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Research Paper

The relationship between goals, metacognition, and academic success

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Contextualisation

This study builds on existing research in the educational psychology domain that focuses on how students learn with a view to improve learning tactics for students and encourage effective teaching practices by teachers. This study examines the relationship between three variables – achievement goal orientation that orient students towards a focus on mastering information or performing well, metacognition which is the learner's monitoring of how well he or she is learning, and academic success which is reflected in class grades accumulated over the college tenure. These variables have been studied with elementary and secondary school students but not college students. College students are a different group from elementary and secondary students and may have different learning patterns that are based on their goals to finish college or acquire skills for a job. The learning variables used in this study have not been studied in this combination. Both reasons provide support for conducting this study. Relationships between these variables have implications for student learning, and can help students become better learners and apply their knowledge to academic and non-academic settings. Findings may also help structure teacher training and course material.

Abstract *This study examined the relationship between mastery goals, performance goals, metacognition, and academic success. Regression analyses revealed a partial mediation effect in the relationship between mastery goals and academic performance. Performance goals were unrelated to academic performance. This study supports research findings suggesting that students with mastery goals reap the rewards of academic success.*

Introduction

Researchers in the field of educational psychology have investigated a number of variables in their relationship to academic performance. Two variables that have been of particular interest to researchers are achievement goals and metacognition. The present study seeks to examine achievement goals and metacognition in relation to academic success. Academic success in this research refers to academic performance which is assessed in the United States by Grade Point Average (GPA). GPA is cumulated across academic subject areas and over semesters, and thereby provides a fairly robust measure of success in university.

The first variable in this study is achievement goals. Whenever students are in learning environments, they are believed to have certain goals towards learning, referred to as achievement goals. Achievement goals are the types of outcomes students pursue in learning environments (Dweck, 1989). There are two main types of achievement goals: mastery goals and performance goals (Dweck and Leggett, 1988). Mastery goals orient students to a focus on learning and mastery of content, and have been linked to adaptive outcomes such as strong self-efficacy, good metacognition, and good performance. People with mastery goals seek challenging tasks and strive under difficult situations. When faced

with failure, they respond with 'solution-oriented instructions, as well as sustained or increased positive affect and sustained or improved performance' (Elliot and Dweck, 1988, p 5).

Performance goals encourage students to focus on scoring better than others or avoiding the appearance of incompetence (Dweck and Leggett). People with performance goals strive to demonstrate ability and avoid negative judgments of competence (Dweck and Leggett, 1988; Elliot and Dweck, 1988). They evade challenges and obstacles, and prefer simple tasks where success is guaranteed. When confronted with challenging tasks, they may react in a number of ways: withdraw due to the risk of failure, demonstrate negative affect, make negative ability attributions, and report decreased interest in the task. Research suggests that goal orientations may exist independently of each other, allowing students to adopt multiple goals simultaneously, such as an orientation towards mastery of information as well as striving to perform well on a test (Pintrich and Garcia, 1991; Meece and Holt, 1993; Nolen, 1988). Students may adopt only one goal, or both goals with one being a primary goal and the other being a secondary goal.

The second variable in this study is metacognition. Metacognition refers to awareness and monitoring of one's thoughts and task performance, or more simply, thinking about your thinking (Flavell, 1979). It refers to higher-order mental processes involved in learning such as making plans for learning, using appropriate skills and strategies to solve a problem, making estimates of performance, and calibrating the extent of learning (Dunslosky and Thiede, 1998). Metacognition is comprised of two major components: metacognitive knowledge and metacognitive regulation (Schraw and Moshman, 1995). Metacognitive knowledge refers to knowledge of cognition such as knowledge of skills and strategies that work best for the learner, and how and when to use such skills and strategies. Metacognitive regulation refers to activities that control one's thinking and learning such as planning, monitoring comprehension, and evaluation (Artzt and Armour-Thomas, 1992; Baker, 1989; Schraw and Dennison, 1994).

Metacognition is important in learning and is a strong predictor of academic success (Dunning, Johnson, Ehrlinger and Kruger, 2003; Kruger and Dunning, 1999). Students with good metacognition demonstrate good academic performance compared to students with poor metacognition. Students with poor metacognition may benefit from metacognitive training to improve their metacognition and academic performance. Individual differences exist in metacognition and people with poor metacognition are deemed "incompetent" as they perform inadequately relative to their peers (Kruger and Dunning, 1999). Metacognition enables students to be strategic in their learning by, for instance, learning new information rather than focusing on studying information already learned (Everson and Tobias, 1998).

While a positive relationship between mastery goals and metacognition has been widely established (Ames and Archer, 1988; Dweck and Legett, 1988), the relationship between metacognition and performance goals is less clear. Some studies cite a weak positive relationship between metacognition and performance goals (e.g., Ames and Archer; Butler, 1993) whereas other studies report a negative relationship (Wolters, 1998) or no relationship (Ford, Smith, Weissbein, Gully, and Salas, 1998). Mastery goals also show a strong relationship to performance compared to performance goals (Button, Mathieu, and Zajac, 1996). However, some researchers report no relationship between performance goals and performance (Butler, 1993; Button, Mathieu, and Zajac, 1996) and others suggest a positive relationship (Elliot and Church, 1997; Middleton and Midgley, 1997).

The present study examines the relationship between achievement goals, metacognition, and academic success and is based on the hypothesis that the relationship between goals and academic success is fully mediated by metacognition (see Figure 1 for the mediation).

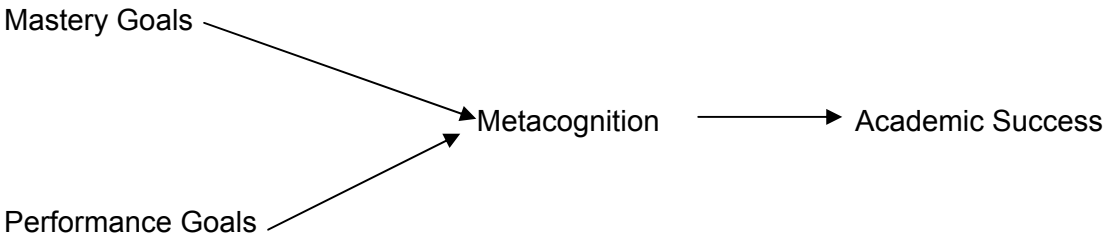

Figure 1. Relationship between achievement goals, metacognition, and academic success

This means that mastery goals and performance goals are related to academic success but only through metacognition. Thereby, students with mastery goals are predicted to have good metacognition, and this leads to academic success. Similarly, students with performance goals are expected to have poor metacognition, which translates to poor academic results. The present study also examines whether metacognition, and mastery and performance goals are predictors of academic success. If mastery or performance goals are significant predictors of academic success, this would mean that educators could infer academic success of students not yet enrolled in university based on their mastery and performance goals and metacognition.

This area of research was selected because it has not been investigated before and so contributes to the existing wealth of knowledge on achievement goals and metacognition in relation to academic success. Achievement goals are typically assessed using a sample of students in elementary and secondary schools and not students in universities. Therefore, another reason for this investigation was to contribute to existing educational psychology research on university students and allows for comparisons between elementary and secondary students and university students. This area of research is also important because relationships between achievement goals, metacognition, and performance could be used to support training programs to teach students metacognitive skills and strategies and the importance of achievement goals. Results could also be used to alter teaching techniques in universities to meet learning needs of students.

Method

Participants

Participants were 179 undergraduates (87 women, 92 men) at a Midwestern university. Students participated in this experiment to fulfil class requirements. Ages ranged from 18 years to 40 years (M = 20.84, SD = 2.38).

Procedure

This study employed survey methodology. Participants were informed that the purpose of the experiment was to understand the learning process. Participants completed a survey comprising a goal orientation scale, a metacognition measure, and a demographics sheet that also asked for their college GPA and the scale of the GPA since GPA can be measured on different scales. There was no experimental manipulation of participants and participants were not divided into groups. All participants completed the same survey.

Materials

The survey comprised three sections. The first section was the 25-item Goals Inventory (Roedel, Schraw and Plake, 1994). This instrument comprises 12 items assessing mastery goals and five items assessing performance goals. Students responded to each item on a 7-point scale ranging from *strongly disagree* (1) to *strongly agree* (7). This scale was selected because it has been used widely in the literature to assess mastery and performance goals and has been shown to have good reliability and validity for assessing goals. It has been developed for use by students in schools and universities. See Appendix A for the instrument.

The second section was the 52-item Metacognitive Awareness Inventory (MAI; Schraw and Dennison, 1994). This is a long, comprehensive scale assessing various facets of metacognition. It has good reliability and validity for metacognition assessment. It effectively covers various aspects of metacognition in-depth and can also be used to obtain scores for individual areas of metacognition, such as monitoring, planning, comprehension, and so on. See Appendix B for the scale. Participants responded to each item on a 7-point scale ranging from *strongly disagree* (1) to *strongly agree* (7). The third section was a demographics and performance measure where students provided demographic information of age, gender, ethnicity, and year in school as well as their college GPA and the scale for the GPA from memory.

Results

Table 1 presents descriptive statistics for the variables. Descriptive statistics are the first step in any quantitative analysis as they provide information on the distribution of scores, average scores (i.e., mean scores), and help to identify any anomalies in the data. The data in this study was normally distributed and had no problems with skewness (scores clumping towards one end of the scale) or kurtosis (scores gathering in the middle of the scale).

Table 1. Mean, Standard Deviations, Minimum, Maximum, and Reliabilities

	Mean	Std. Dev	Min	Max
Mastery Goals	60.59	11.46	18	84
Performance Goals	22.59	6.72	5	35
Metacognition	254.42	40.5	92	343
College GPA	2.83	.61	1	4

Note. N = 179

Next, correlations were computed between mastery goals, performance goals, metacognition, and performance. Correlations show the extent to which one set of scores change with another set of scores. Positive correlations indicate that two sets of scores increase together or decrease together. Negative or inverse correlations suggest that as one set of scores increase, the other set of scores decrease. In this study, mastery and performance goals correlated weakly together (r = .24, p = .01) suggesting that mastery and performance goals are somewhat independent of each other and students high in mastery goals are not likely to be high or low in performance goals. Mastery goals correlated strongly with metacognition (r = .73, p = .01) compared to performance goals (r = .26, p = .01). This indicates that as students with good metacognition also have strong mastery goals whereas students with performance goals may or may not have good metacognition (i.e., there is no strong relationship between performance goals and metacognition). Mastery goals had a modest correlation with GPA (r = .29, p = .01) whereas performance goals did not correlate significantly with GPA (r = .10, p = .19). This means that to a weak extent, students with strong mastery goals also have good GPAs whereas we cannot infer anything about GPAs

from students with strong or weak performance goals. Finally, metacognition had a weak correlation with GPA (r = .21, p = .01) suggesting that it is difficult to say whether students with good or poor metacognition have good GPAs.

The next analysis conducted was a regression analysis. Regression analyses typically follow significant correlations and are used to determine the extent to which GPA can be predicted from mastery goals, performance goals, and metacognition. The utility of regression lies in its future use. For example, if metacognition is a strong predictor of GPA, then we can typically predict GPAs of students who complete the same metacognition scale before they enter university, assuming that metacognition remains stable. Regression is also used to examine mediation where one variable has an influence on another variable through a mediating variable.

Regression analyses examined mediation effects of metacognition in the relationship between goals and performance. The first set of mediation analyses was run for mastery goals. Mastery goals were positively related to GPA, $F(1, 172) = 15.96$, $p = .001$, $\beta = .29$. Mastery goals were positively related to metacognition, $F(1, 178) = 197.05$, $p = .001$, $\beta = .73$. Metacognition was a predictor of GPA, $F(1, 172) = 8.16$, $p = .001$, $\beta = .21$. The direct relationship between mastery goals and GPA was still significant with metacognition in the equation, $F(2, 172) = .7.9$, $p = .01$, $\beta = .20$, suggesting a partially mediated model. Performance goals were unrelated to GPA, $F(1, 172) = 1.80$, $p = .18$, $\beta = .10$, and so there was no mediation. This means that mastery goals influence performance directly as well as indirectly through metacognition which supports a partially mediated model for mastery goals rather than a fully mediated model. However, performance goals do not influence performance directly or through metacognition (see Figure 2).

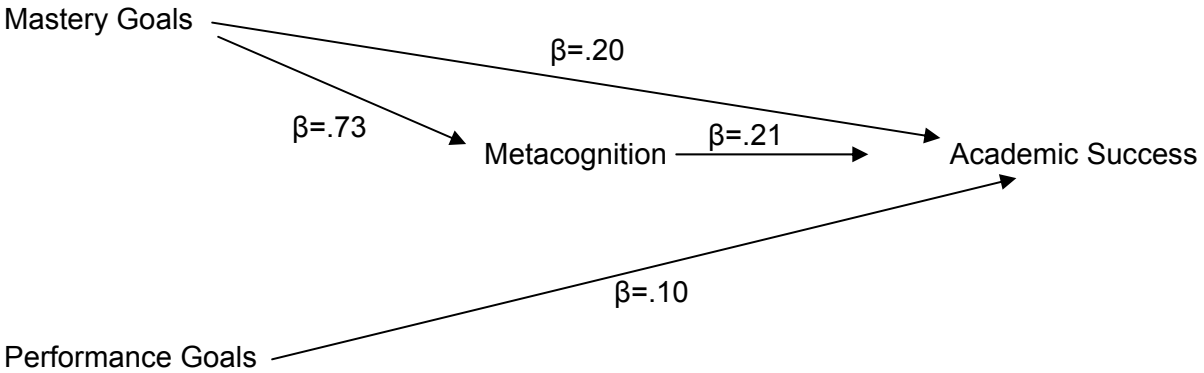

Figure 2. Relationship between mastery and performance goals, metacognition, and academic success.

Discussion

The present study examined the relationship between goals, metacognition, and GPA. Previous research has shown conflicting information on the relationship between performance goals and academic performance as some research suggests no relationship between performance goals and performance (Butler, 1993; Button, Mathieu, and Zajac, 1996) whereas other research suggests that students with performance goals who orient themselves to doing well can perform well (Elliot and Church, 1997; Middleton and Midgley, 1997). Findings of this study support the former research findings of performance goals having no relationship with GPA.

Mastery goals predictor GPA and metacognition

Students with mastery goals are more likely to have good metacognition, and thereby, be better learners than students with performance goals. Students with performance goals may not enjoy the fruit of academic success even though they strive to perform well. Students should be encouraged to adopt a mastery approach to learning. Students who tend to be driven by performance goals may benefit from training related to mastery goals and metacognition.

One drawback to consider is the survey nature of the study. Participants reported their perceived goals and metacognition, and not their actual goals or metacognition, which may be different. Participants also reported their GPA and so GPA cannot be verified. Participants may have reported inflated or inaccurate GPAs. Another drawback of the study is the use of GPA which is a measure of academic success and not necessarily a measure of learning. GPA measures performance in classes rather than the extent of learning. Therefore, conducting a similar study with learning measures rather than GPA (which is a performance measure) may be insightful.

Another limitation of this study is the use of survey methodology which makes it difficult to asses cause and relationship. It is difficult to say whether mastery goals caused good GPAs or if good GPAs over a few semesters encouraged the use of mastery goals. Causal relationship such as these can be investigated in experimental settings where students are taught mastery goals or metacognition to see if this increases their GPA and this could be a direction for future research. Participant characteristics (primarily 18-year olds in their first year of university) are another drawback which limits the findings of this study to university students in the Midwest region of the United States. Participants had to complete the survey to fulfil class requirements and so this study uses a convenience sample rather than a truly random sample. Different findings may be seen with students in other countries with non-Western cultures that encourage either mastery or performance goals or participants who are adult learners. Finally, students in classes may have performance goals since they have to do well to pass their classes. These students may strategically use performance goals to meet performance needs whereas they may use mastery goals in settings where the outcome is learning and not good GPAs. Future research could examine environments where performance plays less of a role and more emphasis is placed on learning and applying learned information.

Conclusion

The present study examined the relationship between achievement goals, metacognition, and academic success. Participants completed a survey reporting their use of achievement goals, metacognition, and GPAs.

Results showed that mastery goals were related to GPA performance whereas performance goals were unrelated to GPA performance. This suggests that students with the intent to deeply comprehend information tend to be successful in their academic performance. Students who seek to simply perform well on a test without understanding the information do not necessarily have good performance. Metacognition is also related to academic success and students with good metacognition have good GPAs. Mastery goals influence GPAs through metacognition as students with mastery goals may have superior metacognitive skills and strategies that they use to mastery information; the use of superior metacognition eventually leads to enhanced GPA.

Findings from this research may support training programs instructing students on how to adopt effective metacognitive skills and strategies and learn how to master information instead of simply seeking to perform well. These research findings may also encourage

teaching techniques that present information to students in a way that encourages the use of mastery goals and metacognitive strategies. In conclusion, the present study supports the utilization of mastery goals and metacognition in generating academic success rewards.

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Appendix A

Mastery Goal Items

1. I enjoy challenging school assignments.
2. I persevere even when I am frustrated by a task.
3. I try even harder when I fail at something.
4. I adapt well to changing situations.
5. I work hard even when I don't like a class.
6. I am very determined to reach my goals.
7. Personal mastery of a subject is very important to me.
8. I work very hard to improve myself.
9. I am naturally motivated to learn.
10. I prefer challenging tasks even if I don't do well at them.
11. I feel most satisfied when I work hard to achieve something.
12. I give up too easily when faced with a difficult task.

Performance Goals Items

13. It is important to me to get better grades than my classmates.
14. I like others to think I know a lot.
15. It bothers me the whole day when I make a big mistake.
16. I feel angry when I do not do as well as others.
17. It is important to me to always do better than others.

Appendix B

Metacognitive Awareness Inventory

1. I ask myself periodically if I am meeting my goals.
2. I consider several alternatives to a problem before I answer.
3. I try to use strategies that have worked in the past.
4. I pace myself while learning in order to have enough time.
5. I understand my intellectual strengths and weaknesses.
6. I think about what I really need to learn before I begin a task.
7. I know how well I did once I finish a test.
8. I set specific goals before I begin a task.
9. I slow down when I encounter important information.
10. I know what kind of information is most important to learn.
11. I ask myself if I have considered all options when solving a problem.
12. I am good at organizing information.
13. I consciously focus my attention on important information.
14. I have a specific purpose for each strategy I use.
15. I learn best when I know something about the topic.
16. I know what the teacher expects me to learn.
17. I am good at remembering information.
18. I use different learning strategies depending on the situation.
19. I ask myself if there was an easier way to do things after I finish a task.
20. I have control over how well I learn.
21. I periodically review to help me understand important relationships.
22. I ask myself question about the material before I begin.
23. I think of several ways to solve a problem and chose the best one.
24. I summarize what I have learned after I finish.
25. I ask others for help when I don't understand something.
26. I can motivate myself to learn when I need to.
27. I am aware of what strategies I use when I study.
28. I find myself analyzing the usefulness of strategies while I study.
29. I use my intellectual strengths to compensate for my weaknesses.
30. I focus on the meaning and significance of new information.
31. I create my own examples to make information more meaningful.
32. I am a good judge of how well I understand something.
33. I find myself using helpful learning strategies automatically.
34. I find myself pausing regularly to check my comprehension.
35. I know when each strategy I use will be most effective.
36. I ask myself how well I accomplished my goals once I've finished.
37. I draw pictures or diagrams to help me understand while learning.
38. I ask myself if I have considered all options after I solve a problem.
39. I try to translate new information into my own words.
40. I change strategies when I fail to understand.
41. I use the organizational structure of the text to help me learn.
42. I read instructions carefully before I begin a task.
43. I ask myself if what I am reading is related to what I already know.
44. I reevaluate my assumptions when I get confused.
45. I organize my time best to accomplish my goals.
46. I learn more when I am interested in the topic.
47. I try to break studying down into smaller steps.
48. I focus on overall meaning rather than specifics.
49. I ask myself questions about how well I am doing while I am learning something new.
50. I ask myself if I learned as much as I could have once I finished a task.
51. I stop and go back over new information that is not clear.
52. I stop and reread when I get confused.