

The Link Between Mindset, Self-Efficacy for Self-Regulated Learning, and Metacognitive
Learning Strategies

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Abstract

It has been suggested that students hold beliefs, both conscious and subconscious, about their ability to learn. One set of beliefs, implicit theories of intelligence, indicates student beliefs about their ability to learn. Students are said to hold an incremental mindset, more commonly known as a growth mindset, when they believe intelligence is malleable. When they believe intelligence is a stable trait, they hold an entity theory, or a fixed mindset (Dweck & Leggett, 1988; Castella, 2015). Another set of beliefs, self-efficacy, indicates student beliefs regarding their ability to complete a task successfully (Zimmerman, 2000). Students with higher self-efficacy are more likely to have greater cognitive engagement when learning (Walker, 2016). Both growth mindset and self-efficacy have been linked to self-regulated learning (Antony, 2016; Yan, 2014). Self-regulated learning is defined as a series of self-determined thoughts, feelings, and behaviors that are set in order to reach educational goals (Zimmerman, 2000). Positive links have been found in students who hold growth mindset and use self-regulated learning processes in a meta-analysis that assessed the links between implicit theories and self-regulation (Burnette, 2013).

The sample consisted of students ($N = 132$) who were enrolled in a three-credit-hour course that focused on motivation and learning strategies. Students were administered a self-reported questionnaire that asked them to rate themselves accordingly regarding beliefs about learning on a Likert scale. These beliefs included self-efficacy for self-regulated learning, growth mindset, and metacognitive learning strategies. Preliminary analyses indicated positive correlations between all three variables, with the strongest link between self-efficacy for self-regulated learning and metacognitive learning strategies. In addition, regression analyses suggested a significant relationship between self-efficacy for self-regulated learning and metacognitive learning strategies ($b = .48, p < .001$), but no significant relationship between

growth mindset and metacognitive strategies. These findings offers support for the connection between students' self-efficacy for self-regulated learning and their reported use of metacognitive strategies.

Growth mindset is currently a popular topic among primary and secondary educators (Ivory, 2016; Terada, 2017). There has been a focus on using terminology that does not label students as “smart” or not, but rather to emphasize hard work over fixed intelligence. In addition, asking students to reflect more on their learning is currently a technique teachers are encouraged to implement in the classroom (Cleary, 2018). Because of the growing popularity of mindset, it is important to analyze the importance of mindset for students' academic performances. More specifically, it is important to understand the importance of mindset compared to other beliefs. In the present study, I was interested in better understanding how two beliefs impacted student work strategies.

Literature Review

Mindset

During their experiences in school, students develop both conscious and subconscious ideas about their abilities to understand information, think critically, and further their knowledge of complex skillsets. Implicit theories of intelligence suggest that students might adopt either an entity mindset or a growth mindset (Dweck & Leggett, 1988). Students who adopt an entity mindset consider intelligence to be a fixed trait, meaning that it is previously established and cannot easily be changed. For example, students who hold an entity mindset in mathematics might believe that they will never possess the necessary skillsets to perform well in the subject. Others, however, view intelligence as a malleable trait that can be grown or strengthened; they espouse an incremental theory of intelligence (Dweck & Leggett, 1988; De Castella, 2015). For example, students who hold an incremental mindset in mathematics might believe that their ability in the subject can be improved through practice. In the field of education, having an incremental theory of intelligence also is known as having a growth mindset, while having a

entity theory of intelligence is considered to be a fixed mindset (Dweck, 2008). Some researchers prefer to use the terminology incremental and entity beliefs; however, in this paper, I will use the terms growth mindset and fixed mindset.

Research has suggested that having a growth mindset has a positive effect on students due to the link between growth mindset and adaptive motivational beliefs (Diseth, 2014; Dinger & Dickhauser, 2013; Komarraju, 2013; Blackwell, 2007). Motivational beliefs might consist of students' self-efficacy beliefs and goal orientations (Pintrich, 1999). Self-efficacy is the belief in one's ability to complete a task successfully (Pajares 1996). Goal orientation is the reason why a student is motivated to successfully complete a task (Kaplan & Maher, 2007). Specifically, research has suggested that undergraduate students who hold a growth mindset tend to have higher self-efficacy beliefs (Komarraju, 2013). A similar trend has been found for students in middle and high school (Diseth, 2014). Additionally, a study with seventh grade students found that those who underwent a mindset intervention saw a positive change in classroom motivation, including within their learning goals (Blackwell, 2007); other research has noted that the presence of growth mindset increases the likelihood that the student holds mastery goals in their learning, thus influencing motivational beliefs (Dinger & Dickhauser, 2013). These findings indicate that adopting a growth mindset can have a positive impact on students' motivational beliefs.

The benefits of adopting a growth mindset extend beyond the classroom and can have a positive effect on students who face difficulties in areas other than academics. In these cases, growth mindset applies to a belief in the malleability of domains other than intelligence. One study found that ninth grade students who received a growth mindset intervention had fewer negative reactions compared to peers who held a fixed mindset after a simulation of peer

exclusion (Yeager, Johnson, Spitzer, Trzesniewski, Powers, & Dweck, 2014). Additionally, in a study of undergraduates, those with a fixed mindset were found to have stronger negative emotions after watching an unpleasant movie clip, demonstrating minimal regulation of negative affect (Kappes & Schikowski, 2013). In another study of undergraduate students, researchers found that those who held a growth mindset were more likely to approach a failed task again if their initial performance was deemed unnecessary (Hong, 1999). Overall, these findings suggest that holding a growth mindset can benefit students academically and personally.

In addition to literature suggesting a link between growth mindset and positive outcomes, researchers have noted that fixed beliefs, or the mindset that intelligence is unable to change, has also been linked to negative effects on students in areas outside of academics. Generally, having a fixed mindset has been positively related to negative emotions (King, 2012; Rattan, 2012). One study found that holding fixed beliefs was negatively related to academic achievement and collective self-esteem (King, 2012). Additionally, a study among graduate teaching assistants in mathematics found that those who adopted a fixed mindset were more likely to attribute struggles in student learning to inability (Rattan, 2012). These instructors subsequently held their students to lower standards compared to the instructors who were found to be incremental theorists. Therefore, it is very important for students, as well as instructors, to adopt a growth mindset. Growth mindset positively influences processes such as motivation and self-efficacy, while fending off negative trends in self-esteem.

Although research has been consistent in connecting students' growth mindset to adaptive motivational beliefs, recent research has questioned the impact of mindset on academic achievement. A recently published meta-analysis found that the correlation between implicit theories of intelligence and academic achievement is weak (Sisk, 2018). As a whole, there was

not a strong link between mindset and performance in school. However, once broken down into specific demographics, researchers found that at-risk students and students from low socioeconomic backgrounds were more likely to benefit from mindset interventions. For example, one of the highest correlations in the meta-analysis between growth mindset and academic achievement came from a study analyzing low-socioeconomic high school students within their Algebra 1 class (Schullo, 1996). However, when surveying high school students classified as gifted, the connection between growth mindset and academic achievement when compared to a fixed mindset was not as strong (Ziegler & Stoeger, 2010). This might mean that growth mindset may be beneficial for specific populations of students.

Self-Regulated Learning and Metacognitive Learning Strategies

One pathway through which students' mindset may influence their academic achievement is based on their self-regulated learning. Self-regulated learning is defined as a series of self-determined thoughts, feelings, and behaviors that are set in order to reach educational goals (Zimmerman, 2000). Students are able to learn effectively by implementing metacognitive, motivational, and behavioral strategies as they engage in the forethought, performance, and self-reflection stages of their learning (Zimmerman, 2000). During these stages, students engage in planning, monitoring, and regulating processes in order to successfully complete their academic tasks.

Researchers have suggested that motivation and self-regulated learning have a dynamic reciprocal relationship (Wolters, 2003; Pintrich, 1999). Self-regulated learning has been linked to increased self-efficacy (Antony, 2016; Zimmerman, 1990). There is also evidence that self-regulated learning has a positive influence on the development of students' mastery goals, thus influencing motivation (Pintrich, 1999; Pintrich & De Groot, 1990; Wolters, Yu, & Pintrich,

1996). It has been theorized that students with a more adaptive mindset (i.e., a growth mindset) would exhibit more engagement in self-regulated learning because of the relationship between motivation and self-regulated learning (Burnette, 2007). In particular, one type of strategy that self-regulated learners might implement is metacognitive learning strategies.

Metacognitive learning strategies are defined as the processes of planning, monitoring, and regulating one's knowledge development (Brown, 1982). As students grasp new concepts, they play an active role in their own learning by taking the time to consider how well they know the material, and what can be done to improve their grasp of the information (Ciardello, 1998; Paris, 2001). For example, a college student completing her math homework might check her answers, and then review her mistakes, learning why she made her mistakes, and thus having a stronger understanding of the concepts in the homework. Because full comprehension of the material is the goal of metacognitive learning strategies, the use of these strategies in learning has resulted in higher academic achievement in elementary and secondary students (Dent & Koenka, 2016; Zollanvari, 2017). Research has also found that undergraduate students who learned about metacognitive learning strategies demonstrated higher rates of academic achievement in their courses (Cook, 2013).

There has been limited research on the link between metacognition and growth mindset. One study that surveyed adults using Amazon's Mturk platform found that those with a growth mindset were more likely to utilize metacognitive learning strategies (Yan, 2014). This study also drew the conclusion that those who hold a growth mindset also more effectively manage their learning than those who hold a fixed mindset. It was noted that those with a growth mindset had an increased likelihood of self-testing and restudy the material in order to learn the information.

Both growth mindset and metacognitive learning strategies have strong links to adaptive motivational beliefs. Research has suggested that students with a growth mindset participate in self-regulated learning because the students reflect on their learning and then set goals based on the plan that they have made (Molden & Dweck, 2006; Ommundsen, 2005). Additionally, a recent meta-analysis found that there are positive correlations between growth mindset and self-regulatory processes that included goal operating and goal monitoring (Burnette, 2013). Goal operating and goal monitoring are the terms for the processes in self-regulation that are also known as monitoring and regulating. Burnette (2013) suggested that one area that needs to be more heavily studied is the link between growth mindset and the specific process of self-regulated learning that create that link.

Self-efficacy

Self-efficacy is a motivational construct defined as a student's beliefs about his/her ability to successfully complete an academic task (Bandura, 1989). This belief is domain-specific, meaning students' self-efficacy varies based on the task and subject they are engaged in (Zimmerman, 2000). This belief is not limited to academic settings; people hold self-efficacy beliefs for a variety of domains beyond the classroom (Pajares, 1996). An important characteristic of self-efficacy is that it can be improved and developed (Bandura 1989).

Research has suggested that self-efficacy and academic achievement are strongly linked. Numerous studies have identified the link between a student's belief in their own abilities and their academic achievement (Multon, Brown, & Lent, 1991; Pajares, 1996). Furthermore, studies have found that academic achievement also benefits self-efficacy. A longitudinal 5-year study focused on 1177 seventh grade students found that there was a reciprocal relationship between self-efficacy and academic achievement. The study found that academic achievement at the end

of one semester increased self-efficacy the following term, and high self-efficacy at the start of a semester positively impacted student achievement (Hwang, Choi, Lee, Culver, & Hutchinson, 2015).

One specific type of self-efficacy that researchers have explored is self-efficacy for self-regulated learning. Self-efficacy for self-regulated learning is defined as students' confidence in their ability to use the processes of self-regulated learning successfully or effectively.

Researchers have found that self-efficacy for self-regulated learning has led to students' setting higher goals for themselves (Zimmerman, Bandura, & Martinez-Pons, 1992) and is an indicator of deep cognitive engagement (Walker, Greene, & Mansell, 2005).

Self-efficacy is considered to be a precursor to self-regulatory activities (Bandura, 1989). Furthermore, it has been found that self-efficacy for self-regulated learning has a positive correlation with academic self-efficacy (Joo, Bong, & Choi, 2000). Additionally, Usher (2008) notes that students with lower self-efficacy are less likely to implement these learning strategies because they do not have the confidence to apply the strategies they may know.

Present Study

Research has suggested that strong links exist between growth mindset and self-efficacy as well as metacognitive learning strategies and self-efficacy (Burnette, 2013; Molden & Dweck, 2006; Usher 2008; Joo, Bong, & Choi, 2000). Presently, there is little research on the connection between growth mindset and metacognitive learning strategies. The goal of the present study was to investigate the relation of college students' mindset and self-efficacy beliefs and their reported used of metacognitive learning strategies. I pursued two research questions. My first research question was: To what extent is mindset a predictor of metacognitive learning strategies? I hypothesized that a student who held a growth mindset would be more likely to utilize

metacognitive learning strategies. The second research question was: To what extent is self-efficacy for self-regulated learning a predictor of metacognitive learning strategies? Based on prior research that suggested a link between self-efficacy for self-regulated learning and self-regulated learning (Bandura, 1989), I hypothesized that self-efficacy for self-regulated learning would be linked to increases in a student's self-reported use of metacognitive learning strategies.

Method

Sample

All participants ($N = 121$) were enrolled in a learning to learn course offered through a university learning center that focused on motivation and self-regulated learning. This three-credit hour, twelve-week, letter graded online course was offered online during the summer session. The sample included students enrolled during summer 2016 ($n = 50$) and summer 2017 ($n = 71$). University records indicated that the sample was composed primarily of males (60%). Participants' race and ethnicity were self-reported as 56% white, 15% international, 11% Asian, 10% African-American, 6.5% unknown, 2% Hispanic, and 2% biracial. The average age was 22 years, and all academic ranks were represented (6% first-year, 17% second-year, 24% third year, 45% fourth year or higher, and 3% graduate students).

Procedure

Throughout this class, students were administered four different online surveys as part of their regular course assignments. These surveys assessed students' beliefs and learning strategies, including self-efficacy for self-regulated learning, growth mindset, and metacognitive strategies and were given during the first, second, sixth, and twelfth week of the semester. Students responded to statements using a five-point scale, with 1 indicating strongly agree to 5

indicating strongly disagree. Students completed a consent form that allowed their responses to be used for research purposes.

Measures

Self-efficacy for self-regulated learning. Self-efficacy for self-regulated learning measures a student's belief in their ability to engage in self-regulated learning during their learning processes. The eleven statements for self-efficacy for self-regulated learning were derived from Zimmerman's (1993) self-efficacy for learning scale. Examples for statements included "I am confident that I can organize my schoolwork", "I am confident that I can get myself to do school work" and "I am confident that I can plan my schoolwork for the week". The students responded to these statements within the third survey of the class. The scale displayed adequate Cronbach alpha reliability ($\alpha = .84$), meaning that there was consistency across the items asked in a survey.

Growth Mindset. Mindset is a student's belief regarding how malleable their intelligence is. Students were asked how strongly they agreed with three statements that included "Your intelligence is something about you that you can't change very much" and "You can learn new things, but you can't really change your basic intelligence". The items were reverse coded and were derived from Dweck's *Mindset: The New Psychology of Success* (2006). Therefore, items that scored higher were more likely to indicate a growth mindset, and items that were lower indicated a growth mindset. Mindset was assessed during the second survey of the class. The scale displayed adequate Cronbach alpha reliability ($\alpha = .91$), again demonstrating consistent results.

Metacognitive learning strategies. Metacognitive learning strategies involve thinking about one's own learning through the process of planning, monitoring, and regulating as learning

occurs. Students were assessed for metacognitive learning strategies in the third assigned survey. The thirteen statements were adapted from the *Motivated Strategies for Learning Questionnaire* (Pintrich, Smith, Garcia & McKeachie, 1993). Each statement was designed to evaluate one phase in the planning, monitoring, or regulating feedback loop. Examples included “Before starting any assignment, I figure out the best way to do it”, “I stop from time to time to think about what I am learning”, and “If an assignment is giving me trouble, I change the way I get it done.” The scale displayed adequate Cronbach alpha reliability ($\alpha = .85$).

Results

Descriptive statistics

As an initial step to the analyses, mean, standard deviation, skewness, and kurtosis were computed for the three study variables, as seen in Table 1. The means were calculated based on a Likert scale of 1 to 5. Each mean was within the range of 3-4 (Neutral to Agree) on the Likert-styled response scale. The standard deviations were all within .5 to 1. Skewness and kurtosis values fell between -1 and 1, suggesting that the distribution was normal and that over half the data fell within one standard deviation of the mean.

Table 1. Mean, Standard Deviation, Skewness, and Kurtosis

Measure	Mean	SD	Skewness	Kurtosis	α
Self-efficacy for Self-regulated learning	3.83	.63	-.17	-.70	.84
Growth Mindset	3.61	.99	-.51	-.42	.91
Metacognitive Learning Strategies	3.59	.56	-.25	.85	.85

Bivariate Correlations

Bivariate correlations were calculated among the three study variables. The relationships between self-efficacy for self-regulated learning and growth mindset were considered small ($r = .27$). The relationships between growth mindset and metacognitive learning strategies were

considered non- significant ($r = .15$). The relationship between self-efficacy for self-regulated learning and metacognitive learning strategies was considered moderate ($r = .55$). These results indicated positive relationships between self-efficacy for self-regulated learning and metacognitive learning strategies as well as self-efficacy for self-regulated learning and growth mindset. However, these positive relationships do not necessarily indicate predictive behaviors. These findings indicate that students who reported higher levels of self-efficacy for self-regulated learning were more likely to report higher use of metacognitive learning strategies. Similarly, students who reported higher levels of growth mindset were more likely to report higher levels of self-efficacy for self regulated learning, although this connection was not as strong. On the other hand, there was no relationship between the reported levels for growth mindset and use of metacognitive learning strategies.

Table 2. Bivariate Correlations

	1	2	3
Self-efficacy for SRL	--		
Growth Mindset	.27**	--	
Metacognitive Learning Strategies	.55*	.15	--

* $p < .05$, ** $p < .01$

Regressions

A linear regression was calculated to predict metacognitive learning strategies based on mindset and self-efficacy. The findings suggested that self-efficacy for self-regulated learning positively predicted metacognitive learning strategies. A significant regression equation was found ($F(2, 115) = 25.654, p < .000$), with an R^2 of .29. However, growth mindset was not significantly predictive of metacognitive learning strategies. This indicates that metacognitive learning strategies behaviors are more likely to be reported used by students who have a higher self-efficacy for self-regulated learning.

Table 3. Results of Regression Analysis Predicting Metacognitive Learning Strategies

	<i>B</i>	<i>SE B</i>	<i>b</i>	<i>t</i>	<i>p</i>
Self-efficacy for SRL	.50	.07	.56	6.90	.00
Growth mindset	.00	.05	.00	.02	.98

Discussion

At the start of the study, two questions were posed. I looked at the extent to which growth mindset predicted metacognitive strategies, hypothesizing that the adaptive motivational beliefs that support growth mindset would predict students' metacognitive learning strategies. My second question hypothesized that self-efficacy for self-regulated learning would also have a link to metacognitive learning strategies.

Findings suggested that self-efficacy for self-regulated learning and metacognitive learning strategies were positively correlated. Therefore, this supported my second hypothesis. One reason I believe the hypothesis was supported is because students who use metacognitive learning strategies are self-regulated learners. Previous research suggested that self-regulated learners have higher self-efficacy (Usher, 2008; Joo et al, 2000). Additionally, it has been hypothesized that self-efficacy is a precursor to self-regulation (Bandura, 1989). Therefore, because metacognitive learning strategies are one process of self-regulated learning, high self-efficacy is also connected to metacognitive learning strategies. This confirms prior findings that suggest a link does exist between self-efficacy for self-regulated learning and self-regulated learning (Usher, 2008; Joo et al 2000).

The hypothesis could be supported due to the fact that metacognitive learning strategies are used by students who are self-regulated learners. Thus, it is logical that those who would have high self-efficacy for self-regulated learning are more likely to implement metacognitive learning strategies in their studies.

The analysis also suggested that growth mindset and metacognitive learning strategies were not strongly related and therefore did not support my hypothesis. This could be for two reasons. First, this could potentially indicate that metacognitive learning strategies and growth mindset do not have a relationship, despite their similar links to academic achievement (Cook, 2013; Ziegler & Stoeger, 2010), and mastery goals (Pintrich, 1999; Wolters, Yu, & Pintrich, 1996; Dinger & Dickhauser, 2013). Additionally, demographics could indicate the importance of breaking down mindset studies into groups of different types of students. A 2018 meta-analysis found that there were significant differences in the link between improved ability and growth mindset when different groups were compared (Sisk & Burgoyne 2018). Students considered gifted did not have any improvement in academic achievement after various growth mindset interventions, while students considered at risk had the most significant improvement in academic achievement after a growth mindset intervention. This analysis signifies the importance of breaking down data into demographics to understand how to best serve different populations of students.

Because growth mindset was not found to be predictive of metacognitive learning strategies, educators should know that fostering a growth mindset in students will not lead to increased use of metacognitive learning strategies. Rather, educators who want to encourage students to use metacognitive learning strategies should focus on encouraging student self-efficacy for self-regulated learning, rather than fostering growth mindset within students.

Limitations. These findings should be considered with an understanding of a few limitations. Since students self-enrolled in the course in which the study was conducted, there was little control over the demographics of the sample. This study was not entirely representative of an undergraduate population at the university the study took place. Therefore, more research

should be conducted that is representative of all populations, including race and ethnicity, age, status as a first-generation college student, and gender. Additionally, the course is a learning to learn course; the course self-selects for students who may be more motivated to strengthen their work habits compared to an average college student. Students who enroll in this course are signing up to learn more about what they can do to develop their study skills. This attracts students who are motivated to improve in school.

Additionally, the data were self-reported. Analyzing data based on student behavior rather than student perception of action may yield different results. This is particularly important in the case of metacognitive learning strategies, as it is a behavior, rather than a belief. Students may believe they are using one strategy when in reality they are using it poorly or not using it at all. Therefore, it may be better to measure metacognitive learning strategies in another manner. Further, since this is a self-reported survey, students who were more likely to have higher self-efficacy for their self-regulated learning were more likely to report metacognitive learning strategies that they used. Since the data were self-reported, rather than observed, students' perception of their metacognitive learning strategy use was collected, rather than their actual implementation of these strategies.

Finally, the survey assessed students' general beliefs rather than assessing the beliefs and strategies for one specific course. Student's self-efficacy and study strategies may change depending on the course. However, the survey asked students to think about their beliefs and strategies generally. Asking students to think about beliefs and strategies for a specific class may yield different results.

Future Directions. Researchers should continue to assess the link between self-efficacy and metacognitive learning strategies. One area that should be investigated is gender. Pajares

(2002) found that gender affects students' self-efficacy for self-regulated learning and Zimmerman and Martinez-Pons (1990) found that girls in both elementary and secondary grades displayed a higher use of goal-setting and planning strategies in addition to more self-monitoring. Therefore, future researchers should make effort to study the beliefs and strategies of male and female students separately in order to further identify potential differences in metacognition and beliefs. Separating the data into groups based on gender may yield different results than analyzing the data set as a whole.

This study also suggests that an intervention for students with low self-efficacy for self-regulated learning might increase their metacognitive learning strategies. Studying how interventions that focus on self-efficacy for self-regulated learning affect metacognitive learning strategies will further explore the relationship between students' beliefs and strategies. This study would contribute to whether or not educators should foster self-efficacy for self-regulated learning in the classroom.

Conclusion

It is important to understand how the beliefs that students hold impact their learning strategies. In this study, I examined the links between self-efficacy for self-regulated learning, mindset, and metacognitive learning strategies. Findings suggested that self-efficacy for self-regulated learning and metacognitive learning strategies had the strongest relationship. This highlights the importance of a student's belief in their ability to engage in the processes of metacognitive learning strategies. Better understanding the connections between the beliefs students hold and the strategies they implement can help educators better support their students by fostering specific beliefs in the classroom.

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