

Study Context Matters: A Case Study on How Time Crunches Lead to Coping Modes of Learning

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Abstract

Self-regulated learning (SRL), an important part of student learning success, is a complex process that includes the learner's beliefs about his or her own learning, motivations, pre-existing knowledge, and cognitive and metacognitive skills. Despite the importance of context to SRL, very little research has specifically examined the contextual factors that impact SRL among college engineering students. To contribute to building a knowledge base of the contextual factors important to SRL among college engineering students, we engaged in an ethnographically-informed study of engineering students who study in teams outside the classroom environment. Time outside the classroom is often structured by the students themselves in response to the requirements of their courses and competing demands. A focus on this self-structured time enables us to consider the specific contextual factors that contribute to students' SRL within these outside the class environments where they are making choices about learning habits that impact what, where, how and with whom to study. Situated in a larger study, in this analysis we describe one specific example of how context can impact students' approaches to learning. We used Boekaerts¹ Model of Adaptable Learning as a lens to view the activities of a student study group on two separate occasions. By comparing these two study group examples, we found that feeling a time crunch can cause students to shift from a mastery mode to a coping mode of learning. While in mastery mode, students tend to exhibit behaviors that are shown to promote deeper learning. In coping mode they are just trying to get done and learning is secondary. Implications for research and practice are discussed.

Introduction

It is a commonly held belief in education that the most effective students in a learning environment are the students who have a high level of awareness about their own knowledge level and take control of their own learning processes²; these students are referred to as self-regulated learners. Self-regulated learning (SRL) is the process that a learner goes through to enact and sustain cognitive functioning, behaviors, and metacognitive functioning to reach a set goal or goals³. While SRL skills can be beneficial to students of all ages, SRL has been specifically identified as a skill set beneficial to college students because they face more difficult classes while having more autonomy over their own learning than they did in primary or secondary school⁴.

SRL is a complex process that includes the learner's beliefs about his or her own learning, motivations, pre-existing knowledge, and cognitive and metacognitive skills. Some of these skills include creating an effective study environment (time and location), seeking help from peers and teachers and engagement in planning and monitoring activities, to name a few⁵. Because SRL is so complex, there is not a single SRL approach or strategy that students can be taught that will be applicable in all situations. In fact, situation, or context, dependence is one of the areas in need of further research so we can better understand the contextual factors that impact engagement in SRL⁶. Research in SRL has already suggested that contextual factors such as degree of instructor scaffolding⁷, pedagogical approach used in the classroom⁸, gender

balance⁹, learner's interpersonal relationships as well as school policy or structure¹⁰, impact engagement in self-regulated learning strategies. Most of these studies have focused on investigating students' use of SRL in the classroom. Very few studies have been conducted to look at SRL strategies in out of class environments, where students do a majority of their learning.

To contribute to building a knowledge base of the contextual factors important to SRL among college students, we engaged in an ethnographically-informed study of engineering students studying in teams outside the classroom environment. We chose this context because time outside the classroom is often structured by the students themselves in response to the demands of their courses and competing demands. A focus on this self-structured time enables us to consider how competing demands for time result in self-governed choices of study activities. The choice of engineering students as participants for the current analysis was also intentional. Engineering majors have a reputation of being a particularly hard or demanding¹¹ such that students are typically pressed for time in completing course requirements and engineering in general has a reputation of being particularly unwelcoming to women and underrepresented students¹². In combination, these factors suggest that the engineering learning environment, or context, is not perceived as optimum for many students. Thus, succeeding in engineering requires that the learner take ownership of his or her own learning and engage in SRL. Research has in fact confirmed engineering students engage in SRL and that there are differences in self-reported SRL strategies among high- and low-performing engineering students¹³. The strenuous nature of the learning environment in engineering makes this a valuable context to investigate as other STEM related fields face similar rigor and challenging environments.

We specifically sought to answer the research question, *How do time restrictions on a study session impact the selection of learning strategies for study group members?* We used Boekaerts model of Adaptable Learning (a basis for her work in Self-Regulated Learning) as a lens to view the activities of a student study group on two separate occasions. Consistent with ethnographically-informed approaches, the theory that explained patterns emerging in our data was identified after data collection was complete. However, consistent with the ways research is often reported in engineering education research, we describe the Adaptable Learning Model up front to help the reader understand the lens through which the data was selected for analysis and then analyzed. We describe in detail two study sessions for one study group where looming deadlines directly impacted the SRL approaches students used.

Framework

Boekaerts¹ Adaptable Learning Process (shown in Figure 1) is one of several models of SRL. Boekaerts' model differs from others in that it combines elements from motivation and cognition and emphasizes how self and situational appraisals play a critical role in how learners choose their course of action or a strategy for a particular learning activity¹⁴. Boekaerts model gives us a unique way to investigate the SRL aptitude of a student or group of students as it focuses on the actions that students choose to take based on the domain of study, the students' self-referenced cognitions, and their emotional state at the time of work. Boekaerts states, "the unique ways in which students experience everyday curricular activities in class and outside

should be addressed in order to understand the extent to which they self-regulate their learning, given their perception of self in relation to different learning contexts”.¹⁵ In essence, Boekaerts’ model provides a framework for studying self-regulated learning in situated learning contexts by look at how students interpret their current situation and use those interpretations to select their next action.

Boekaerts theorized that the quality of a student’s learning process largely depends on the student’s goal orientation¹: mastery mode where students see school work as an opportunity to learn new ideas and coping mode where students see school work as an opportunity to demonstrate their abilities. The goal orientations are considered modes because they are not fixed traits of an individual; as students engage in their learning environment, they work to balance these two goals: to learn and to protect ego¹⁵. Therefore, the balance between the mastery mode and the coping mode is changing and fluid. While a student can start in the mastery mode with the intention to learn, situations may arise that tip the balance and push the student into the coping mode. For instance, when a student encounters a stressful situation, he or she may shift away from the mastery mode and into the coping mode in order to protect self-concept¹⁶.

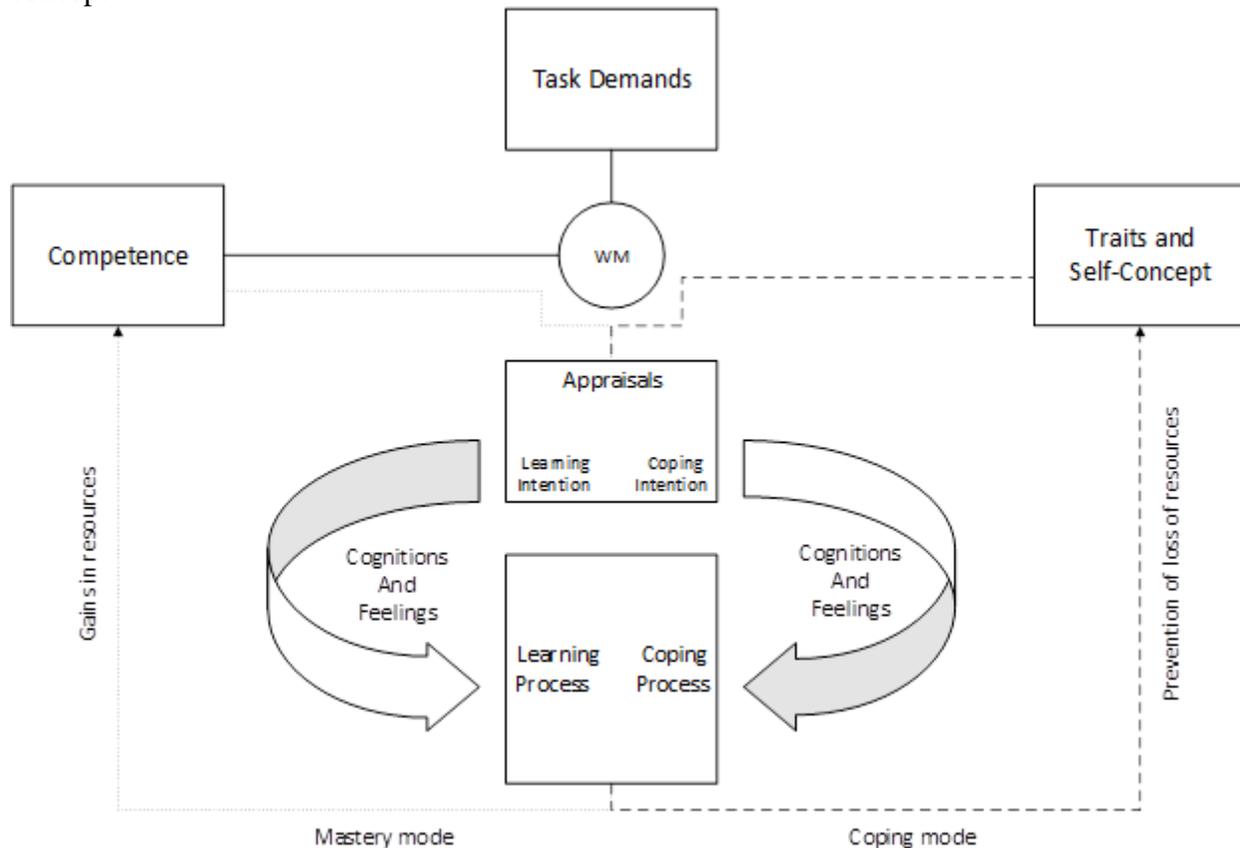


Figure 1 Adaptable Learning Process (Boekaerts, 1992)

This model poses that a learner combines information regarding task demands, competence, and traits and self-concept in working memory (WM) in order to make appraisals about his/her learning process. Competence is defined as “domain specific knowledge and skills

relevant to the task”¹⁶. Traits and self-concept are defined as manifest aspects of the personality, the beliefs one holds about themselves, and the specific short and long term goals of the person.¹⁶. An appraisal is defined as an “ongoing comparison process between task or situational demands and personal resources to meet these demands”¹⁶. Though the learner may not realize it, appraisals are constantly being made throughout the learning process. The appraisal developed is then used to determine if a learner engages in mastery mode or coping mode and whether the current course of action is appropriate or whether a new course of action should be created. Boekaerts’ model poses that students will pursue a learning intention, or mastery mode, when they make positive appraisals about the learning situation. But when negative appraisals have been made, students will pursue a coping intention in order to maintain or restore their well-being in the learning situation. For example, when an appraisal occurs where the learner believes that the gains from the activity are paired with reasonable costs, positive thoughts and feelings dominate the learner, and thus will want to engage in activities that help to learn (mastery mode). In these situations, learners tend to put themselves in learning contexts that help them build competence and positive self-concept. In contrast, when an appraisal occurs where the learner believes that the gains from the activity are paired with unreasonable costs, or when the learner perceives that they do not have the necessary resources to adequately complete the task negative thoughts and feelings dominate the learner. In this case, the learner will avoid engaging in activities that may aid in learning in order to cope with the negative feelings experienced. Students who are in the coping mode tend to place themselves in learning situations that allow them to protect their self-concept.

Methods

To answer our research question, we drew on ethnographically informed methods using participant observations. Participant observation, or the strategy of immersing oneself in the research field to experience and note events, is the primary method of data collection in traditional ethnographic research^{17, 18}. Glesne¹⁹ describes the main outcome of participant observation as the understanding of the participants, their behavior, and the setting. Consistent with this, participant observations were the primary method of data collection in our study. Lofland and Lofland²⁰, Glesne¹⁹, and Spradley¹⁸ all discuss the role of the researcher during participant observation as on a continuum of participation. Lofland and Lofland²⁰ describe the continuum as to how much the researcher’s role is known to the participants. For this study, the lead author acted as a passive participant observer who was partially known to the participants during observations. Being a passive participant allowed her to ask questions of the participants when necessary without significantly altering the context of the study group session. While being a passive participant attempted to minimize intrusion in the study context, this role limited how much the researcher could interact during the actual study sessions in order to gain understanding from the participants’ perspectives about what was transpiring during a particular observation. Thus, we drew inferences based primarily off the interpretation of the observer with little input from the participants.

Research Site and Participants

As described in the introduction, our ethnographically-informed study was intentionally focused on engineering students. This analysis is part of a larger NSF-funded research project

aimed at understanding intersections between student motivation and learning strategies of engineering students. This study was conducted at a small teaching focused college (STFC). STFC has approximately 2,000 undergraduates, most of whom major in an engineering, science, or mathematics discipline. Class sizes at STFC typically range from 20-25 students per class. Approximately 99% of students graduate from STFC with offers of employment. Thus, STFC was selected as a research site for this study as we believed that due to the high concentration of engineering students and the prestige and competitiveness of the university, time management might be particularly important. Therefore, an investigation of the habits of these students would provide beneficial information on how to cultivate rich, out-of-class learning environments under the most challenging circumstances making them more easily transferable to other University contexts.

The first criterion for inclusion in this study related to participation in a common sophomore engineering problem solving course. The course was made up of 9 sections that contained approximately 28 students in each section. The nine sections were taught by six different instructors. For this course, two homework assignments were due every week. Each homework assignment contained four problems that focused on content reviewed in the previous days' classes. The course also contained three non-cumulative exams and one cumulative final. While the homework assignments and exams were common across all sections, instructors had liberty to assign extra homework or give quizzes to their individual sections, as they thought necessary. This course was selected for recruitment as it was one of the largest courses on the STFC campus and thus allowed for a large population of students to recruitment from. The specific course was also identified as one of the most difficult courses in the undergraduate curriculum at STFC and thus would allow for observations of students learning conceptually difficult material.

The second criterion for inclusion in this study related to student study habits. Specifically, participants needed to participate in a naturally formed (not formed by the research team) study group as part of the sophomore engineering problem solving course. In order to investigate the learning habits of students while working in a study group, it was important to be able to observe conversations and actions of students in action. Therefore, students that studied alone were excluded from this study. It was also important that conflicts or difficulties due to newly formed groups be minimized, as these difficulties could be mistaken for learning difficulties instead of group dynamic issues. Thus, students that did not participate in a naturally formed study group were excluded from participation.

For the larger study, a total of three study groups volunteered for participation. These groups were recruited as and identified as 'study groups', even though the work or activity performed by the members of the group varied from completing homework assignments, reviewing concepts from class, and preparing for class exams. We chose to use the term 'study group' to describe the recruited teams, as this is a colloquial term used by students to describe the function of their group. A total of 18 observations were conducted across 3 teams. For this analysis, two observations were selected from one of the participating teams, as these specific observations displayed actions of interest that could be described by the use of Boekaerts Adaptable Learning Model. This team also comprised the majority of the observations conducted throughout the entire study. The team included five members—two female students majoring in

biomedical engineering (Becca and Jenny) and three male students majoring in mechanical engineering (Benjamin, Michael, and Gary). All names reported in this paper are pseudonyms to protect the identities of the individuals involved in the research.

Throughout all observations conducted, this team displayed a high number of positive learning habits throughout the academic term, thus identifying them as the highest functioning team of the three participating. The two observations selected for this study represent disparate scenarios: 1) the first observation is representative of a typical evening with the team, which was observed numerous times over the academic period, where team members worked together to accomplish the task of completing a homework assignment, and 2) the second observation is representative of a contrasting evening where the team members selected strategies for completing homework assignments that were not observed in any other observation conducted throughout the academic term. By comparing the incidents of these two observations side by side, we begin to understand how the context of an out-of-class meeting shapes the strategies a team selects for a particular goal.

Study Sessions

Study sessions for this team were held in the library located on the university campus. For each study session, a study room was reserved for the group to work in by a group member. The study room was located either on the main floor of the library or on the second floor and had a door that closed and separated the group from the main traffic in the library.

Observation One represents a ‘typical’ study session where the team members meet to work on homework two nights before the due date of a particular assignment. This particular homework assignment focused on conservation of mass principles. For this session, Becca, Michael, and Benjamin are present and work in a smaller study room in the library. The study session lasts approximately two and a half hours.

Observation Two represents an ‘atypical’ evening where the team members meet the night before an assignment is due (rather than two nights before) to work on homework. There is no explanation provided by the team as to why this particular working session deviated from the standard protocol to work two nights prior to a deadline. This particular assignment focused on conservation of energy principles. For this session, Becca, Michael, Benjamin, and Gary are present at the beginning of the study session. Jenny joins the session approximately one hour into the study session as she had already completed the first two problems and was only working on the last two problems of the assignment. In this session, participants work on a homework assignment. The study session lasts approximately three hours.

Data Collection

Study sessions were video and audio recorded for later analysis. The observations were intended to capture what naturally occurred during study sessions; therefore, the researcher did not give any instructions to the group about what should be done during the study session. For the larger NSF study, extensive field notes were taken for each observation that focused on observing metacognitive behaviors in the study sessions. While throughout the larger study, the observing researcher was allowed to ask follow up questions during the observation, it should be

noted that no follow up questions were asked during the two observations that are the focus of this paper.

For this study, a secondary data analysis was conducted on the two observations of interest. Video recordings of the two observations were viewed in order to record a new set of ethnographic fieldnotes that focused on observing behaviors related to the Boekaerts framework in Figure 1. Field notes were generated with the Adaptable Learning Model as a lens. Specifically, field notes focused on changes in study session strategies made by the study group as well as the discussions leading up to and following those changes in strategy.

Data Analysis

Through deep immersion in the culture and data, themes and connections to the Adaptable Learning model were generated¹⁸. Focused coding²⁰ was conducted to identify instances where participants engaged in appraisal statements. Using contextual clues, these appraisal examples were then classified as mastery or performance mode examples. The descriptions of events developed reflect a discussion of observed learning and study session strategies and observed utterances of appraisals that occurred before and after changes in strategy.

Results

These findings focus on descriptions of events from the two selected observations. The first observation represents mastery intention evidenced by the study group using the overall strategy of tackling one homework problem at a time and waiting to start a new problem until the entire group had finished and was ready to move on. In the second observation, we show how the study group takes a coping approach as evidenced by breaking up the problems among different groups, or “divide and conquer,” in order to complete the problems in a set amount of time. Task, competence, traits and self-concept scenarios play out differently in the two observations as well.

Observation One

The Wednesday evening study session started around 7pm in the small conference room in the library. Becca, Benjamin, and Michael sat around a small round table where they began to unload the resources they planned to use for working on the homework set. The group started by working on the prescribed homework format, which was a requirement for all homework assignments in this course. The homework format required students to write out what information was *known*, what was being *found* in the problem, what information was *given*, and the *analysis* technique used to solve the problem, including a *strategy* statement that describes the concept applied and procedure used for analysis. Benjamin asked when this specific assignment is due. The others responded that the homework assignment was due on Friday and Benjamin remarks that the group is actually getting ahead. This remark was the first indicator of a positive appraisal for the group’s work during the study session. The appraisal that the group was “getting ahead” set a positive tone that allowed the group to focus on learning the content (mastery mode) instead of worrying that they would run out of time before being able to complete the assignment (coping mode). All three work through the homework format for the

first problem before moving on to developing a strategy for solving the problem. Benjamin also states that he had glanced at the problems before coming to the study session and they did not look too difficult. This second appraisal from Benjamin communicates to the group that, because the level of difficulty of the task at hand was low, they would have the skills necessary to complete the task. Therefore, this positive appraisal of the task again sets a positive tone for the working session, which pushes the group toward a learning intention, or mastery mode. The group works quietly as they continue to write out the homework format for the first problem. While Becca leaves the room to make a copy of the problem statement for each member of the group, Benjamin and Michael begin to develop a strategy for solving the problem. Becca returns with the copies and the group gets started developing a strategy together for solving the first homework problem.

The group adopts a mastery mode where individual and group mastery of content is as important to the group as completing the assignment. As they finish up the homework format, Benjamin and Michael begin to develop a strategy for solving the first part of the problem. Each begins to develop the series of equations that are needed to solve the problem. At different times, Benjamin, Michael, and Becca share out loud different parts of the equations they are writing down. In a back and forth conversation, the three collaboratively develop a strategy for developing the series of equations they'll use to find the required mass flow rates for the problem solution. This example demonstrates how all three members contribute to the conversation in order to reach an understanding of how to proceed in solving the problem:

Benjamin: Alright, so now what we need to do is –

Becca: Now we need to find water and jam, right?

Benjamin: We need to find how much of each thing is in the mixture. Like how much mass.

Becca: Ok.

Benjamin: And then from there we can do percentages. For the composition. So –

Becca: So is this a bit like when we were doing the umm ideal gas law last time.

Benjamin: Yeah, a little bit. It's just not a gas this time.

Becca: Yeah.

Michael: So we take the percentage times that amount?

Benjamin: Uh yeah.

Michael: To fill in the mixture portion.

Benjamin: Mhmm.

From this example, we can see that Benjamin, Becca, and Michael all three contributed to developing the solution for this particular part of the solution. While Benjamin gets the group started with a solution, Becca jumps in to add her own understanding of the solution. Near the end of this exchange, Michael contributes his understanding and the group agrees on a solution. This type of behavior is very typical throughout the duration of this observation and represents a combination of task and competence appraisals, i.e., in this instance, and throughout this

observation, the group members continually and collectively contributed to developing the strategy for solving the problem, demonstrating beliefs in their own (personal) competence as well as the competence of fellow group members. These positive appraisals of self and group competence lead to the group developing the solution to each problem together.

Also as evidenced from this observation, when competence is in question it does not become a stumbling block for the individual or the team. The outcome of these appraisals is to continue with a mastery mode and help each other learn. Based on the theory, this is suggestive of a positive learning environment¹. For example, about 30 minutes into working on problem one for this homework set, Benjamin works to explain a particular approach to Becca and Michael. Both Michael and Becca are quiet for a moment after Benjamin finished his explanation. Becca then asks, "Can we write it on the board? Because I am having trouble visualizing what you are saying." Benjamin moves to the whiteboard and begins his explanation of the strategy again. Benjamin draws the system diagram on the whiteboard, draws the particular series of equations for that system, and then explains his rationale to the group. Both Michael and Becca ask questions and actively engage in a discussion about this part of the problem. This is an example of Benjamin taking a role to teach both Becca and Michael in order that the entire group understands the process to be used in the homework problem. Again, this is a very typical behavior for this particular observation. At different times, different members of the group take turns teaching other members of the group so that all group members share a common understanding of the solution for the homework problem. Several minutes later, Becca finds that she continues to get the wrong answer for the problem and is struggling to find her mistake.

Becca: Is it three thousand....I got the same answer!

Benjamin: (picks up Becca's calculator) Cause you don't add the 238...the 238...

Becca: Cause we're not doing water!

In a simple exchange, Benjamin is able to offer help, find Becca's mistake, and help her reach a correct solution to her problem.

About 50 minutes into the study session, the group finished their first homework problem. Becca notes that the group has successfully finished their first problem.

Becca: Well, we finished a problem team. How long did it take us?

Benjamin: It's 8:20. I don't know when we started.

Becca: Probably around – 8:50 – or 7:50.

Benjamin: Mhmm.

Becca: Because I had to go copy everything. So – not too shabby team.

From Becca and Benjamin's interaction, we see that the completion of this homework problem is seen as a group effort. The group moves on and begins the second problem in the homework assignment, which they find to be very similar to the first homework problem. Note that Becca asks Benjamin how long it took to finish the first homework problem. The group finds that it took approximately 30 minutes to complete the first homework problem, to which

Becca says ‘not too shabby team.’ In this instance, Becca makes a positive appraisal that the length of time spent on the homework problem was appropriate and thus, the group was successful in completing this first task. While it is not known what length of time would be unacceptable in this particular case, we do know that the length of time spent was seen as positive and thus led the team to continue working problems with a similar strategy as that used with the first homework problem. If the time to completion had been longer, we may have seen a shift in strategy due to the negative appraisal that would have been associated with the length of completion. We will see an example of this shift in Observation 2.

Throughout this observation, homework problems are worked as a group in a mastery mode. A new homework problem is not started until all members of the group have completed the previous problem. Group members take time to appraise competence ensuring that everyone’s questions are answered and that each group member understands the process for a particular problem before moving on. There is not a palpable sense of a need to rush in order to finish the assignment by a certain time. Though members of the group do, at different times, speak about other assignments and commitments that they have to do after this homework assignment is complete, there is no observed sense that the group is in a hurry to complete the assignment.

Observation Two

In the second observation, the study session was held on a Thursday evening with the homework assignment of interest due the following day. The study session began at 10:00PM. Benjamin and Becca are the first to arrive at the study session. Benjamin begins working on the first homework problem before the others arrive. Michael enters the room and says that Gary is on his way. As Gary enters the room, he asks “Have you guys started yet?” The rest of the group says no, though Michael does share that he thinks he knows how to do the first two problems. Here, Michael starts out the study session with a positive appraisal about his competence, in that he believes he has the skills necessary to complete the first two tasks in the assignment. As Michael and Becca discuss a 5K run that will be occurring on campus later that weekend, Benjamin continues to work on the first homework problem. Notice that the strategy for this session is already different than the last; Benjamin has started his assignment before all other members are present though he does not tell the others he has started.

It becomes obvious quickly that this session is not a mastery mode as was the previously described session. Instead, participants are in a coping mode likely because the assignment is due the next day. The work is less collaborative and participants are less likely to engage in shared task and competence appraisals. In the first few minutes of the observation, the four group members (Becca, Benjamin, Gary, and Michael) are observed to be working somewhat together on the same homework problem. But very shortly into the study session, this behavior changes as certain group members struggle with different parts of the problem. While Gary and Michael struggle with the first homework problem, Benjamin and Becca pull ahead and do not wait for the other two members to catch up. Approximately twenty five minutes into the study session, Becca and Benjamin are on a different part of the problem than both Gary and Michael. At this point, two distinct groups form in the study session. Michael and Gary work together as they struggle through completing the homework while Becca and Benjamin forge ahead.

The group works quietly for a period of time. This suggests that the group is working individually on the homework assignment instead of in the collaborative nature of the prior observation. There are times when members of the group have questions and other members join in to help. For example, Gary says to Michael that he has no idea how to do part C of one of the homework problems. Michael tells Gary that he will walk Gary through the problem once he determines if he has done it correctly. Here Michael offers help to Gary, but the work is not collaborative in nature and Michael offers help only after he has completed the problem himself.

At the end of these exchanges, the group members go back to working quietly on their own papers. There is little collaborative discussion about how to develop a solution. Based on comparing behaviors from Observation One, where team members actively helped other, and these behaviors in Observation Two, one possible explanation is that the individuals in the group are more worried about completing the assignment than on ensuring that everyone in the group understands the content focus of the assignment. Thus, this shows a focus on coping intentions instead of mastery intentions.

In these examples, we see that the rest of the group is so focused on the individual nature of their work that they fail to support or help their peers that are in the room. This behavior is in stark contrast to the earlier observation where all activity would cease when someone asked a question. All members would help answer the question of the other group member and would not move on until everyone reached understanding.

Michael particularly struggles on part B of the first homework problem. For approximately 15 minutes, he struggles to get the correct solution for this problem. At times, he asks targeted questions to Benjamin and Becca, as they have already completed part B and have moved on to part C. Benjamin and Becca give Michael short explanations to his questions and then go back to working on part C. At no point do Becca or Benjamin stop in order to help Michael catch up to them. Finally, Michael exclaims, "God, that took forever. That was stupid." He has finally reached the correct solution on part B. His exclamation reveals a negative appraisal regarding the length of time it took to complete that portion of the problem was unacceptable. This frustration leads Michael to move on to the next part of the problem without checking to see if his partner, Gary, is caught up. He moves on to part C, while there is no indication that Gary is caught up to the rest of the group. By the time Michael moves on to part C of the first homework problem, Becca and Benjamin have already moved on to the second problem.

The group continues working in a similar manner throughout the evening. While members take turns asking questions of others as they attempt to develop solutions for the homework problems, there is no time where all members are working collaboratively on the same problem at the same time. We observed that the strategy for the evening was an "every man or woman for him or herself" strategy, where individuals were focused on finishing their individual assignment. About an hour into the study session, Jenny enters the room. She has completed the first two problems and now needs help from the group finishing the last two problems. Jenny begins to help Becca with a part of the second homework problem. Gary asks Michael for help on part B of the first homework problem. Benjamin works quietly to himself.

At this point in the session, each member of the group is working individually on different parts of the homework assignment though they do help each other when stuck.

Fatigue becomes a noticeable problem about one hour and forty five minutes into the study session. For example, Becca makes the comment “I know I’m getting stuck on these because I’m tired and I’m losing my life.” A few minutes later, Becca states, “I’m sorry guys. I think I’ve just lost everything right now.” In these statements, Becca discusses how her fatigue is causing her to lose focus on the homework assignment. In this observation, Becca seems to explain and apologize for her lack of understanding whereas in the previously described observation she stated that she didn’t understand and asked for help. Her mental and physical fatigue plays into a negative appraisal of the task at hand. Becca is tired, does not understand the content, and has lost much of her motivation to try to come to an understanding on her own. She has shifted towards a coping mode of not trying.

At one hour and fifty minutes into the study session, a pivotal interaction occurs.

Michael: What time is it? Crap.

Benjamin: Midnight.

Michael: That’s great. Good to know.

Jenny: I was worried when you guys said you were starting it so late but then again there’s four of you working on it and not just one. It took me a while –

Becca: And also, I was not around.

Benjamin: Yeah.

Jenny: Yeah, but I’m just saying it was a lot of – it took me a while to get the first ones done but I was also working by myself so I wasn’t like bouncing ideas off, you know what I mean?

Michael: When does the library close?

Benjamin: Two.

Jenny: Two.

Benjamin: Two. We’re fine.

In this interaction, Michael asks what time it is in order to evaluate the group’s progress on the homework assignment for the evening. Michael’s realization of how late it is begins a panic, as he realizes that there is little time to complete the rest of the assignment. Michael asks about when the library closes, thus signifying he also realizes a deadline in the physical location where this type of studying continues. This added time deadline could have further added to the panic to finish the assignment, though Benjamin reassures that the group is fine, signaling they still have time to complete the assignment. Jenny’s arrival further adds to a concern for completing the assignment when she states that she was worried about when the group chose to begin the assignment. Jenny’s statement reflects a shift from the normal procedures of this group to start

homework several days before the stated deadline and serves as an added reminder that there is still much to do and the deadline is looming.

A short time later, the group begins to further change their approach to the rest of the evening.

Becca: I have no idea how to do A. So, I'm going to wait till you guys finish.

Michael: On sixty seven?

Becca: Yeah. I have forgotten how to do everything. So, Michael is going to teach me.

Becca: Sixty.

Michael: Ok, I'll go through sixty. You can run through sixty seven and then we can get this wrapped up.

Jenny: Ok.

Benjamin: We're going to get this done so we won't be paying attention at first.

There are two interesting behavioral changes to note in this interaction. First, Becca states that she is now going to wait to work on a homework problem until Michael is finished so that Michael can teach her how to do it. It is observed later that much of what Becca does for the remainder of the evening is copy the work of her peers. This behavior is in stark contrast to her previous behavior, both in this study session and in the study session captured in Observation One. At this point, Becca has given up and no longer seems to engage in a learning process. Instead, she is coping by copying the work of others in order to complete the assignment.

Second, Michael, Benjamin, and Jenny agree on a new strategy for the rest of the evening. Michael states, "Ok, I'll go through sixty. You can run through sixty seven and then we can get this wrapped up." Michael will finish the third homework problem and then explain his solution to the rest of the group. In turn, Benjamin and Jenny will work on the fourth homework problem and explain their solution to the rest of the group. For the first time in any observation of this group, the 'divide and conquer' strategy has been adopted. Instead of focusing on helping all members of the group understand each individual problem for the homework assignment, the group has resorted to dividing up the work so that the group can get the assignment "wrapped up." It is obvious that the group has shifted its focus away from making sure everyone has learned the material and is now more concerned with completing the assignment at all cost. This is made apparent by Benjamin's statement, "I'm at the point where I just want to get this done." The negative appraisal that the time left to complete the assignment is dwindling causes this dramatic shift to fully position the group in a coping mode. They now care very little about learning the content associated with the homework. The goal of the evening now is to finish the assignment so they can turn it in and not get a bad grade.

The divide and conquer strategy is implemented throughout the remainder of the study session. Michael completes the third homework problem and puts its solution up on the whiteboard in the study room. Benjamin, Jenny, and Becca commence with copying down what Michael has written on their own homework papers. Benjamin then gives his paper to Michael in order for Michael to copy the solution for the last homework problem. While there are

questions that are asked during this period, questioning is minimal and is not focused on a deep understanding of the content. Observation Two clearly represents a coping mode. The time pressure yields a negative environment where learning and mastery of content are secondary to completion. While there is still a desire for correct answers, the focus is on being done in time. Lack of understanding (competence) is seen as something for which one should apologize rather than openly seeking help.

Discussion

In these two scenarios, a shift in how the students approached their study sessions was evident. Specifically, when students were pressured by looming deadlines for an assignment, they shifted away from strategies that were focused on learning (mastery) and towards strategies that were meant to help them complete the assignment at hand (coping). The study group's normal behaviors included working one homework problem at a time, helping the other members of the group to understand components of the assignment, and not moving on to a new problem until all members had completed the task. Even when competence or self-concept were challenged because a group member may not understand a concept, the other group members would step in to help bring the 'lost' member back so that the whole group stayed in the mastery intention. Without the fear of the looming deadline, the group worked collaboratively to stay in the mastery intention.

But these strategies changed when the study group session neared the assignment deadline. As time ran out on the assignment, the study group began breaking up the assignment in order to complete it more quickly. Reminders of the looming deadline, including the closing of the library and the statement of the lateness of start from a new group member, had an impact on the shift in strategy. Small groups of students completed different homework problems in order to share answers among others so that they could complete the assignment before the deadline. In these examples, the looming deadline caused a shift between the mastery intention and the coping intention. When threats to self-concept or competence occurred, the group no longer worked collaboratively to bring back the 'lost' group member. Because of this, group members strayed. Several group members engaged in divide and conquer behaviors. Another group member disengaged completely and instead decided to copy the work of her peers, thus completely removing herself from the learning process. The looming deadline caused this group to focus on the needs of the individual and thus lose the benefit of collaboratively working towards the mastery intention.

Consistent with theory, the mastery environment was more positive and the coping environment negative. Moreover, appraisals, particularly of competence and task demands, were offered, experienced and responded to in respectively positive and negative ways. Pintrich described the use of self-regulatory strategies as mediators between the personal and contextual characteristics of a particular scenario²¹, meaning that choice of SRL strategies is not just a function of the person or the context. Instead, the choice of strategy is interconnected with the person and the context. This can mean that even the most highly SRL skilled students can choose poor strategies in a certain context. We observed this mediation at play when the study team chose different tactics for working on assignments on different evenings. Specifically, when working two nights prior to a deadline, participants showed of learning intentions by working

together as a group on each homework problem, taking time to explain areas of confusion, and only moving on to the next problem after everyone was finished and had signaled understanding and readiness to proceed. When working the night prior to the deadline, participants showed evidence of coping intentions by working more as individuals, ignoring others requests for explanations for understanding, and splitting up the homework problems to complete them all and share solutions with each other at the end of the session.

One could look at these findings and think they are obvious, i.e., that students should always start assignments earlier. While perhaps a true statement, our findings offer insight into exactly what happens when students are rushed and why time pressures are not conducive to learning. Specifically, students engage in different time management, task management, and peer helping strategies. SRL literature suggests that these three strategies are among several strategies that make up the SRL process²². Specifically, time management strategies are connected to the forethought phase, while task management and peer helping strategies occur in the performance phase of the SRL process.

Time Management Strategies

Time management is one key SRL skill for successful students²¹. Numerous studies have shown that students with better time management skills perform better in academic coursework²³⁻²⁵. For the different scenarios, the group selected different time management strategies, specifically when they would work on an assignment in association to the due date. Though the group said on numerous occasions that they chose to study two nights before an exam because it gave them freedom to work, ask for help, and complete in a timely manner, there were occasions when they did not follow this rule. For the second observation, they chose to divert from their original strategy, even though they could communicate that study two days before was the preferred and better strategy. When different time management strategies were selected, the group likewise selected different task management strategies.

Task Management Strategies

When the group selected a time management strategy of working on an assignment several days before the due date, the task management strategy that was associated was a collaborative engagement strategy. The group members deliberately chose to work on one problem at a time and make sure that everyone in the group had a full understanding of the concept before moving on to a new task. In this case, it was clear that the goal for completing the task was to ensure that everyone learned about the content that was the focus on the assignment. In contrast, when the time management strategy of starting the assignment the night before the assignment was due was selected, this led to a 'divide and conquer' task management strategy. Here, the group's goal for task completion shifted to finishing the assignment so it could be turned in on time. The focus was no longer on learning, but simply on completion. To that effect, members of the group didn't develop solutions to all of the tasks for the homework assignment. Instead, group members completed a portion of the tasks and shared their results with others. The differences in task management strategies also had an impact on the peer support/help strategies that were used.

Peer Support/Help Strategies

When working on the homework assignment collaboratively, the group worked collaboratively to ensure that all members understood the content. At times, individual members would stop their own work in order to explain or teach content to other group members. Questions to the group were handled collectively. In this situation, help for a group member was always at hand. And then group did not move on until each group member was ready. In contrast, when working on the homework assignment using the divide and conquer method, help and peer support was not readily available to all group members. Because the focus on the study time shifted to just getting the assignment done, there was less of an emphasis on helping others understand the concepts and procedures for a particular task. Many times, questions would be posed by a group member that would go unanswered by the rest of the group. The task management strategy shifted to individual effort which meant that the collaborative nature of work and help was lost.

Contextual factors can contribute to students engaging in learning in very different ways. In particular, feeling a time crunch can cause students to shift from a mastery mode to a coping mode. While in the mastery mode, students tend to exhibit behaviors that are shown to promote deeper learning, in the coping mode they are just trying to get done and learning is secondary.

Implications for Research and Teaching

This leads us to implications for educational practice and research. Educators, especially those teaching in the engineering disciplines, can be more cognizant of student workloads. Perhaps by asking ourselves what we hope students are gaining from working assignments and if these outcomes would be achieved if students were in a coping rather than mastery mode, we could better scope workloads. Since most students in a given major are taking similar courses at the same time, efforts could be extended to look at workloads across courses as well. For example, if several core courses are giving an exam the same day or week, how does that help student learning?

Education researchers, especially those in engineering, can also learn from the methods used in this study. Through an ethnographic study, we were able to observe what students were actually doing. Had we tried to ask these same questions through surveys or interviews, students might not have been aware of or recognized the changes in their habits or the ramifications of such changes. For example, Becca might not know that in a mastery mode she more actively asks for help then when she is in a coping mode.

It is perhaps also important for educators to talk directly to students about ways to set up their learning environments to promote learning. While it may not be possible to eliminate coping modes, helping students raise awareness of when these situations are arising could help them know where to focus when they do have time to study content more fully. Research has shown that students can build their SRL skills when they engage in classroom teaching that engages them in SRL practice²⁶. Research has also shown that the metacognitive strategy of

planning learning is an inherently subconscious process²⁷. By simply engaging students in conscious discussion about planning their own learning, students can bring these planning thoughts to a conscious level and think more critically about the choices they make in choosing learning habits. For example, the team in this study might want to revisit the content from the second observation more carefully because they spent less time trying to understand as they worked on the assignment.

Finally, educators can use the stories presented in this research study and other studies that focus on rich descriptions of learning in context to present cases by which their students can learn about their own learning. Many educators become frustrated when they try to convey to their students a need for more effective learning strategies but it seems as if the students do not listen. We may have more opportunities to reach our students by telling real stories of student learning, how these stories are connected to educational theory, and how students can practically learn from educational research and the experiences of their peers. Incorporating case studies of how students learn into engineering curriculum may be an effective way of helping our students realize the changes they need to make to their own study habits to be more academically successful in their own undergraduate engineering careers.

Limitations & Future SRL Research

Our study is limited in that it represents only one study group in one class at one school. However, the depth of data available from the intensive set of participant observations in our ethnographic study yield sufficient details to understand how and why behaviors are changing. We could also argue that this group that we studied in detail represents a best case in the sense that they are very conscientious and try to study in advance so they can focus on learning. Our extended observations show that even for this group, studying in advance is just not always possible due to competing demands from other courses or even from the same course. Our findings could be even more impactful if we consider that students are not always this conscientious and are often in a rush. Given the repeated research that demonstrates how time intensive engineering programs are,¹¹ our assumption that most students are burdened for time is reasonable.

The study of student learning in context is a critical area of research for understanding the challenges that our students face as they work to learn difficult content and attempt to be successful in higher education. Future research should focus on understanding how the context of the learning environment impacts student learning and willingness to engage in positive learning strategies. While we know that certain learning strategies can prove more beneficial for learning than others, we still know very little about how and why students choose certain learning strategies over others. Research focused on investigating contextual influences could prove very influential on understanding student choice for learning strategies.

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References

1. Boekaerts, M., *The Adaptable Learning Process: Initiating and Maintaining Behavioural Change*. Applied Psychology, 1992. **41**(4): p. 377-397.
2. Butler, D.L., *In Search of the Architect of Learning: A Commentary on Scaffolding as a Metaphor for Instructional Interactions*, in *Journal of Learning Disabilities*. 1998, Sage Publications Inc. p. 374-385.
3. Corno, L., *Work Habits and Self-Regulated Learning: Helping Students to Find a "Will" from a "Way"*, in *Motivation and self-regulated learning: Theory, research, and applications*, D.H. Schunk, amp, and B.J. Zimmerman, Editors. 2012, Routledge.
4. Pintrich, P.R., *Understanding self-regulated learning*. New Directions for Teaching and Learning, 1995. **1995**(63): p. 3-12.
5. Pintrich, P.R., *Reliability and Predictive Validity of the Motivated Strategies for Learning Questionnaire (MSLQ)*. Educational and psychological measurement, 1993. **53**(3): p. 801.
6. Butler, D.L., *Qualitative Approaches to Investigating Self-Regulated Learning: Contributions and Challenges*. Educational psychologist, 2002. **37**(1): p. 59-63.
7. Meyer, D.K. and J.C. Turner, *Using Instructional Discourse Analysis to Study the Scaffolding of Student Self-Regulation*. Educational psychologist, 2002. **37**(1): p. 17-25.
8. Patrick, H. and M.J. Middleton, *Turning the Kaleidoscope: What We See When Self-Regulated Learning is View With a Qualitative Lens*. Educational psychologist, 2002. **37**(1): p. 27.
9. Stefanou, C., et al., *Effect of Classroom Gender Composition on Students' Development of Self-Regulated Learning Competencies*. International Journal of Engineering Education, 2014: p. 333.
10. De Groot, E.V., *Learning Through Interviewing: Students and Teachers Talk About Learning and Schooling*. Educational psychologist, 2002. **37**(1): p. 41-52.
11. Stevens, R., et al. *Engineering as lifestyle and a meritocracy of difficulty: Two pervasive beliefs among engineering students and their possible effects*. in *American Society for Engineering Education Annual Conference and Exposition*. 2007. Honolulu, HI: American Society for Engineering Education, Chantilly, VA 20153, United States.
12. Lee, W.C., H.M. Matusovich, and P.R. Brown, *Measuring underrepresented student perceptions of inclusion within engineering departments and universities*. International Journal of Engineering Education, 2014. **30**(1): p. 150-165.
13. Lawanto, O., et al., *Task Interpretation, Cognitive, and Metacognitive Strategies of Higher and Lower Performers in an Engineering Design Project: An Exploratory Study of College Freshmen*. International Journal of Engineering Education, 2013. **29**(2): p. 459-475.
14. Winne, P.H. and A.F. Hadwin, *Studying as Self-Regulated Learning*, in *Metacognition in Educational Theory and Practice*, D.J. Hacker, J. Dunlosky, and A.C. Graesser, Editors. 1998, Lawrence Erlbaum Associates, Publishers: Mahwah, New Jersey. p. 277-304.
15. Boekaerts, M., *Self-regulated learning: Bridging the gap between metacognitive and metamotivation theories*. Educational Psychologist, 1995. **30**(4): p. 195.
16. Boekaerts, M., *Being Concerned With Well-Being and With Learning*. Educational Psychologist, 1993. **28**(2): p. 149.
17. Rossman, G.B. and S.F. Rallis, *Learning in the field : an introduction to qualitative research*. 2012, Thousand Oaks, Calif.: SAGE.
18. Spradley, J.P., *Participant Observation*. 1980, New York: Holt, Rinehart and Winston.
19. Glesne, C., *Becoming qualitative researchers : an introduction*. 2011, Boston: Pearson.
20. Lofland, J. and L.H. Lofland, *Analyzing social settings : a guide to qualitative observation and analysis*. 1995, Belmont, Calif.: Wadsworth.
21. Pintrich, P.R., *A conceptual framework for assessing motivation and self-regulated learning in college students*. Educational psychology review, 2004. **16**(4): p. 385-407.

22. Zimmerman, B.J. and M. Campillo, *Motivating Self-Regulated Problem Solvers*, in *The Nature of Problem Solving*, J.E. Davidson and R.J. Sternberg, Editors. 2003, Cambridge University Press: New York.
23. Claessens, B.J., et al., *A review of the time management literature*. *Personnel review*, 2007. **36**(2): p. 255-276.
24. Kitsantas, A., A. Winsler, and F. Huie, *Self-regulation and ability predictors of academic success during college: A predictive validity study*. *Journal of Advanced Academics*, 2008. **20**(1): p. 42-68.
25. Macan, T.H., et al., *College students' time management: Correlations with academic performance and stress*. *Journal of educational psychology*, 1990. **82**(4): p. 760.
26. Zimmerman, B.J. and D. Schunk, *Motivational sources and outcomes of self-regulated learning and performance*. *Handbook of self-regulation of learning and performance*, 2011: p. 49-64.
27. Schellings, G. and B. Hout-Wolters, *Measuring strategy use with self-report instruments: theoretical and empirical considerations*. *Metacognition and Learning*, 2011. **6**(2): p. 83-90.