THE EFFECTIVENESS OF USING A PEER MODELING INTERVENTION IN CONJUNCTION WITH PROMPTING TO PROMOTE SELF-REGULATION AND DECREASE PROCRASTINATION IN A HYBRID ONLINE CLASSROOM ENVIRONMENT

by Samatha Garrison

The study tested the effectiveness and level of required intrusiveness of a peer modeling video in conjunction with a weekly email prompting intervention to increase undergraduate students’ academic self-regulatory skills. There were 130 participants between two classes. The study examined the intervention’s effect on weekly quizzes over the course of 11 weeks. An experimental pretest posttest design examined the intervention’s effects on performance on weekly content quizzes, submission time of quizzes, procrastination ratings, and anxiety ratings. Intrusiveness was examined by comparing three groups with varying levels of the intervention components. Pretest and posttest measures with the group scores were compared by a paired samples t-test. Performance and submission time were compared between the groups with a Mixed Model ANOVA. No significant results were found for the measures. However, higher levels of perceived procrastination were found for the most intrusive intervention group on a procrastination posttest.
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The effectiveness of using a peer modeling intervention in conjunction with prompting to promote self-regulation and decrease procrastination in a hybrid online classroom environment

Incoming undergraduate students are often unprepared for the greater reliance on self-regulatory skills that is required in the college environment (Hadwin & Winne, 2001). This issue is further exacerbated by the emerging technological advances that allow and promote online interaction within the traditional classroom structure. Many courses now are being taught in an online manner where the majority of the learning takes place online (Tallent-Runnels, Thomas, Lan, Cooper, Ahern, Shraw, & Liu, 2006). Throughout numerous research examples, good self-regulation skills are a determinant of success in these types of courses along with in all learning environments (Azevedo, 2007). Self-regulatory skills are not an innate ability but rather, should be fostered throughout a student’s learning history and develop over time (Boekaerts & Corno, 2005). However, many undergraduates still lack these skills and continually struggle in their coursework while having little opportunity to learn the skills. This is a frequent referral concern for school psychologists at all school levels and school psychologists are often unfamiliar with the measurements and interventions needed to help these students. This self-regulatory process along with academic motivation has been consistently implicated in students’ academic success. Additionally, these processes are rarely evaluated and thus they are seldom targeted through intervention (Cleary, Gubi, & Prescott, 2010). Courses typically focus on teaching content material rather than self-regulation skills (Schunk & Zimmerman, 1998). Therefore in this widespread online environment, students need the opportunity to learn and practice these self-regulatory skills in order to be successful in their studies.

According to the social cognitive theory, self-regulation is cyclical process where learners consciously direct and adapt their own learning (Schunk & Zimmerman, 1998). It includes three distinct stages that interact with each other: forethought, performance/volition, and self-reflection (Schunk & Zimmerman, 1998). With the development of these processes, a learner will become more proactive in their learning and use of strategies which subsequently will result in greater academic performance (Zimmerman, 2002). Furthermore, academic procrastination and anxiety should be decreased with the use of self-regulatory processes. Procrastination is often due to a lack or failure of proper self-regulatory skills that results in putting off a task for a length of time that can lead to hurried and careless work (Steel, 2007). In turn, procrastination can lead to internal discomfort thus causing anxiety.

The current study sought to gather more information about self-regulation assessment and intervention with older students to add to school psychology literature and to develop and gain more knowledge about a potential intervention that can be used with students and be easily deployable in the classroom setting. A majority of teachers have indicated their concern over how to deal with students who struggle with their self-regulatory skills and their lack of knowledge of effective interventions. Educators with knowledge of the self-regulatory processes can use this information to guide their instructional practices (Cleary et al., 2010). The overall goal of this current study was to examine the effectiveness of an intervention to promote self-regulation in the university environment for undergraduate students using the least intrusive intervention possible while improving learning and achievement. The intervention sought to be plausible for use in a large enrollment hybrid online class where it was embedded in the curriculum and continued to be sustainable over a semester. The intervention relied on the social cognitive theory and the learning devices of modeling and scaffolding. The supposition of the research was that a video that teaches self-regulation skills through peer modeling in conjunction with weekly online prompts would be successful in improving performance, decreasing
procrastination, and decreasing anxiety levels. This examination was much needed in the educational environment due to the growing presence and reliance on online programs and distance education opportunities for learning.

**Literature Review**

**Self-Regulation**

Self-regulation is a self-directed, conscious mental process that is controlled by the learner and enhances learning. It is not an innate ability that develops through maturation but is a skill that must be practiced and developed throughout a learner’s life. This set of skills must be learned and fostered. It is viewed as an active learning approach in which students direct themselves through various behaviors in order to achieve a goal. Students do this through a cyclical feedback loop where they consciously monitor their own learning and adapt strategies and thinking when needed (Zimmerman & Schunk, 2001). It has been demonstrated that students who possess the skills of self-regulation perform better on academic tasks than those who do not. Students with these skills are more likely to use metacognitive skills and learn the material more efficiently and deeper (Schraw, 2007). Poor performance by reactive learners can often be remedied by enacting the phases of self-regulation.

According to Zimmerman (2000), there are three distinct phases of self-regulation: forethought, performance or volition control, and self-reflection. These stages also follow a cyclical pattern with constant interaction. The **forethought stage** is the initial planning stage that occurs before any effort has been made on the task. Within this stage are goal setting, goal orientation, intrinsic interest, self-efficacy beliefs, and strategic planning. Goal setting is an essential initial step in the self-regulation process as it focuses and motivates the learner by determining the outcomes needed and desired with learning. It gives the learner an objective to work toward. Goal orientation can be just as important as the goals themselves. This refers to a mastery or performance goal orientation. In a mastery goal orientation, learners aim to learn the material for the benefit of having knowledge rather than solely for an external reward while performance goals focus on the tangible outcomes such as good grades (Schunk & Zimmerman, 1998). Students who have mastery goal orientation for a task tend to use more effective strategies, are drawn to more challenging tasks, and have a positive attitude toward the class. This type of behavior aids in the application of adaptive motivational patterns (Ames & Archer, 1988). With a mastery goal orientation the learner is influenced to gain knowledge without the reinforcement of external rewards thus creating intrinsic interest. If a learner has intrinsic interest in a task, they will continue with the task without an extrinsic reward and they are more likely to continue the task if they encounter obstacles. Self-efficacy beliefs continually affect this goal-setting process because it encompasses the learner’s beliefs about their abilities and what they will be able to achieve. This construct is defined as a learner’s beliefs about their performance abilities and what they are capable of attaining (Zimmerman, Bandura, & Martínez-Pons, 1992). With poor self-efficacy beliefs, a learner will set minimal goals for learning because they assume that they cannot be successful with more difficult ones. With all of these processes in place, a learner with self-regulation skills will engage in strategic planning where they map out strategies to help them be successful in their goals. These sub-processes help to motivate and orient a learner to task and will help the learner to be successful (Schunk & Zimmerman, 1998).

Once the task has been started, a learner with good self-regulation skills will enter into the **performance or volition stage** of the self-regulation process. This stage is when the learner will use techniques to enhance their task concentration and performance. In order to do this,
learners must follow the processes of self-control and self-observation. The processes within the self-control category: self-instruction, attention focusing, imagery, and task strategies, help the learner by making learning meaningful, thus more easily learned and later retrieved, by enacting learning devices and strategies will centering one’s attention of task by limiting distractions (Zimmerman, 2000). With self-instruction, a learner will mentally direct themselves through a task thus keeping them more focused and organized (Zimmerman, 1998). Students who engage in this process tend to have better performance and conceptual gains than those students who do not. As seen in a study by Miller (1985), elementary students were taught to use self-instruction in a reading task. The students who used the self-instruction strategy had greater performance and were better able to monitor a larger breadth of conceptual information within a task. Students will be more successful in self-instruction and other self-regulatory strategies, when they can focus their attention on the task by limiting distractions within their learning environment. Once this is done, a learner can engage in several task strategies such as imagery, where learners create mental pictures of a concept in order to aid in learning and retrieval, and other strategies (Zimmerman, 1998).

During self-observation in the performance or volition stage, a learner will monitor their learning while it is occurring, determine why it is occurring (what conditions enable it), and evaluate the outcome. Within this stage are self-recording and self-experimentation. Self-recording is a technique that involves identifying behavior and the thought processes surrounding performance when it occurs. This can help by demonstrating a pattern of thought processes and behaviors related to a task. During this process a learner will constantly be aware of their performance and will be able to adapt it if need be in order to be successful. When a learner adapts their thoughts and behaviors during this cycle, it is referred to as self-experimentation. By varying their behavior, a learner can have better understanding of their own learning behavior and what works best for them (Zimmerman, 1998).

Once the task has been completed, a learner should engage in self-reflection. This is the last stage of the self-regulation process. This stage involves self-judgment and self-evaluation. Self-judgment is when a learner takes note of their performance and makes attributions as to why they were successful or not successful (Zimmerman, 2000). These attributions of success or failure are very important for the learner because they have an effect on self-efficacy and future performance. Schunk (1982) found that students who were given past attributional feedback linking past achievement to a task, regarding their past mathematical performance along with didactic teaching had faster success in mastering mathematical procedures than those students who received future attributional feedback directed toward their future performance or no feedback at all. In conjunction with quicker progress, the students were found to have greater skill development and a higher perception of self-efficacy (Schunk, 1982). Similarly, negative attributions regarding ability were associated with a performance goal orientation thus demonstrating how these behaviors continually interact and affect each other (Ames & Archer, 1988). The final process is self-evaluation, which is the comparison of one’s performance to their previous goal and how they align with their previous goals. This final phase is important in the cycle because it will continually affect future decisions and performances bases on the self-judgments and self-evaluations (Zimmerman, 2000).

**Academic Performance**

Improved performance on academic tasks is an effect of highly developed self-regulatory skills. Academic motivation and self-regulatory skills have been linked to academic achievement
(Cleary et al., 2010). The variance of these skills, whether a learner has developed key self-regulatory processes, can determine a student’s level of learning. These abilities help learners to monitor and consciously adapt their learning, strategy use, and goals in order to have more success in a task which, in turn, increases their self-satisfaction and motivation to improve their self-regulatory skills. These skills will then make them more likely to succeed in their academic challenges (Zimmerman, 2002). Spitzer (2000) found motivation to be highly correlated with self-regulation ($r = .59$) and self-efficacy ($r = .55$) thus demonstrating the cyclical effect that these processes have on each other. In addition, research has shown that academic self-efficacy, self-regulation, and social support for traditional and nontraditional college students were found to be positive predictors of GPA thus demonstrating the great effect that self-regulatory skills can have on academic performance (Spitzer, 2000).

Self-regulation skills have also been found to have an effect and be predictive of learning and performance in the online education environment. Intrinsic goal orientation, self-efficacy for learning and performance, time and study environment management, help-seeking behavior, and internet self-efficacy have been identified as key self-regulatory processes for predicting success in a hybrid online classroom as measured by a student’s final grade in a course (Lynch & Dembo, 2004). These behaviors are characteristic during the course of the self-regulation cycle and crucial to be developed throughout a student’s learning history. Will and self-regulation were similarly found to be fundamental indicators of success in another distance learning class. These components composed the major differences between high achieving and low achieving students in the university environment (Yip, 2009). Low achieving students tend to be more impulsive, be less accurate of assessing their abilities, have lower goals, be self-critical, and are likely to give up more easily which can affect their academic performance and learning behaviors. This underachievement can be due to a student struggling with the ability to be self-disciplined (Schunk & Zimmerman, 1998). Essentially, they lack good self-regulatory skills. Students who struggle in their last year of high school show difficulties in their abilities to plan, regulate, and monitor their learning behaviors. These students also have low expectations about their abilities, or low self-efficacy, and continue in a cycle of failure. They appear to have less self-discipline and self-regulatory skills and this behavior often follows them into the university environment (Lecce et al., 2003).

**Procrastination**

Once self-regulatory skills have been fostered and developed, they will have an effect on many other mental processes and behaviors. One such behavior is procrastination. Procrastination is the intentional delaying or avoidance of a task and is related to a failure of self-regulation. This behavior has a detrimental effect on task completion and quality. Often when procrastination is used, performance suffers due to the pressure and time constraints once the task in finally enacted. It is estimated that 80% to 90% of college students engage in procrastination with 50% engaging in the behavior chronically (Steel, 2007). However, this behavior can be helped through the development of self-regulation skills through the practice of goal setting, planning, attention control, intrinsic interest, increased self-efficacy, and self-monitoring. Goal setting affects procrastination when the learner sets proximal goals and deadlines thus leading to increased self-efficacy which would give the learner more confidence to engage in the avoided task. Self-monitoring can help a learner to set realistic goals because they are better aware of their behavior and capabilities. Goal setting also helps to create a timeline for task completion that can be further developed through planning. Planning helps by overcoming distractions and controlling attention by setting up a structured schedule when the
task can be completed instead of waiting for the last minute to complete it. Intrinsic interest can be fostered by making the task meaningful. Once a student finds interest in task, they will be more likely to engage in it which leads to a reduction in procrastination behavior (Van Eerde, 2000).

This is illustrated in a study by Senecal, Koestner, and Vallerand (1995), where extrinsic motivation was associated with procrastination while intrinsic motivation was seen to reduce it. Intrinsic motivation is a part of the forethought stage in the self-regulation cycle. Students with strong self-regulation skills will be able to use intrinsic motivation rather than relying on extrinsic motivation and subsequently will have more motivation and avoid procrastination. Furthermore, a relationship that has also been found is as intrinsic motivation and effort regulation (volition) increase, procrastination decreases. These factors can predict procrastination. A student’s goal orientation also has a significant effect on their procrastination. Students with a mastery approach to goal setting tend to procrastinate less. Their goal orientation is affected by both intrinsic motivation and self-efficacy. Those students with an interest in the material and a belief that they will be able to learn it well, will most likely have a mastery approach to their goal setting. Students who use more cognitive and metacognitive strategies are also less likely to engage in procrastination (Howell & Watson, 2007). These types of strategies are commonly found in the performance/volition stage of the self-regulation cycle.

Self-efficacy, an important process in the self-regulation cycle, is also found to be strongly related to procrastination. Ferrari, Parker, and Ware (1992) found in a research study with college undergraduates who engaged in frequent procrastination behavior, that students who had poor self-efficacy beliefs in relation to their perceived ability to master general life events were more likely to participate in procrastination more often. Furthermore, general self-efficacy beliefs were able to predict the frequency of academic procrastination, the reasons for it, and task aversiveness. These behaviors were negatively related to self-efficacy (Ferrari, Parker, & Ware, 1992). Procrastinators are also found to attribute their success to factors other than themselves which negatively affects self-efficacy and self-confidence. Low self-confidence is found to obstruct effective studying. Moreover, procrastinators are often aware of their low self-confidence and self-efficacy which, in turn, affects their performance (Rothblum, Solomon, & Murakami, 1986). Procrastination also affects self-efficacy because the behavior of procrastination can lead to poorer performance on task, which can lead to lower self-efficacy thus creating a cycle of future procrastination (Steel, 2007).

Anxiety

Another behavior affected by an increase in self-regulation skills is anxiety. Procrastinators report higher levels of test anxiety and weekly general anxiety. Students who are considered to be low procrastinators tend to experience less anxiety as stressful events approach (e.g. midterm exams) while high procrastinators report stable levels of high anxiety throughout the entire event (Rothblum et al., 1986). Anxiety is related to procrastination although it is not known whether anxiety acts as an antecedent or consequence for the procrastination. It may be the anxiety-producing nature of task that can cause a student to procrastinate and avoid a task or perhaps the time pressure that is created by engaging in procrastination that may contribute to anxiety (Van Eerde, 2003). This procrastination-anxiety link was seen in a study by Fritzche, Rapp Young, and Hickson (2003) investigating the procrastination associated with writing. Writing is considered to be a task that requires great amounts of self-regulation skill (Graham & Harris, 2000). In the study, academic procrastination was found to be associated with increased
general anxiety and greater anxiety about the task (Fritzsche, Rapp Young, & Hickson, 2003). With these results, it can be assumed that due to the connection between procrastination and anxiety that as one decreases so will the other. Therefore with a better development of self-regulation skills, students should exhibit fewer symptoms of procrastination and, in turn, less anxiety.

**Technology-Infused Learning Environments**

While this self-regulation process is helpful in all educational environments, it is especially important for a computer-based learning environment. Although technology-infused environments pose a wealth of accessible information, studies have found that they can provide little learning for some students. This may be due to a failure of self-regulatory processes to direct a student through their independent learning (Azevedo & Cromley, 2004). The nature of a computer-based learning environment, where the learning must be directed by the learner rather than an external motivator (e.g. teacher), may add to this failure. Furthermore, hypermedia environments give a learner a plethora of information at one time and that learner must be able to sort through that information and use it accordingly. This is where self-regulation skills are needed most (Winters, Greene, & Costich, 2008). It is the learner-directed nature of computer-based learning environments that pose a problem for students who have not developed strong self-regulatory skills. In a study comparing students with good self-regulation skills to those without, students without good self-regulation skills performed poorly in a learner-controlled online environment as opposed to a program-controlled online environment thus indicating that they have difficulties directing themselves through an independent learning process. However, the students possessing good self-regulatory skills performed well in both. While the students with poor self-regulation skills were able to perform well in an environment that was controlled by a program, this skill does not translate to the online classroom environment because the learner must navigate their own learning without reliance on a program (Young, 1996). This same result was seen in a case study following six graduate students. These students adapted their existing self-regulation skills to the web-based environment. For example during their planning phase, the students allotted time for logins on the computer, the balance of online and offline work, and the possibility of technical difficulties (Whipp & Chiarelli, 2004). This is the type of behavior that needs to be seen from all students enrolled in an online course.

However, these self-regulation learning skills do not have to be thoroughly developed and practiced before engaging in online learning. In a study comparing student’s knowledge of the circulatory system based what they could learn from a forty-five minute computer tutorial, students who had received a thirty minute training session with practice on self-regulated learning beforehand showed a deeper conceptual understanding of the subject matter than those participants without training. Furthermore the students who received the training, used their newly acquired self-regulatory skills and strategies during their learning process of the subject matter and this, in turn, enhanced their learning. They were found to engage in planning, using learning strategies, continually monitoring their comprehension, and controlling their time and effort while the students who had not received the training were found to have used ineffective strategies and have underdeveloped goals (Azevedo & Cromley, 2004). This demonstrates that self-regulation skills help to facilitate learning in a hypermedia environment. Additionally, it shows that long, intensive self-regulation training sessions are not always needed to sufficiently teach a student to self-regulate their learning.
Scaffolding

Emerging research has focused on the use of prompting or scaffolding techniques to aid the learner in deploying self-regulation techniques in the hypermedia environment. Scaffolds are considered to be any tool, aids, tutors/guides that help a learner to engage in skills to regulate their behavior and learning. These tools can be provided in a variety of ways through the computer, human tutors, etc. Scaffolds can have an important function in initiating and sustaining self-regulation skills according to the social cognitive theory (Azevedo, Cromley, Winters, Moos, & Greene, 2005). Self-regulation skills are seen as dependent on the environment. These skills are situationally-specific and there must be a context for their deployment. A learner reacts to cues from the environment in order to self-regulate and consequently they may regulate their behavior in one setting but not another (Zimmerman & Schunk, 2001). Scaffolds can be put in place to provide the cue needed to signal these processes. Moreover, these scaffolds can provide effective cueing in a hypermedia environment when other external cues are not available (e.g. teacher, classroom environment, etc.). Proske, Narciss, and McNamare (n.d.) examined the use of computer scaffolds to enhance students’ writing. Through the program escribo, students were aided in their writing practice. The program supported the student’s learning by breaking down the writing process into smaller processes to make it more manageable, then directing them through mastering the smaller processes, providing feedback, and allowing for practice and correction. This scaffolding process helped to improve the comprehensibility of the escribo group’s essay writing as compared to the group that had practice-only sessions without the aid of scaffolds. Additionally, the escribo group was found to engage in more preparation activities such as prewriting and planning their essays. These are essential activities in the self-regulation cycle. These enhanced skills carried over in a posttest measure thus demonstrating that the students were able to transfer their learned ability from the scaffolds to similar situations (Proske, Narciss, & McNamara, n.d.).

There are different types of scaffolding techniques that can provide benefits to the learner. For example, Azevedo, Cromley, Thomas, Seibert, and Tron (2003) compared differing scaffolding techniques varying on the amount of tutor instruction. The scaffolding techniques were intended to improve self-regulation skills. The No Scaffolding condition provided no aids during students learning of the circulatory system online. The Adaptive Process Scaffolding condition provided students with a tutor who went over a script describing the steps and concepts involved in self-regulated learning before the students engaged in the learning task. However, the tutor did not help the students during the task. In the Adaptive Content and Processing Scaffolding condition, students were given the same script and tutor as in the Adaptive Processing Scaffolding condition but the students still had access to the tutor while learning the material. The tutor would answer questions and help students to self-regulate their learning. The results of these conditions showed that the Adaptive Processing Scaffolding condition and Adaptive Content and Processing Scaffolding condition showed a larger mental shift in self-regulation strategies than the No Scaffolding condition. The difference between the Adaptive Processing Scaffolding condition and Adaptive Content and Process Scaffolding condition came from each group’s use of self-regulation strategies. The Adaptive Processing Scaffolding group had a higher rate of students engaging in the self-regulatory processes of planning, monitoring comprehension, and effective strategy use while the Adaptive Content and Process Scaffolding condition students were found to use more help-seeking behavior by using the tutor to regulate their behavior. Thus, they were found to rely heavily on their tutor. This study illustrates the importance of teaching students self-regulatory skills and using scaffolds to prompt the students.
to engage in that behavior. However, it also shows that providing too much scaffolding may actually encourage a student to not regulate their own behavior and instead primarily rely on the scaffolds (Azevedo et al., 2003).

**Interventions**

Given that this set of self-regulatory skills is so vital to learner success, many interventions have been aimed at teaching them. These interventions vary widely in scope and tactics. There is no defined intervention for teaching self-regulation skills. The basic distinction between interventions is the teaching of a general or specific skill set to the learners. A general skill intervention design focuses on teaching a set of strategies while a specific skill design thoroughly teaches a few skills or strategies. Although research has indicated that teaching the general skill set for self-regulation produces a weaker effect than teaching a specific strategy, a consideration must be made for the characteristics of the learner. Younger students will benefit more from specific strategy instruction than college students because they have had less exposure and opportunity to build these basic skills and later combine them. College students will most likely already have a base of skills that can be strengthened in order to enhance their self-regulation skills therefore an intervention focusing on the general aspects of self-regulation may be effective. Older students should have the initial skills to be successful in a general skills intervention (Schunk & Zimmerman, 1998). It is important for a student to learn these skills in context which will have an effect on the student’s performance and confidence in learning (Cleary et al., 2010). A general skills intervention was used in a case study where a 12 year old student was taught how to use the self-regulation cyclical loop based on a survey of her own weaknesses. After learning and practicing this cycle, the participant earned a much higher grade (higher than her goal grade) on her subsequent test in an area where she had struggled previously thus demonstrating that a general skills invention can be successful with older students (Cleary & Zimmerman, 2004). Also with college students, it is possible to embed the intervention within a semester long course instead of constructing a time-consuming individual class due to their present knowledge base. This is important to do in order to aid with transfer of self-regulation skills to other areas. A meta-analysis of research regarding the issue of transfer has found that learning study skills within a context will aid with later practice (Hattie, Biggs, & Purdie, 1996). However, it is important to note that some college students may be stuck in their current ineffective habits and may be more resistant to change thus making an intervention useless (Schunk & Zimmerman, 1998).

**Modeling**

The basis of many of these inventions and an important piece of the social cognitive theory is the use of modeling to teach these skills. Modeling refers to demonstrating a behavior, thought pattern, or beliefs to another individual in order to encourage learning of the same activity. Modeling has been shown to heighten learning, self-efficacy and motivation in a learner especially when the model is similar to the learner (Schunk & Zimmerman, 2007). Many self-regulation training interventions have sought to capitalize on this concept and use this type of learning. They depend on cognitive modeling where the model’s thoughts and explanations for engaging a task are verbalized to the learner. Then the learner can gain insight into the process and rationalizations of completing task and increase their self-efficacy depending on the outcome associated with the model. Cognitive modeling was used in the case study by Cleary and Zimmerman (2004), when the student was shown a model using self-regulation strategies while verbalizing aloud their reasons for engaging in those processes. The student later used the same
strategies that she had learned from the model (Cleary & Zimmerman, 2004). If the model experienced a positive outcome due to their performance, then the learner will most likely have an increased sense of self-efficacy with a similar task due to what they had seen thus setting more realistic goals involving the task in the future (Schunk & Schunk, n.d.). Overall, cognitive modeling has been found to be a powerful learning device.

Many other interventions have centered on modeling to teach self-regulation skills. Bielaczyc, Pirolli, and Brown (1995) found performance gains in their experimental group when training with a video of a student model and explicit instruction in self-explanation and self-regulation strategies when learning a difficult LISP programming. The model read through a LISP instructional manual while making verbalizations aloud about their reasons for engaging in the task. The experimental group later used these strategies when completing the same task and had success. Their enhanced abilities can be attributed to what they had viewed and learned from the model (Bielaczyc, Pirolli, & Brown, 1995). Peer modeling was also used in a study of teaching self-regulation by Orange (1999) to improve self-regulation skills in undergraduate students. The experimental group was given a pretest measure to assess the students’ current level self-regulatory skills, and then they watched a video over these skills and strategies acted by peer models. After the intervention, the experimental group was given the same measure to assess their self-regulatory skills and improvement was seen over the control group who did not watch the video (Orange, 1999). It only took the viewing of peer models describing and teaching the self-regulation process for students to have a greater understanding and perform better on a measure of self-regulation skills. However, there was no performance measure in the study to see if these skills translated into practice.

Current Study

The purpose of this experimental study was to examine the effectiveness and level of required intrusiveness of a peer modeling video in conjunction with a weekly email prompting intervention to increase undergraduate students’ academic self-regulatory skills. Techniques from other successful interventions were combined and modified to work in the hybrid online environment. The study sought to determine how much support is needed by college students to cue their self-regulation skills as monitored by performance, procrastination, and anxiety levels on weekly content quizzes. The intervention exploited the use of self-regulation skills teaching sessions through peer modeling and scaffolding that have seen results in previous studies. These techniques were used to encourage and cue students to engage in self-regulated learning while studying and completing a task. Consequently, it was hypothesized that this intervention should increase performance and decrease procrastination and anxiety.

Research Questions: Will there be a difference in performance, as defined by a weekly score on content quizzes, between the three groups of varying levels of intervention intrusiveness? Will the participants’ procrastination be affected by the intervention and differ between groups as measured by hours until submission time of the content quiz? Will the groups differ in anxiety levels post-intervention?

Method

Participants

The participants in this study were composed of two educational psychology undergraduate classes taught by the same professor and teaching assistant. This class was chosen due to its composition of college undergraduates and the online hybrid nature of the class. A
significant amount of learning and quiz-taking occurred online. The two classes met at differing morning class times. The participants were of differing classifications ranging from freshmen to seniors and were a mix of majors. There were a total of 130 participants and each participant was randomly assigned to one of three groups.

**Measures**

*Performance.* Performance on weekly content quizzes was used as a measure of intervention effect. A content quiz was administered online weekly throughout the semester with a total of 13 quizzes recorded. The quizzes were composed of material that was covered in class and in the class readings. The quiz was available online for a designated amount of days before the deadline where the participants could access it. The quiz also had a time limit of 30 minutes. The performance was measured by the numeric score received on the content quiz by each participant out of 100 points. These grades were recorded weekly for each individual in each group.

*Procrastination.* The participants were administered *Lay’s General Procrastination Scale* (1986) to measure their procrastination behavior before and after the intervention. This measure was used in order to assess the intervention’s effect on this specific behavior. The scale was presented in an online format for both the pretest and posttest. The scale is a self-report measure that presents 20 statements of procrastination behavior with a 5-point Likert scale ranging from *false of me* to *true of me*. The reliability of the scale has been tested in numerous studies with a Cronbach alpha ranging from .78 to .85. Test-retest reliability was found to be .80. Validity tests were also conducted and the scale was found to be related to procrastination behavior (Ferrari, Johnson, & McCown, 1995).

Submission time acted as another measure of intervention effect and of procrastination behavior. Submission time refers to the time in which the individual student submits his or her completed quiz. The students had a week before the quiz deadline to complete the quiz. Hours from quiz deadline were counted to represent submission time. Therefore a higher submission time indicates that a student completed their quiz sooner thus signifying they were in engaging in fewer procrastination behaviors. This measure was recorded for each individual and compared by groups weekly.

*Anxiety.* Pretests and posttests for anxiety were administered using the *State Trait Anxiety Inventory (STAI)*. The scale was also presented in an online format as a self-report measure. The scale was developed by Charles D. Spielberger, Richard L. Gorsuch, and Robert E. Lushene in 1964. The *STAI* contains 20 items which assess state or trait anxiety with a 4-point Likert scale ranging from *not at all* to *very much so*. The trait anxiety statements measure a participant’s overall anxiety level while the state anxiety statements assess a participant’s current anxiety state at the time of administration. These measures have been found to have sufficient reliability and validity as evidenced in various research studies. Reliability coefficients for trait-anxiety ranged from .65 to .86 and for state-anxiety, they ranged from .16 to .62. There is more variance in the state-anxiety reliability due to its purpose to measure a participant’s current anxiety level which can be affected by situational factors (Spielberger, 1972; Spielberger, 1980; Spielberger, 1983).

*Instruments.* A peer modeling video that teaches self-regulation skills titled *Ailing Academics* was used with two of the three groups. The video focused on an Ailing Academics meeting and follows a similar format to the video used in the study by Carolyn Orange (1999). During the meeting a reformed struggling student leads the other group members through the steps of self-regulation and they discuss how they can apply them to their own learning. The
students in the video referenced having a class similar in structure to the educational psychology course of the participants and having weekly online content quizzes. The steps of self-regulation were applied and discussed by the student actors for this specific type of classroom environment. These steps were also expressed in a written form throughout the video. The self-regulation steps used in the video are those commonly described by the social cognitive theory (Zimmerman, 2000). The video actors were composed of graduate students in the Educational Psychology Department and were similar in age and diversity to the class demographics. The video lasts approximately 15 minutes. Before the administration of the video in the study, it was viewed and feedback was given by a group of professors in the Educational Psychology department in order to assess face validity. Videos edits were made based on the feedback.

Another video was used with the control group in order to control for time in treatment. The video was deployed in the same method as the experimental video. The control video was a similar length as the self-regulation video. The video was a TED video and covers the exploration of Mars. There was no reference to self-regulatory behaviors or class content in the control video.

Weekly email prompts were used as another piece of the self-regulation intervention. All students completed the weekly prompts before they were given access to the online quiz. The prompts contained a password that would allow them to access the quiz. The prompts for the experimental group were based on the self-regulation cycle and were adapted from a study by Cleary and Zimmerman (2004) and were used to cue the participant to use and develop their self-regulatory skills. The experimental group’s prompts question the participants about their use of self-regulation strategies during the forethought, performance/volition, and self-reflective stage of preparing and taking the weekly quiz. Modifications to the prompts were made to the number of questions and minor wording changes to make them applicable to the setting. The control group’s prompts required the same number of responses from the participants and covered questions about current events.

Procedure

Research Design. This experimental study implemented a pretest posttest experimental design using three randomly assigned groups. The independent variables were the peer modeling video that teaches self-regulation skills and the weekly email scaffolds. The dependent variables were the pretest and posttest scores on Lay’s General Procrastination Scale, STAI, weekly performance on content quizzes, and submission time of content quizzes as mean scores that were compared between the groups. Student consent was collected during the first week of classes from the sample. The participants in each class were then randomly assigned to one of three conditions: the Video and Prompts group, Video group, or Control group. The pretests, the Lay's General Procrastination Scale and STAI, were given during the first week of the semester. Four data baseline points of performance and procrastination were also collected through the weekly online quizzes. The intervention began in the fourth week of classes of the fall semester and continued for nine weeks. Posttests were given at the end of the nine weeks.

Video and Prompts Group. The Video and Prompts Group took the pretests in the first week of the semester. This group was composed of 38 participants. The questionnaires were administered online, had a completion deadline, and were a requirement for the class. The intervention began in the fourth week with the online posting of the Ailing Academic video. The participants in this group were required to watch the video and complete a factual quiz after watching the video. The factual quiz was multiple choice and summarized the video in order to
check for actual viewing. The participants received a score based on their answers. The participants received the weekly experimental email prompts as part of the intervention. The prompts were emailed to the participant three days before their quiz deadline. The prompt was composed of the self-regulatory skills questions where the participant was required to type an answer. Once the answers are submitted for the prompts, the participant received a password that unlocked the content quiz. The password changed weekly. All three groups completed quizzes that covered the same content material. The participants continued to receive the email prompts until the end of the intervention. After the last content quiz, the posttests were administered online.

**Video Group.** The Video group also took the pretests in the first week of the semester. It had 39 participants. Similar to the Video and Prompts Group, they watched the *Ailing Academics* video during the fourth week as the start of the intervention. The participants took the same factual quiz about the video as the Video and Prompts group. Then the participants began to receive a weekly email prompt three days before their content quiz submission deadline. The prompt was composed of the same number of questions as the self-regulatory questions but covered material unrelated to class content and the study in order to account for time in treatment effects. The participants had to submit their prompt answers before they received a password to take the content quiz. The Video group took the posttests at the end of the study.

**Control Group.** The participants assigned to the control group took the online pretests in the first week of the semester. The control group was composed of 51 participants. In the fourth week, the intervention began and the Control Group watched an online TED video that was unrelated to the study constructs and the course content. The video lasted approximately 15 minutes after which a factual quiz was given. The quiz was a course requirement. This group also received the same weekly email prompts as the Video group three days before the content quiz deadline where they completed unrelated prompts to receive a password to take the content quiz. The posttests were given at the end of the study.

**Results**

**Data Analysis**

**Performance.** SPSS was used to conduct the statistical analysis. Performance was evaluated based on the weekly quiz scores. A mixed model ANOVA was conducted for the quiz grades prior to the intervention and revealed no significant differences between the 3 groups with $F(3,108) = 1.52, p = .170$. Another mixed model ANOVA was conducted for the remaining post-intervention quiz scores with $F(8,73) = .96, p = .5$. The analysis indicated that there were no statistical differences between the participants’ performances pre or post intervention between the groups.

**Procrastination.** Pretest and posttest scores of the *Lay’s General Procrastination Scale* along with hours until quiz deadline were the measures used to quantify procrastination behavior. An ANOVA was conducted on the pretest scores of the scale and no significant differences were found between the groups with $F(3,109) = .89, p = .41$. Similarly, an ANOVA conducted on the posttest scores also showed no significant difference with $F(8,74) = 1.33, p = .270$. A correlation was conducted to determine the relationship between the pretest and posttest scores on the scale. The pretest and posttest scores of the scale were found to be significantly correlated with each other, $r(118) = .76, p < .01$. The pretest scores were also found to be negatively correlated with the hours until deadline on the first four quizzes which were administered before the intervention. The posttest scores were also negatively correlated with quizzes 5, 6, 11, and 12 at
the .01 level and with quizzes 6.5, 7, and 10 at the .05 level. Quizzes 8 and 9 were not found to have a significant correlation with the posttest scores.

The pretest and posttest scores were also evaluated using a paired samples t-test. Overall, the t-test showed a significant difference between the pretest and posttest means, \( t(100) = -2.96, p < .01 \). Upon further analysis broken down by group, the Video and Prompts group resulted a lower pretest score (\( M = 2.73, SD = .72 \)) than posttest score (\( M = 2.87, SD = .71 \)), \( t(29) = -2.09, p < .05 \). No significant results for the other groups. Another paired-samples t-test was used to compare the first four pre-intervention quizzes with the first four post-intervention quizzes to investigate any differences in submission time post intervention. No significant differences between the means were found for submission times.

A mixed model ANOVA was also conducted on the pre-intervention quiz submission times and no significant differences were found with \( F(4,101) = .37, p = .88 \). Moreover, no significant differences in hours until quiz deadline were found after conducting a mixed model ANOVA on the post-intervention quiz scores with \( F(9,73) = .45, p = .86 \).

**Anxiety.** Anxiety was evaluated using the *State Trait Anxiety Inventory*. The two sub-inventories of state anxiety and trait anxiety that compose the comprehensive inventory were shown to have significantly correlated scores with a pretest correlation between the two sub-inventories of \( r(118) = .79, p < .01 \). Similarly, correlated scores were also found for the posttest scores between the two sub inventories with \( r(103) = .71, p < .01 \). A mixed model ANOVA was conducted on the pretest and posttest scores and no significant differences were found between the groups on the measure.

Significant correlations were also found between the pretest and posttest scores for each inventory. For the state anxiety measure, significant correlations between the pretest and posttest scores were shown to be \( r(101) = .42, p < .01 \). Additionally, significant correlations, \( r(102) = .60, p < .01 \), were found for the pretest and posttest measures for trait anxiety.

A paired-samples t-test was used to evaluate the changes between the participants’ pretest and posttest anxiety scores for both state and trait anxiety. No significant differences were found between the means of the pretest and posttest scores for either inventory.

**Discussion**

The overall purpose of the study was to investigate the effectiveness and level of intrusiveness of an intervention needed in order to improve the self-regulatory skills of undergraduate students in a hybrid online environment. The goal of the intervention was to increase the use of the participants’ self-regulatory skills on weekly online quizzes through the use of a peer modeling video and weekly email prompts. In turn, with the increased use of self-regulatory skills the researchers sought to find a change in behavior represented through the participants’ improvement of their performance on the quizzes after watching the video and completing the prompts, a reduction in their procrastination behavior through the use of improved self-regulatory skills, and less reported anxiety.

The weekly quiz scores were collected for each group throughout the study. The first four quizzes were administered before the intervention was introduced. A mixed model ANOVA was conducted on these pre-intervention quizzes and showed no significant difference in scores between the three groups thus supporting that the groups were equally distributed after the random assignment. The subsequent nine quizzes were completed after the intervention had been enacted and served as the post-intervention data. The mixed model ANOVA that was conducted...
on these quiz scores also showed no significant differences between the groups. This result indicates that neither the video nor the combination of the video and self-regulatory prompts had a strong enough effect on the participants to change their quiz scores and thus performance behavior. While it is unclear whether there was an effect on their individual self-regulatory skills, there was no significant effect on the groups’ weekly quiz scores. Individual students may have increased their use of self-regulatory skills but the change was not great enough to affect the overall group average. Or the students may have had a change in self-regularly skills knowledge but not in their behavior. Furthermore, according to Schunk and Zimmerman (1998), college students may already be ingrained in their ineffective study habits due to years of repeated use which can cause them to be more resistant to change. Therefore, a least intrusive intervention may not have the strength to disrupt their current study habits.

Procrastination was another variable examined as a potential result of improved self-regulatory behavior. The scores from the Lay’s General Procrastination Scale pretest showed no significant differences between the groups as verified in the results of an ANOVA thus indicating the groups did not differ in procrastination behavior before the intervention and were equally distributed. This result was further validated with a mixed model ANOVA for the hours until quiz deadline for the first four pre-intervention quizzes when no significant differences were found. Further correlations showed that the pre-intervention quiz submission times negatively correlated with the pretest scores. Similar results were found for the post-intervention quiz submission time and posttest scores on the measure. Both results demonstrate the predictive power of the scale of procrastination behavior. As the hours until quiz deadline increased for a participant, thus indicating that they are submitting their quiz earlier and engaging in fewer procrastination behaviors, their procrastination scale score decreased which implies that their responses on the scale are indicative of fewer instances of procrastination behaviors.

Paired-sample t-tests were also completed for the procrastination pretest and posttest scores. The Video and Prompts group showed a significant difference between the means of the pretest and posttest scores with the pretest mean being lower than the posttest mean while the other groups showed no difference. A higher score on the measure signifies that the participant responded that they were engaging in higher levels of procrastination behavior. With the posttest mean being higher than the pretest, there is evidence of a change in the participants’ perception of their procrastination with them responding that they are engaging in more procrastination post-intervention. However, similar results were not found in a comparison of submission time when a paired-sample t-test compared the first four pre-intervention submission times with the first four post-intervention times for the Video and Prompts group. Therefore, a conclusion can be drawn that the participants responded that they were engaging in more procrastination behaviors but that their submission times remained unaffected. This leads to the possibility that the participants viewed themselves as engaging in more procrastination behavior although it was not reflected in their submission times. An alternate conclusion could be that their increase in procrastination behavior did not affect their submission time. Moreover, while each group completed similar tasks that accounted for similar time in treatment intervals, the Video and Prompts group received weekly email prompts that presented questions about their self-regulatory behavior while the other groups received questions about current events. These self-regulatory prompts may have led the participants to view themselves as engaging in more procrastination behavior because they were more aware, from receiving weekly email prompts, of self-regulatory behavior. This could have potentially led to comparison of desired behaviors.
and actual behavior. Although qualitative data through the use of student questionnaires was not collected for the current study, it would have given more insight into these results.

An additional mixed model ANOVA was completed for the post-intervention submission times and no significant differences were found between the groups. This result shows that the intervention did not have an effect on the participants decreasing their procrastination behavior by submitting their quiz earlier for any group. Moreover, it validates the finding that the Video and Prompts group did not engage in higher levels of procrastination that would have an effect on their submission times as compared with the other groups.

Anxiety was also used as a measure in the current study to evaluate the intervention’s effect on anxiety through the improvement of self-regulatory skills and to monitor a potential confound. The participants were administered the State Trait Anxiety Inventory as a pretest and posttest. The mixed model ANOVA demonstrated that there were no significant differences between the groups on the measure during the pretest consequently indicating the groups were composed of participants with similar levels of anxiety before the intervention. Likewise, a mixed model ANOVA for the posttest also showed no differences between the groups’ anxiety levels after the intervention. Similarly, in a paired-samples t-test, no significant differences in the means from pretest to posttest were found for any of the groups. Therefore, it can be concluded that the intervention did not affect the participants’ anxiety levels.

In conclusion, the current study did not find the peer modeling video or the pairing of the peer modeling video with weekly self-regulation email prompts had a significant effect on the participants’ self-regulatory skills as indicated through their performance on weekly quizzes, their procrastination behavior, or anxiety level. Interestingly, the study did find a perception of an increase of procrastination behaviors from the Video and Prompts group after the intervention although there was not an effect on the measured behavior of submission time. These results bring into question the level of intrusiveness needed to improve participants’ self-regulatory skills especially at the undergraduate level and to instigate behavior change. As described by Schunk and Zimmerman (1998), college students tend to more ingrained in ineffective study habits and resistant to change. A more intrusive and individualized intervention may be needed to enact behavior change for this population. Transfer is another issue that may have affected the results. Transfer of study skills is more likely to occur when skills are taught and practiced in context (Hattie & Biggs, 1997). With the intervention, the students were taught the skills through a video and prompts were used to cue the self-regulatory behaviors; however, it is unclear whether the students practiced these skills in their studying. A more effective intervention may have targeted learning the skills in the classroom or studying environment rather than online at the participant’s discretion.

Limitations and Future Directions

The study does contain some limitations. Due to time restraints of a semester-long course, a fading technique could not be implemented to test self-regulatory behavior without scaffolds. This could measure the participants’ behaviors with less intrusiveness and evaluate the learning effect, and the sustainability of the intervention effects. Diversity of the sample population is another issue. The population was from a small university in Ohio and there was not a heterogeneous representation of different cultures, socio-economic status, etc. Therefore these results cannot have great generalization to other populations. Additionally, it is uncertain the amount of effort the participants’ used in the self-regulatory prompts and whether they were utilized properly as the prompts were not monitored. The participants could have accessed the
password without filling out the prompts. It is unknown if any participants routinely did not complete the prompts. Qualitative data and analysis of the prompts would have provided more insight into the study. Another limitation was the use of groups for statistical analysis. Single subjects design may have shown change in participant behavior that was lost with the overall group effect. More research is needed into the level of intrusiveness needed in an online environment for college undergraduate in order to produce behavior change.

The measures used in the study also may not have adequately captured the targeted behavior change. For example, submission time was used a measure of procrastination behavior. Other factors may have affected submission time and could have been unrelated to procrastination. Furthermore, students may have displayed appropriate time management and study skills by choosing to take the test at a certain time that may have not been reflected in the submission time measure. Other measures of behavior change, especially when evaluating procrastination behavior, may have been more appropriate. Furthermore, the students’ knowledge of the self-regulatory process and the potential of awareness of their own self-regulatory behavior may have occurred but did not represent itself through a behavior change thus not being evidenced an effective intervention with the measures used.

Additionally, as demonstrated in Azevedo, Cromley, Thomas, Seibert, and Tron (2003) study, students engaged in more self-regulatory behaviors when provided scaffolds which involved a tutor teaching the steps in the self-regulatory process. A more interactive intervention similar to this may have been more appropriate when trying to institute a development of knowledge and possible behavior change. Potentially, an interactive intervention may have been deployed through the use of live models with which the participant could have interacted with or rather through the use of the computer with more interactions built into the intervention such as the student being able to ask questions or be involved in the learning process instead of passively watching a video. Likewise, this intervention could have been deployed and interacted with the participants in their study environment to aid in the facilitation of transfer.

Nevertheless, there continues to be a need for more knowledge about the development of self-regulatory skills especially in older students who appear to lack the ability to regulate their behaviors and demonstrate success in the academic environment. Self-regulation and academic motivation are the precursors to students’ academic achievement thus affecting their performance in the classroom and confidence with their own learning abilities (Cleary et al., 2010). Through this knowledge, interventions aimed at improving these skills in students can be developed and adapted to differing classroom environments at all education levels while utilizing technology that is found in both the classroom and home environment. Likewise, through experimental research and statistical analysis the components of such intervention can analyzed for the potential evidence to substantiate their use and benefit for all students.
References


Appendix A: Prompts

Forethought:
  1. Do you have a goal when studying for your test?
  2. Do you have a goal you are trying to achieve on your test?
  3. How did you decide to use this strategy when preparing?
  4. How sure are you that you can get an 85% on your next test?
  5. How interesting is studying/preparing for your test?

Performance
  1. What do you do when you don’t feel like studying for the test?
  2. Do you keep track of how long you study for your test?

Self-Evaluation
  1. How do you determine if you performed well on your test?
  2. How satisfied are you with your performance?
  3. What is the main reason for your success/failure?
  4. What do you need to do to improve your performance on your next test?

Self-Reflective Quiz
  1. Were your goals met?
  2. Did you study and perform in a manner that you had previously decided?
  3. What score did you receive? Why did you get this grade?
  4. Are you satisfied with your performance?
  5. What changes or adaptations will you make in the future?