and college GPA (Tuckman, 1994; VanZile-Tamsen, 1993). Some students, such as the two in the present study, are highly motivated for all of their classes, and metacognitive self-regulation is an integral part of their learning. Other students, like the other eleven in this study, are metacognitively aware of

important variables but either do not expend the energy on self-regulation unless there is strong motivation to do so or are unable to translate knowledge about cognition into procedures for regulating cognition. These findings are consistent with several quantitative studies which have found that students from all achievement levels may show some degree of metacognitive awareness (Lehrer & Randle, 1987).

Summary of the Findings and Implications

In the present study of metacognitive self-regulation in college students, the college students interviewed have metacognitive awareness, and they do make an effort to plan/organize, monitor/evaluate, and adjust their own cognitive activities. This addresses the nagging question in metacognition research regarding the degree to which metacognitive processes are conscious (Garner, 1988; Meichenbaum, Burland, Gruson, & Cameron, 1985). In the present study, metacognitive self-regulation is conscious to a degree and can be discussed by participants when they place it in the framework of specific academic tasks that they must complete. It is much more difficult for them to discuss the relevance of metacognitive self-regulation for their academic activities in general, when they are not discussing specific classes and academic activities.

In addition, because they were recalling detailed activities from the distant past, it is unlikely that their comments reveal everything about their self-regulating activities. It is likely that many of their self-regulatory activities have become automatized and are not available for conscious reflection (Glaser, 1984).

When the participants were discussing specific academic activities, however, a total of twelve separate metacognitive awareness and self-regulation themes were evident in the transcripts. In addition, these self-regulating activities are most likely to occur when participants

have an intrinsic interest in class content, they enjoy the class, they see the teacher/professor as well-organized and enthusiastic, and they have sufficient time to devote to academic activities. To determine how applicable these findings are to other students at other schools in different majors, interested readers must determine the similarity of other contexts to this one (Lincoln & Guba, 1985).

Implications for Theory, Research, and Practice

The present study provides evidence that these college students are conscious of their metacognitive self-regulation activities to some degree and are able to discuss them. However, they must do so within the framework of their academic activities. When they were asked to talk about metacognitive self-regulation activities devoid of the context provided by referring to a specific class or academic task, they were unable to give more than a simple example of metacognition, which generally involved self-awareness or planning/organizing factors. This fact reinforces the recent trend of researchers in the area of metacognition performing research in naturalistic settings, in the classroom or academic environment where learning takes place (Entwistle, 1994; Jacob, 1992; Tuckman, 1994).

From these results with these students, it appears that there is no generic metacognitive self-regulation which exists in a decontextualized state outside of a specific academic context. Since these college students seem to be aware of their own metacognitive self-regulation activities within the context of actual academic tasks, assessing metacognitive self-regulation by asking them about these tasks seems to be more useful than asking them to respond to hypothetical problem situations, which may or may not be related to academic situations (Garner, 1988). Methods which maintain the academic context in which the student is immersed seem more valid

than self-report measures which assess metacognitive self-regulation in a generic manner with no explicit ties to specific academic tasks in specific academic situations.

Because of this contextualized state in which metacognitive self-regulation exists, there are many problems with attempts to teach metacognitive self-regulation in a general form that will transfer to a variety of subject areas (Osman & Hannafin, 1992). Students involved in metacognitive training programs cannot be expected to make the connection between knowledge and practice without a lot of encouragement. Teachers from every discipline may need to incorporate information about metacognitive self-regulation and guided practice in regulation into their courses to encourage students to make the connection between knowledge and application (Pearson & Santo, 1995).

A further implication for metacognitive training programs comes from the finding that participants in this study also engaged in a wide range of self-regulation activities in spite of the fact that they expressed similar levels of metacognitive awareness; metacognitive awareness does not guarantee that self-regulation will occur. The participants stated that there were situations in which they were more likely to be mindful learners. This suggests, as does research by Archer (1994) and Tuckman (1994), that metacognitive training at the college level is less effective than attempts to enhance motivation. However, some students, like some of the participants in the present study, are happy with "just getting by" and do not want to expend more cognitive effort.

Suggestions for Future Research

A large discrepancy seems to exist between what students know about metacognition and about learning in general and the degree to which they incorporate this information into their own attempts to complete academic activities successfully. Future research in the area of

metacognition needs to address the process through which students incorporate declarative knowledge about the way humans learn and remember into their procedural knowledge of how to successfully control their own learning through self-regulation and the use of learning strategies. More studies like the one described by Pearson and Santo (1995) need to be conducted to determine the effectiveness of teaching metacognitive self-regulation embedded within a curriculum and to assess the degree of transfer of self-regulation to other subject areas.

In the present study, interviewing was an effective method of assessing metacognitive self-regulation in a group of college students. However, future research should attempt to incorporate other innovative methods, such as the tutor-tutee method used by Garner, Wagoner, and Smith (1983), with interviewing in order to verify that the students are doing what they say they are doing. Having them "teach" a novice college student how to study successfully for exams, complete papers, and take lecture notes is a way of looking at what they actually do when completing these activities themselves.

Finally, the present study, as well as others (Ames & Archer, 1988; Archer, 1994; Nolen, 1988; Tuckman, 1994), has established an important link between motivational factors and metacognitive self-regulation. Research which examines this link needs to continue, especially research concerning the aspects of the classroom environment which will enhance motivation in such a way that metacognitive self-regulation is also enhanced.

References

Ames, C., & Archer, A. (1988). Achievement goals in the classroom: Students' learning strategies and motivation processes. Journal of Educational Psychology, 80, 208-223.

Archer, J. (1994). Achievement goals as a measure of motivation in university students. Contemporary Educational Psychology, 19, 430-446.

Borkowski, J. G. (1985). Signs of intelligence: Strategy generalization and metacognition. In S. R. Yussen (Ed.), The growth of reflection in children (pp. 105-140). New York: Academic Press, Inc.

Borkowski, J. G., Carr, M., & Pressley, M. (1987). "Spontaneous" strategy use: Perspectives from metacognitive theory. Intelligence, 11, 61-75.

Bouffard-Bouchard, T., Parent, S., & Larivee, S. (1993). Self-regulation on a concept-formation task among average and gifted students. Journal of Experimental and Child Psychology, 56, 115-134.

Brown, A. L. (1978). Knowing when, where, and how to remember: A problem of metacognition. In R. Glaser (Ed.), Advances in instructional psychology, volume I (pp. 77-165). Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.

Brown, A. L. (1987). Executive control, self-regulation, and other more mysterious mechanisms. In F. Weinert & R. Kluwe (Eds.), Metacognition, motivation, and understanding. (pp. 65-116) Hillsdale, NJ: Erlbaum.

Brown, A. L., & Smiley, S. S. (1977). Rating the importance of structural units of prose passages: A problem of metacognitive development. Child Development, 48, 1-8.

Brown, A. L., & Smiley, S. S. (1978). The development of strategies for studying texts. Child Development, 49, 1076-1088.

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. Educational Researcher, 18 (1), 32-42.

Chamot, A. (1987) A study of learning strategies in foreign language instruction Rosslyn,VA: Interstate Research Associates, Inc. (ERIC Document Reproduction Service No. ED 352 824).

Diener, C. I., & Dweck, C. S. (1978). An analysis of learned helplessness: Continuous changes in performance, strategy, and achievement cognitions following failure. Journal of Personality and Social Psychology, 36, 451-462.

Dudley, T. V. (1993). An analysis of selected black male achievers and non-achievers of the 1992 graduating class of Jones High School, Orlando. (Doctoral dissertation, University of Central Florida, 1993). Dissertation Abstracts International, 54-03, 0794.

Entwistle N. (1994, April). Experiences of understanding and strategic studying. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. (ERIC Document Reproduction Service No. ED 374 704).

Evans, K. S. (1991, December). The effect of a metacognitive computer writing tool on classroom learning environment, student perceptions and writing ability. Paper presented at the annual meeting of the National Reading Conference, Palm Springs, CA. (ERIC Document Reproduction Service No. ED 344 212).

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

Flavell, J. H. (1981). Cognitive monitoring. In W. P. Dickson (Ed.), Children's oral communication skills (pp. 35-60). New York: Academic Press.

Flavell, J. H. (1987). Metacognition and motivation as effective determinants of learning and understanding. In F. Weinert & R. Kluwe (Eds.), Metacognition, motivation, and understanding. (pp. 21-29) Hillsdale, NJ: Erlbaum.

Garner, R. (1988). Verbal-report data on cognitive and metacognitive strategies. In C. E. Weinstein, E. T. Goetz, & P. A. Alexander (Eds.), Learning and study strategies: Issues in assessment, instruction, and evaluation. (pp. 63-76). San Diego: Academic.

Garner, R., & Alexander, P.A. (1989). Metacognition: Answered and unanswered questions. Educational Psychologist, 24 (2) , 143-158.

Garner, R., Wagoner, S, & Smith, T. (1983). Externalizing question-answering strategies of good and poor comprehenders. Reading Research Quarterly, 28 (4), 439-447.

Glaser, B. G., & Strauss, A. L. (1967). The discovery of grounded theory: Strategies for qualitative research. New York: Aldine Publishing Company.

Glaser, R. (1984). Education and thinking: the role of knowledge. American Psychologist, 39, 93-104.

Hayes, J. R., & Flower, L. S. (1983). Uncovering cognitive processes in writing: An introduction to protocol analysis. In P. Mosenthal, L. Tamor, & S.A. Walmsley (Eds.), Research on writing: Principles and methods (pp. 207-220). New York: Longman.

Jacob, E. (1992). Culture, context, and cognition. In M. D. LeCompte, W. L. Milroy, & J. Preissle (Eds.), The handbook of qualitative research in education (pp. 293-335). New York: Academic Press, Inc.

Kraft, C. L. (1991). What makes a successful black student on a predominantly white college campus? American Educational Research Journal, 28 (2), 423-443.

Kurtz, B. E., & Borkowski, J. G. (1984). Children's metacognition: Exploring relations among knowledge, process, and motivational variables. Journal of Experimental Child Psychology, 37, 335-354.

LeCompte, M. D., & Preissle, J. (1994). Ethnography and qualitative design in educational research (2nd ed.). New York: Academic Press.

Lehrer, R., & Randle, L. (1987). Problem-solving, metacognition, and composition: The effects of interactive software for first grade children. Journal of Educational Computing Research, 3 (4), 409-427.

Lester, F. K., Carofalo, J., & Kroll, D. L. (1989). The role of metacognition in mathematical problem-solving. Bloomington, IN: Mathematics Education Development Center, Indiana University (ERIC Document Reproduction Service No. 314 255).

Lincoln, Y. S., & Guba, E. G. (1985). Naturalistic inquiry. Newbury Park, CA: Sage Publications, Inc.

Livingston, J.A. (1996). Effects of metacognitive instruction on strategy use in college students. Unpublished Manuscript, State University of New York at Buffalo.

Malone, M. M., & Speaker, R. B. (1994, April). Analysis of second graders' knowledge of oral reading miscues. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. (ERIC Document Reproduction Service No. ED 375 379).

Marton, F., & Saljo, R. (1976). On qualitative differences in learning I: Outcome and process. British Journal of Educational Psychology, 46, 4-11.

Meichenbaum, D., Burland, S., Gruson, L., Cameron, R. (1985). Metacognitive assessment. In S. R. Yussen (Ed.), The growth of reflection in children (pp. 3-27). New York: Academic Press.

Miles, M. B., & Huberman, A. M. (1994). Qualitative data analysis. Thousand Oaks, CA: Sage Publications.

Nolen, S. B. (1988). Reasons for studying: Motivational orientations and study strategies. Cognition and Instruction, 5 (4) , 269-287.

Osman, M. E., & Hannafin, M. J. (1992). Metacognition research and theory: Analysis and implications for instructional design. Educational Technology Research and Development, 40 (2) , 83-99.

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

Paris, S. G., & Oka, E. R. (1986). Children's reading strategies, metacognition, and motivation. Developmental Review, 6, 25-56.

Patton, M. J. (1991). Qualitative research on college students: Philosophical and methodological comparisons with the quantitative approach. Journal of College Student Personnel, 32 (5) , 389-396.

Pearson, J. W., & Santo, C. M. (1995). Students as researchers of their own learning. Journal of Reading, 38 (6), 462-469.

Reynolds, W. M., & Miller, K. L. (1989). Assessment of adolescents' learned helplessness in achievement situations. Journal of Personality Assessment, 53, 211-228.

Schraw, G. (1994). The effect of metacognitive knowledge on local and global monitoring. Contemporary Educational Psychology, 19, 143-154.

Seidman, I. E. (1991). Interviews as qualitative research. New York: Teacher's College Press.

Shuell, T. J. (1983). The effects of instructions to organize for good and poor learners. Intelligence, 7, 271-286.

Sternberg, R. J. (1984). Toward a triarchic theory of human intelligence. The Brain and Behavioral Sciences, 7, 269-315.

Spradley, J. P. (1979). Ethnographic interviewing. New York: Holt, Rinehart, & Winston.

Svensson, L. (1977). On qualitative differences in learning, III: Study, skill, and learning. British Journal of Educational Psychology, 47 (3), 233-243.

Swan, K. (1993). Domain knowledge, cognitive styles, and problem solving: A qualitative

study of student approaches to Logo programming. Journal of Computing in Childhood Education, 4 (2), 153-182.

Swanson, H. L. (1992). The relationship between metacognition and problem-solving in gifted children. Roeper Review, 15 (1), 43-48.

Tuckman, B. W. (1994). Comparing incentive motivation to metacognitive strategy in its effect on achievement. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. (ERIC Document Reproduction Service No. ED 368 790).

van Kraayenoord, C. E., & Paris, S. G. (1993, December). Self-assessment: Children's perspectives on their literary activities in the classroom. Paper presented at the annual meeting of the National Reading Conference, Charleston, SC. (ERIC Document Reproduction Service No. ED 365 952).

Van Meter, P., Yokoi, L., & Pressley, M. (1994). College students' theories of note-taking derived from their perceptions of note-taking. Journal of Educational Psychology, 86(3), 323-338.

VanZile-Tamsen, C. (1993, October). The Motivated Strategies for Learning Questionnaire: A valid index of metacognitive ability? Paper presented at the annual meeting of the Northeastern Educational Research Association, Ellenville, NY.

von Glasersfeld, E. (1995). Radical constructivism: A way of knowing and learning. Washington, DC: The Falmer Press.

Von Wright, J. (1992). Reflections on reflection. Learning and Instruction, 2 (1), 59-68.

Appendix:

Interview #1/2: Metacognitive Self-Regulation in the Context of The Past/Present:

In your past/present experiences with school, have you made attempts to influence/control your own learning and achievement?

A. If you did/do attempt to control your own learning:

In what ways did you do this? How did you turn your intentions into actions?

Do you think the control you exerted had beneficial results? If so, why?

How did you decide which activities would help you gain control of your own learning?

Did your use of these activities (strategies) increase over time? Did you get better at these activities?

When are you more likely to use these activities? (Under what conditions?)

What importance have these activities had for your overall academic success?

Did your family influence these control activities? How about your teachers? Your peers?

Did you notice a difference in the types of control activities that you used for different academic tasks (e.g., different types of exams, exams vs. papers, projects)?

Looking back, would you change your approach to learning/studying?

B. If you did/do not attempt to control your own learning:

Who do you believe controlled your learning and academic achievement?

How did you study? Did you always study in the same way? If not, when did your study habits differ?

What things did you do when preparing for a test? Writing a paper? Completing a project?

What did you do in class while the teacher was talking?

What role did the people in your home play in your learning/studying? What role did your teachers play? How about your peers?

Were you successful? Why or why not?

Looking back, would your change your approach to learning/studying?

Interview #3:

Can you summarize your study habits for me?

Do you think that the experiences you have had in high school (e.g., teachers, classes, etc.) have contributed to the development of your study habits? In what ways?

Do you believe that anything has occurred between the first interview and now which has caused you to change in terms of your responses? If so, what was that occurrence? How have your responses changed?

Why did you consent to participate in this study?

Table 1

Taxonomy of Metacognitive Self-Regulation

Metacognitive Theme	Sub-Theme	Cognitive Component
Awareness	1. Self	knowledge about how self learns
	2. Task	knowledge about task requirements
	3. Memory/Memory Strategies	knowledge about how people in general remember
Planning/Organizing	4. Time	allocating time to complete tasks
	5. Tasks	dividing tasks into manageable parts
	6. Materials	arranging course materials to facilitate processing/strategy use
Monitoring/Evaluation	7. Tests	memory/understanding
	8. Writing Papers	check correctness/clarity of content
	9. Lecture Notes	completeness/understanding
Adjusting		10. attention
		11. comprehension
		12. learning/memory

Table 2

Definitions and Examples of Metacognition

Participant	Definition	Example
High Achievement		
CC	I can remember seeing the term in my EXE 100 class. I can see the page it's on and I can't remember exactly what it is	If it's something I was unfamiliar with, I'd give myself more time, if it's something I'm familiar with, I don't think I'd put as much time in.
HO	Unh, unh	I do tend to go through my studying before I'm actually doing it, so I am thinking about it before I'm doing it.
EI	Isn't that thinking about thinking?	I've gotten used to the fact that I know I learn things...by hearing them...I don't think about it much anymore.
JS	My definition would be...being aware of different strategies and thinking skills	I always make a list of homework I have.

Table 2 cont'd.

Participant	Definition	Example
Medium Achievement		
SL	The way you think about something.	I have to learn the major terms and what the chapter's about...before I can learn about any other tiny ideas in it, or it doesn't all come together.
SJ	No.	It probably does affect how you approach different tasks.
JO	I don't have a full understanding of it, no.	I try to plan out what's gonna be on the test.
EL	Is that thinking about thinking?	They're not gonna ask you how you learned this information, they want to know whether you know it.

Table 2 cont'd.

Participant	Definition	Example
Low Achievement		
EO	Is that your prior knowledge and schema and all that?	Knowing how you are helps you develop and become better.
JH	I've heard of it. I don't really remember what it is.	I think it's very important to understand what you need to know in order to study or complete academic tasks.
JG	I should, but I can't think right now.	You have to plan.
JF	I should. What is it? I know I've heard it a million times.	I probably don't realize it, I probably just do it.
JT	I know it has something to do with thinking...the way you think or something?	I know I have a way of studying...I know what works for me.

Figure Caption

Figure 1. Academic Achievement and Metacognitive Self-Regulation

Metacognitive Self-Regulation and Awareness	Participants												
	High Achievement				Medium Achievement				Low Achievement				
	CC	HO	EI	JS	SL	SJ	JO	EL	EJ	JH	JG	JF	JT
Awareness Self	●	●	●		●	●	●	●	●	●			●
Tasks	●	●	●	●	●	●	●	●		●	●	●	
Memory	●	●	●		●	●				●			
Planning/ Organizing Time	●	●	●					●					●
Tasks	●	●			●	●		●			●	●	●
Materials	●	●	●	●	●	●			●		●	●	
Monitoring/Eval. Tests	●	●		●	●	●	●	●		●		●	●
Papers	●	●	●	●			●			●			
Notes	●	●							●		●		
Self-Regulation Attention		●							●				
Comprehension/Und	●	●					●	●	●		●	●	●
Learning/Memory	●		●				●			●			

Figure Caption

Figure 2. Example of One Column in the Case-Ordered Meta-Matrix

Participant	Self-Awareness
CC	If it's something that I'm familiar with or have had some exposure to, I don't feel as uncomfortable going into a test.
HO	If I just sit there and read my notes, I won't learn anything. So I always say my notes aloud. Always right before I go to bed, I make sure I go through my notes because for some reason it always sticks with me.
EI	Saying it fifty times is not gonna...mean anything to me if I can't even think long enough to know what I'm saying. I like to work at unusual hours.
JS	The first exam is always the hardest, cuz you never know what to expect.
SL	I can remember things a lot by just writing them over. I'm better from examples than solid definitions of words cuz it doesn't mean anything to me.
SJ	I think it sticks in people's heads sometimes better if they write things down than just reading it.
JO	I do better when somebody will ask me something and I have to explain it. I do much better that way than sitting reading a book and writing things out.
EL	I can't study out of a book. I have to keep the door closed, I can't have the radio on, I can't have the tv on, and I'm easily distracted.
EJ	I need to write things over and over and over again for me to learn, not just say it because by saying it to me doesn't mean anything.
JH	I learn more by just reviewing everything and then writing down everything I really should know.
JG	
JF	
JT	The best thing that I found for me to do is just not miss class... I'm not good on my own...as far as reading and stuff, my mind wanders all the time when I'm trying to read. As far as studying, I don't like a huge chunk of material...I need to comprehend small bits.

Figure Caption

Figure 3. Cross-Case Meta-Matrix: Awareness of Self, Task, and Memory

Type of Awareness	Illustration
Self-Awareness	"The best thing I found for me to do is just not miss class...I'm not good on my own...as far as reading and stuff, my mind wanders all the time when I'm trying to read." (JT) "I need to write things over and over and over again for me to learn, not just say it because by saying it to me doesn't mean anything." (EJ). "I'm better from examples than solid definitions of words, cuz it doesn't mean anything to me." (SL)
Task-Awareness	"The first exam is always the hardest cuz you never know what to expect." (JS) "As far as studying, I don't like a huge chunk of material...I need to comprehend in small bits." (JT)
Type of Test	"I study less cuz essay questions ask for more of an in-depth knowledge, and by the time it's last-minute studying, either you have it or you don't." (EI) "When they say multiple choice, I look for keywords, essays, I try to pick out certain topics and then just write a few... sentences about the topic." (JO)
Importance of Test	"I might study just a little bit more if there are more quality points." (HO) "I do it differently, cuz I know I have to." (SL)
Memory-Awareness	"Always right before I go to bed, I make sure I go through my notes because for some reason it always sticks with me." (HO) "I think it sticks in people's heads sometimes better if they write things down than just reading it." (SJ) "I'll use phrases or sayings to remember it." (SL) "I try to figure out a way to remember it...a mnemonic or connecting it to make sense with something else." (EI)

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Figure Caption

Figure 4. Cross-Case Meta-Matrix: Planning and Organizing Activities

Type of Planning/ Organizing	Illustration	Mentioned By
Time	"If they're major dates...like midterms or finals, I'll put it on my calendar at home on my refrigerator, and I'll put stars or something so I'll know to pay attention." (CC) "I like to make myself a visual calendar and put it right by my word processor." (EL) "I used to be very good at guessing how long I'm gonna need to work on something." (EI)	CC, HO, EI, EL, JT
Tasks	"I write everything down on a piece of paper, and I write each day what I have to do." (SL) "I keep lists." (JH)	CC, HO, SL, SJ, EL, JG, JH, JT
Materials	"I take a notebook per class...I find that organization very useful." (EI) "Using...a three-ring notebook instead of a spiral, keeping everything organized...that's helped me." (Jessica) "I wrote down through my notebook different pages where you could find the different things because it was an open-book test, and it saved me a lot of time." (CC) "I try to...put titles and subtitles...and...underline or make bold print...star things that he says are important." (JS)	EI, JF, CC, JS, JG, SL, HO, SJ, EJ

Figure Caption

Figure 5. Cross-Case Meta-Matrix: Monitoring/Evaluation Activities

Type of Task	Illustration	Mentioned By
Tests		
1. quizzing self	"I'll write down questions...and see if I can answer all of em." (EL)	EL, JO, CC, JH, SL
2. quizzed by others	"I have my husband or a friend ask me the questions and ask them in different ways so I get the concept and not just the answer to a question phrased in a particular way." (CC)	CC
3. telling information to self	"When I'm ready for an exam, I can sit there and say all my notes aloud without looking at the pages." (HO)	HO, JS, SJ, JH
4. telling information to others	"I can talk about it, and even ask questions about it to a teacher or a friend or someone in the class." (JF)	JF
5. feeling confident	"If I comprehend everything and understand what I'm reading." (JT)	JH, JF, JT
Papers	"I have the assignment sheet right there so that I can keep referring to it and just ask myself things, do I think this is important enough to put in the paper, am I adding too much." (JO) "I'll do it a couple of days beforehand, and then I'll go back the next day and read it over, and then I'll have...just a different look on it." (JH)	JO, CC, EI, JS, HO, JH
Lecture Notes	"If I just look at my notes, there's way too much information for me to look at...I...pull out from my notes the real important stuff and put that on yellow paper." (EO) "I usually try and get the reading done before and judge what's in the reading and what the professor's saying...and that way to help figure out what's important." (HO)	EO, CC, HO, JG

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Figure Caption

Figure 6. Cross-Case Meta-Matrix: Adjusting Activities

Cognitive Area	Illustration	Mentioned By
Attention	"If the teacher is directly lecturing, I'll try and read the book if I don't find it interesting." (HO) "I almost fell asleep the whole first week...so I would sit right in the front of the room...I would bring my text book out because I like to write...he's not very thorough with what he says, so I would find it in the book, I'm writing." (EO)	HO, EO
Comprehension /Understanding of Course Materials	"I also left a little bit of time to ask the teacher questions...he helped me out a lot, which is what I like to do with most of the papers if I don't know what I'm doing on 'em." (EO) "If he...says something about a chapter or something that I don't recognize, I'll write it down and go back to the chapter an see what he's talking about." (EL) "I try to get what I can that's important, and I try to find someone who's a really good student and look off their notes." (JG)	EO, JG, EL, JO, CC, HO, JF
Memory/ Learning	"When I hit something again that I realize I didn't really learn the first time I just read it over, I try to figure out a way to remember it...a mnemonic or connecting it to make sense with something else." (EO) "I'll just keep going over the information that I don't think sunk in." (JH)	EI, JO, JH, CC