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ABSTRACT

This study examined individual differences in the ways students responded to a self-regulation learning training. It was predicted that students' motivational beliefs would be associated with at-risk college students' use of self-regulated learning strategies, homework completion, and academic performance. Participants were 58 college students in an introductory mathematics course. A path analysis revealed that: (1) motivational beliefs play a significant causal role in college students' homework completion, self-regulatory processes, and academic success; (2) these associations are mediated by students' use of self-regulation, delay of gratification, and homework completion; and (3) students who engage in self-regulation are better able to delay personal rewards and complete their homework more frequently. The paper also discusses implications for instruction. (Contains 2 tables, 3 figures, and 19 references.) (Author/SLD)

Running head: SELF-REGULATION AND ACADEMIC ACHIEVEMENT

The Relation of Motivational Beliefs and Self-Regulatory Processes to Homework Completion and Academic Achievement

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Abstract

In this study, we examined the individual differences in the ways students responded to a self-regulation learning training. We predicted that students' motivational beliefs would be associated with at-risk college students' use of self-regulated learning strategies, homework completion, and academic performance. A path analysis revealed that a) motivational beliefs play a significant causal role in college students' homework completion, self-regulatory processes, and academic success, b) these associations are mediated by students' use of self-regulation, delay of gratification, and homework completion, and c) students who engage in self-regulation are better able to delay personal rewards and complete their homework more frequently. Implications for instruction are also discussed.

The Relation of Motivational Beliefs and Self-Regulatory Processes to Homework Completion and Academic Achievement

An extensive body of research indicates that effective learners display high level of self-regulation (Schunk & Zimmerman, 1994, 1997, 1998; Zimmerman, 1998a, 1998b, 2000). However, the direct and indirect effects of students' motivational beliefs on their willingness to delay gratification, use of self-regulated learning strategies, homework completion, and academic performance among at-risk college students is not well understood by researchers, theorists, and educators. *Academic self-regulation* refers to the processes by which learners maintain cognition, affect, and behavior in order to achieve personal goals (Zimmerman, 2000).

Understanding the learning processes of at-risk college students from a self-regulated perspective is important because it would entail consideration about the students' beliefs toward learning, their consideration of future consequences, their use of self-regulation and strategy use, and their willingness to delay gratification when non-academic tasks call for attention. Further, it is important to examine the association between students' use of self-regulation, homework completion, and how they related to their academic achievement. It is important to investigate these associations among at-risk college students because they lack the necessary skill to sustain effort and motivation during long-term tasks and they lack the skills to engage actively and proactively in their own educational processes. At-risk college students tend to give up when competing non-academic tasks demand for attention. They also tend to have low confidence about their capability to stay task-focused. As a consequence, at-risk students tend to drop out of school, often do not complete their college degree, and their academic performance is considered below the level of the expectations.

The purpose of this paper is to report the results of a 15-weeks intervention program designed to enhance the self-regulatory learning skills of at-risk urban minority college students enrolled in a math course. Prior research (Campillo & Pool, 1999; Campillo, Zimmerman, & Hudesman, 1999; Hanlon & Schneider, 1999) has shown that similar students were highly deficient in areas of self-regulated learning such as time management, study strategies, self-monitoring, and self-evaluation. Specifically, we will a) discuss theoretical views associated with self-regulation, b) present an overview of the self-regulated intervention program, c) discuss the method of data collection and major findings, d) draw implications for education, and e) offer suggestions for future research.

Zimmerman's Cyclical Model of Self-Regulation

Prior research has shown that students' motivational beliefs influence their use of learning strategies, and that these motivational beliefs and use of learning strategies are in turn related to students' academic achievement (Schunk & Zimmerman, 1994, 1997, 1998; Zimmerman, 1998a, 1998b, 2000). The associations between learners' self-efficacy beliefs, intrinsic motivation, outcome expectancy, delay of gratification, homework completion, and academic achievement are supported by the social cognitive theory, which maintains that there is an interaction among the person, the environment, and the behavior (Bandura, 1997, Zimmerman, 2000).

Zimmerman (1998a, 1998b, 2000) proposed a *cyclical self-regulation model* in which learners set goals, monitoring their progress, and reflect about their performance interactively. Cyclical feedback from prior performance is used to make personal, behavioral, and environmental adjustments using feedback loops. It is cyclical because information from one phase can be used in the next phase (Zimmerman, 2000).

Zimmerman's model suggests that learning is maintained through a cycle of self-regulatory processes that must be monitored during task performance.

According to Zimmerman (2000), self-regulation involves three-phases. The *forethought phases* (pre-performance) includes processes that set the stage for action. The forethought phase includes goal setting, strategic planning, self-efficacy beliefs, and intrinsic interest. The *performance phase* (during performance) includes the processes that affect attention and action. The performance phase includes attention focusing, self-instruction, and self-monitoring. The *self-reflection phase* (post-performance) includes learners' responses to their efforts (see Figure 1). Examples of the self-reflection phase are self-evaluation, attributions, self-reactions, and adaptation.

Self-efficacy

Self-efficacy refers to one's beliefs in his/her capability to perform at a designated level (Bandura, 1997). For example, learners who engage in homework must believe that they can do and have the competence to do the specific homework tasks. A high self-efficacy belief is associated with selection of task, persistence, and use of learning strategies (Zimmerman, 2000). Learners engage in task for which they believe they can succeed. Self-efficacy is associated with the amount of time learners are on task and the effort they place on those tasks. High degree of self-efficacy is associated with high academic performance, use of self-regulatory strategies, and delay of gratification (Bembenutty & Karabenick, 1998).

According to Zimmerman (1995), self-efficacy involves four distinctive characteristics. First, self-efficacy involves self-judgments about one's capability to performance activities, rather than beliefs about general personal qualities, such as one's psychological trait. Second, it is multidimensional rather than a single disposition; it is

likened to different domains of functioning. Third, it is context-dependent because many non-ability influences can interfere or enhance the skills. Fourth, self-efficacy depends on mastery criterion of success rather than a normative. Further, self-efficacy is assessed before students are asked to perform and as a consequence self-efficacy plays a causal role in relation to academic performance. Given the importance of self-efficacy for task completion, this construct was included in this study to examine its effects on homework, self-regulation, and academic achievement.

Outcome Expectancy

Outcome expectancy refers to an individual's belief that his/her actions would attain expected outcomes (Bandura, 1997). Outcome expectancy determines motivation and is associated with the level of self-regulation and academic performance (Shell, Colvin, & Bruning, (1995). Outcome expectancy is particularly associated with achievement among low achievers, perhaps because high achievers often engage in a task for its own sake rather than for achieving other ends, a connotation that is implied in the utility value associated with outcome expectancy (Shell, Colvin, & Bruning, 1995). That is, learners' beliefs that the consequences that they expected to receive for their actions will influence their behavior. According to Bandura (1997), this expectations will determine actions and behavior. This is important for homework completion because if the students do not believe that the consequence of engaging in a task will not secure the expected outcomes, then they will not initiate actions. These outcome expectation beliefs are hypothesized to influence student' use of learning strategies and delay of gratification.

Intrinsic Interest

Intrinsic interest is another construct that Zimmerman (2000) included in the forethought phase of self-regulation that influences students' use of learning strategy. *Intrinsic interest* refers to one's engagement in a task for the sake of learning and mastering the task. In the present study, it was expected that intrinsic motivation would have a direct effect on students' use of learning strategies and performance. That is, students with high intrinsic motivation would persist longer in homework and would obtain higher grade than students with a low intrinsic motivation

Academic Delay of Gratification

Delay of gratification has received very little attention in academic learning settings to date and is absent in the homework literature. *Academic delay of gratification* refers to one's intentions to postpone immediately available rewards to gain temporarily distant academic goals or rewards. Students' ability to delay non-academic sources of gratification until academic goals are attained is expected to influence their academic achievement and homework completion. To remain task-focused, students often have to maintain academic goals in spite of attractive non-academic sources of gratification that could preclude them from achieving high academic outcomes. Choosing to enact long-term academic intentions requires the ability to forego immediate impulses and to delay gratification for the sake of long-term valuable outcomes (Bembenutty & Karabenick, 1998).

Mischel and his associates (Mischel, 1996, Mischel, Canton, & Feldman, 1996) have developed a paradigm in which children are asked to choose between a less valuable immediately available reward and a larger reward, which is temporarily distant. The researchers found an association between children's willingness to wait for a larger but

temporarily distant reward and their intelligent level, ability to resist temptation, social responsibility, and achievement. About 12 years later, in a longitudinal study, the researchers found an association between children's choice to exercise self-control, their use of strategies to avoid temptation, and their academic and social competence level while they were adolescents (Mischel, Shoda, & Peake, 1988; Mischel, 1996). According to Mischel (1996), the ability to delay of gratification is determined by individuals' expectancies for rewards, self-efficacy level, and the subjective value of the rewards. He argued that in order to wait for the delayed rewards, the individuals must feel self-efficacious about their capacity and competence to obtain the later outcomes. Otherwise, without self-efficacy, the individuals would not persist in a goal-directed behavior, and therefore, would not voluntarily postpone gratification. In other words, the ability to delay gratification would mediate the relationship between individuals' self-efficacy beliefs and their goal-directed behavior toward a temporarily distant outcome.

In summary, Zimmerman's (2000) cyclical phases explain students' learning processes. For example, self-efficacy, intrinsic interest, and outcome expectancy are important motivational beliefs that affect all phases of self-regulation (Zimmerman, 2000) and therefore homework activity and academic performance. As learners engage in the homework, they use self-regulatory strategies, and during self-reflection phase, they will evaluate their learning progress toward homework completion (Zimmerman, 2000). From the social cognitive theory (Bandura, 1997), delay of gratification is hypothesized to be a component of self-regulation that influence learning and is determined by learners' self-efficacy beliefs (forethought phase). Thus, delay of gratification would have a direct effect on students' use of self-regulation and academic performance.

A Self-Regulation of Learning Intervention Program

The goal of this self-regulation of learning intervention program is to help at-risk college students to be self-proactive, to develop learning strategies, to enhance their motivation for learning, and to self-monitor their learning processes. Most of these students are at-risk of failing college. Most of these students are minority students from an urban city, are the first generation in their family to attend college, and receive financial aid.

The self-regulated leaning project has been in place during the last six years following the social cognitive approach (Zimmerman, 1998a) and it successfully has demonstrated that students who self-generate thoughts, feelings, and actions that are directed toward enacting academic goals are those who consistently improve their academic performance and master their learning tasks. However, while the project is effective, there are individual differences in achievement and performance among the participants. There are large individual differences in the way students respond to the training.

Research Objective

Thus, the present study seeks to examine the effect of motivational beliefs (i.e., self-efficacy, outcome expectancy, and intrinsic interest) on students' self-regulation of learning, homework completion, willingness to delay gratification, and academic performance. In the present study, it was expected that students' motivational beliefs would have an effect on the students' use of self-regulated learning strategies, homework completion, and academic performance. We also expected that the effects of motivational beliefs on academic-related outcomes

(i.e., midterm grade and final course grade) would be mediated by students' use of self-regulation, delay of gratification, and homework completion (see Figure 2).

Method

Participants

Participants were college students ($N = 58$) enrolled in an introductory math course (Math 175) at a small, public technical college in New York City. Forty-two of the students were males and 16 were females. Forty-four of the students reported that they were more comfortable speaking English while the other students are more comfortable speaking other languages such as Spanish and Creole. Most of the students identify themselves as members of a minority ethnic group such as African American, Hispanics, or Asian. Almost half of the students reported that they were employed, some of them for just few hours per week and others for up to 35 hours per week. The average age of the participants is 18 years old ($SD = 1.69$).

Measures

Delay of Gratification. A ten-item scale was developed for this study. The scale examines students' delay of gratification in relation to the math course and midterm preparation in which they were currently enrolled. The students rated their preference for an immediately available attractive option versus a delayed alternative, such as "Go to your favorite movies and then cram for the math midterm exam," versus, "Postpone going to the movies until after you have taken the math midterm exam." Students responded on a four-point scale: Definitely choose A, Probably choose A, Probably choose B, and Definitely choose B. Responses were coded and averaged, and a higher total score indicates greater

delay of gratification (range 1 to 4). As Table 1 shows, the scale has an internal consistency Cronbach $\alpha = .84$ and an average item score of 3.24 ($SD = .58$).

Self-efficacy. A four-item scale was developed for this study. The students rated their capability to perform in the math course, such as "I am sure that I can learn all the material for the math midterm exam." The scale had an average item score of 5.49 ($SD = .99$) and a Combat $\alpha = .70$.

Outcome Expectancy. A 2-item scale was developed for this study. The students rated their expectations regarding the outcomes of the math course, such as, "Doing well in the math midterm exam will help me to attain my future career goals." The scale had an average item score of 5.95 ($SD = 1.25$) and a Cronbach $\alpha = .70$.

Intrinsic Interest. A 5-item scale was developed scale for this study. The students rated their interest in mathematics, such as "I enjoy solving challenging math problems." The average item score was 3.46 ($SD = 1.46$) and a Cronbach $\alpha = .84$.

Self-regulation. An 11-item scale was developed for this study. The scale assessed students' degree of keeping records, estimation, goal setting, self-rewarding, self-monitoring, selection of strategies, and environmental control. Two examples of the items are: " How often do you keep records about how well you are doing on practice problems in preparation for the math midterm exam?" and "How often do you set specific goals to guide your efforts while doing the practice problems for the math midterm exam? The average item score was 4.42 ($SD = .85$) and the Cronbach α was .78.

Midterm Course Grade. Midterm course grades were obtained from the instructors. The mean of the midterm grade was 67.72 (SD = 21.45) with values ranging from zero (0) to 100.

Final Course Grade. The final course grade was obtained from the instructors. The average final course grade was 1.84 (SD = 1.37) with values ranging from zero (0) to 4.00, which is the equivalent of a letter grade just below "C."

Frequency of Homework Completion. Following Cooper and his associates (Cooper, Jackson, Nye, & Lindsay, 2001; Cooper, Lindsay, Nye, & Greathouse, 1998; Cooper, Valentine, Nye, & Lindsay, 1999), homework completion was assessed by students responding to the following question: "How often do you complete your homework/assignments for the Math 175 course? The response format consisted of a 7-point Likert scale (1 = "Never" to 7 = "Always"). The average item score was 6.03 (SD = 1.28). Cooper and his associates used one item in their path analysis to test the effects of homework on classroom performance.

Procedure

During the fall semester, the students were enrolled in two courses that jointly enhanced students' learning experience. In the Introduction to College Life course, the participants received direct training to develop self-regulatory strategies such as goal setting, planning, self-management, self-monitoring, organization strategies, self-instruction, attention focusing, estimation, and self-evaluation. This instruction applied specifically to math content. In the math course, the students were constantly reminded of the learning strategies and were required to apply those skills to the specific math course. During the math class, the instructors engaged in modeling, where the students

could see not only how the instructors solved or rationalized the math problems, but also how the instructor engaged in estimation of the problems, set goals to solve specific math problems, and evaluated the task completion.

In the math course, the students followed a six-step approach to solve math problems (Hanlon & Schneider, 1999). The six-step approach includes 1) identification of facts, 2) estimation of answers, 3) deciding how to solve the problem, 4) computing the answer, 5) checking the answer, and 6) examining whether the answer is reasonable.

The classes met two times every week and the students were assigned homework every week. For the homework, the students were expected to set goals about when, where, and what they wanted to study and to self-monitor their progress. The students were also required to see a tutor, who was trained in self-regulation techniques. The tutors monitored the students' progress, kept records, checked completion of the academic goals of the students, and served as social models to the students.

Results

Correlations between the Variables

As Table 1 shows, homework completion was positively correlated to self-regulation (r = .58), delay of gratification (r = .44), self-efficacy (r = .45), intrinsic interest (r = .34), midterm (r = .51) and final course grade (r = .52). Delay of gratification was positively correlated to students' homework completion, self-regulation (r = .48), self-efficacy (r = .42), intrinsic interest (r = .31), outcome expectancy (r = .32), midterm (r = .28) and final course grade (r = .29). Self-efficacy was also correlated to homework completion, self-regulation (r = .40), delay of gratification, intrinsic interest (r = .39), midterm (r = .43) and final course

grade(r = .46). The correlation between midterm and final course grade was highly significant, r = .81, p < .001.

Path Analysis

The proposed model was evaluated using LISREL-8 (Jöreskog & Sörbom, 1993). Several path analyses were conducted to examine the direct and indirect effects of the variables. The final model was evaluated after eliminating non-significant paths. Figure 3 presents the significant paths (correlations are in parentheses) resulted from the LISREL analysis. Omnibus fit indexes suggest the adequacy of this solution indicating that the proposed model fits the data well: χ^2 (18, N = 58) = 20.11, p = .33 (Non-Normed Fit Index (NNFI) = .98, Incremental Fit Index (IFI) = .99, Goodness of Fit Index (GFI) = .92, and Comparative Fit Index (CFI) = 99).

The resulting model differs from the proposed model by the absence of a significant path from self-efficacy and outcome expectancy to self-regulation. However, self-efficacy has an indirect effect on self-regulation via delay of gratification. Intrinsic interest does not have a direct effect on delay of gratification. Self-regulation has an indirect effect on midterm grade via homework completion.

Students' intrinsic interest in the course (β = .45) and their willingness to delay gratification (β = .34) have a direct effect on self-regulation. Outcome expectancy has a direct effect on delay of gratification (β = .31). Self-regulation has a direct effect on homework completion (β = .45) and final course grade (β = .24). Self-efficacy has a direct effect n homework completion (β = .27) and an indirect effect via delay of gratification and self-regulation. Homework

completion has a direct effect on midterm course grade (β = .40) and indirect effect on final course grade mediate through midterm grade. Midterm course grade has a direct effect on final course grade (β = .25.). Table 3 displays the decomposition of effects from the path analysis.

Discussion

The path analysis revealed several important findings. First, at-risk students trained in a self-regulated program responded differently to their training as a function of their motivational beliefs, ability to delay gratification, and use of self-regulatory learning strategies. Second, motivational beliefs play a significant causal role in college students' self-regulatory processes, homework completion, and academic success. Third, students' delay of gratification links two motivational beliefs (self-efficacy and outcome expectations) and their academic self-regulation. Fourth, students, who engaged in self-regulation, were better able to complete their homework. Fifth, students' homework completion was causally linked to their midterm and final course grades. Sixth, elf-efficacy beliefs and self-regulation processes augmented the homework effects on these course outcomes. Seventh, the results provide support for contemporary theoretical emphases on the role of students' motivational self-beliefs and self-regulatory processes in their homework completion.

Other findings are also important. In this particular sample, academic performance is not just a function of having or acquiring cognitive skills, rather it is also important to sustain motivation and persist on task. Students who are less skilled in using self-regulated learning strategies are those who obtain less benefit from a self-regulated learning program.

The lack of a direct path between self-efficacy and self-regulation, and their indirect mediation via delay of gratification is noticeable. It suggests that students' motivational beliefs require that they delay gratification in order to successfully use self-regulatory strategies. If the students are unable or unwilling to postpone immediate available rewards for the sake of achieving long-term goals, they may not be successful in attaining their long-term goals.

Another interesting finding in this study is that delay of gratification does not have a direct effect on homework, rather this relationship was mediated via self-regulation. This finding suggests that delay gratification alone is not a sufficient condition to secure students' homework completion. In addition to delay gratification, students would need to use the appropriate self-regulatory strategies if they want to successfully engage in homework, which will be conducive to high academic achievement. Delay of gratification needs to be supported and sustained by the students' use of self-regulatory strategies.

Educational Implications

Four major educational implications are derived from this study. First, although this study did not directly assess the effectiveness of the instructional intervention, it did reveal that at-risk students' self-regulatory processes and motivational beliefs played a causal role in their academic success. Second, the results indicate the importance of assisting at-risk college students to become active agents of their own learning. Third, teachers should be trained in using self-regulation learning strategies in their classroom in order to serve as social models to their students. Students learn through social modeling (Bandura, 1997). Fourth, tutors should be trained in how to use self-regulatory learning

strategies and not just in content material. Tutors are important social models that influence learners' motivational beliefs and use of self-regulated strategies.

Future Research

Further research is needed to understand these findings. First, the role of motivational beliefs and self-regulatory processes in homework completion and academic outcomes needs to be studied experimentally. Second, the effect of students' delay of gratification on self-regulatory processes in other cyclical phases needs further examination. Third, the promising role of students' delay of gratification in their efforts to self-regulate needs further investigation. It is important to train students to delay gratification and to self-regulate their homework activities if they want to obtain superior skills. Although self-report studies are effective in providing information about students' willingness to delay gratification, experimental research is warranted. Fourth, an adaptation of Mischel's delay of gratification paradigm needs to be considered, in which the immediate and the delayed rewards are both educational, and that it could be applied to adult learners. Fifth, more research to assess homework from a self-regulated learning approach is warranted if we want to comprehend the educational experience of learners.

Conclusion

Students' motivational beliefs (e.g., self-efficacy, intrinsic interest, and outcome expectancy) have direct and indirect effects on at-risk college students' willingness to delay gratification, use of self-regulated learning strategies, homework completion, and academic performance.

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Table 1.

Descriptive Statistics, Cronbach Alpha, and Pearson Correlations among the Variables

	1	2	3	4	5	6	7	8
1. Homework Completion	----							
2. Self-Regulation [a]	.58	----						
3. Delay of gratification [b]	.44	.48	----					
4. Self-Efficacy [a]	.45	.40	.42	----				
5. Intrinsic Interest [a]	.34	.68	.31	.39	----			
6. Outcome Expectancy [a]	-.01	.31	.32	.02	.36	----		
7. Midterm Course Grade [c]	.51	.23	.28	.43	.35	-.18	----	
8. Final Course Grade [d]	.52	.41	.29	.46	.37	-.17	.81	----
Mean	6.03	4.42	3.24	5.49	3.46	5.95	67.72	1.84
Standard Deviation	1.28	.85	.58	.99	1.46	1.25	21.45	1.37
Cronbach Alpha	----	.78	.84	.79	.84	.70	----	----

Note: Correlations greater than .27 are significant at $p < .05$, ($N = 58$).

[a] The response format consisted of a 7-point Likert scale (1 = "Not at all true of me" to 7 = "Very true of me").

[b] Values are based on a 1 ("Definitely choose A") to 4 ("Definitely choose B") cording responses, with higher values indicating greater preference for academic delay of gratification.

[c] The response format consisted of a 7-point Likert scale (1 = "Never" to 7 = "Always"). [d] Values range from 0 to 100.

[d] Values range from .00 to 4.00

Table 2

Decomposition of Effects from the Path Analysis

Effect	Standardized estimate (β)	t^a	R^2
On homework			.36
of self-regulation	.45	3.96	
of self-efficacy	.27	2.37	
On self-regulation			.41
of delay of gratification	.34	3.14	
of intrinsic interest	.45	4.21	
On delay of gratification			.27
of self-efficacy	.41	3.57	
of outcome expectancy	.31	2.69	
On midterm course grade			.30
of homework	.40	3.16	
of intrinsic interest	.25	2.02	
On final course grade			.71
of midterm course grade	.76	9.78	
of self-regulation	.24	3.06	

Note $^a p < .05$

Figure 1
Zimmerman's Cyclical Model of Self-regulation

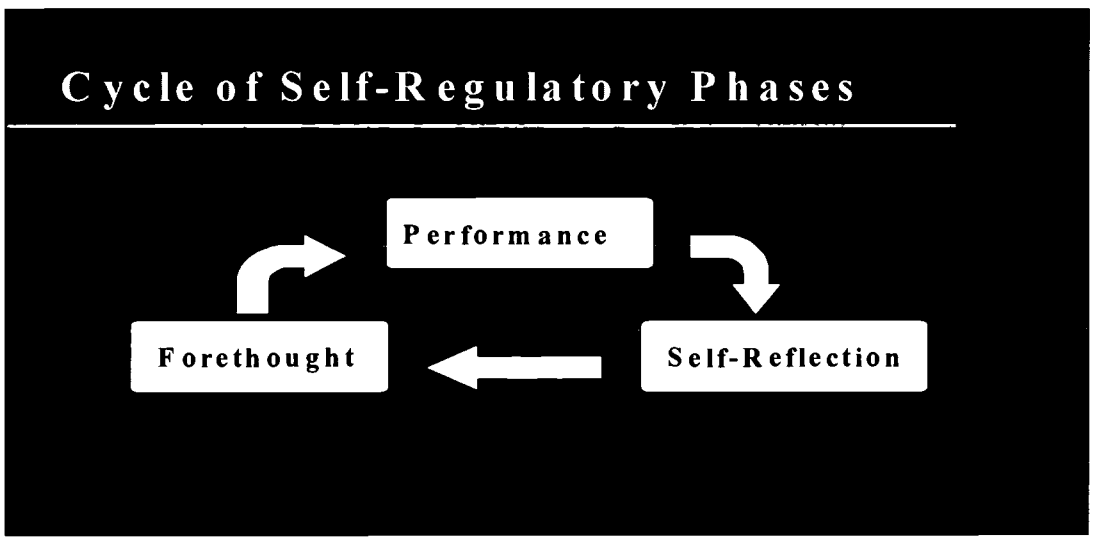


Figure 2. Proposed Path Model

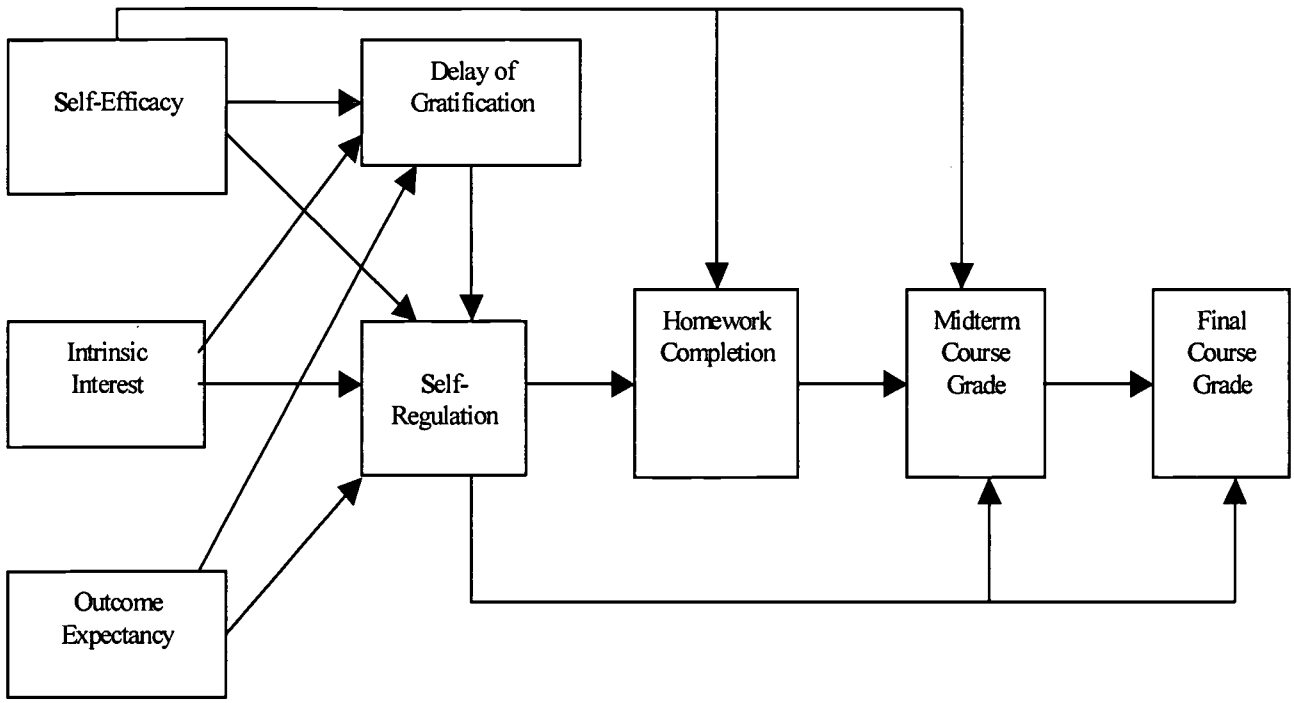
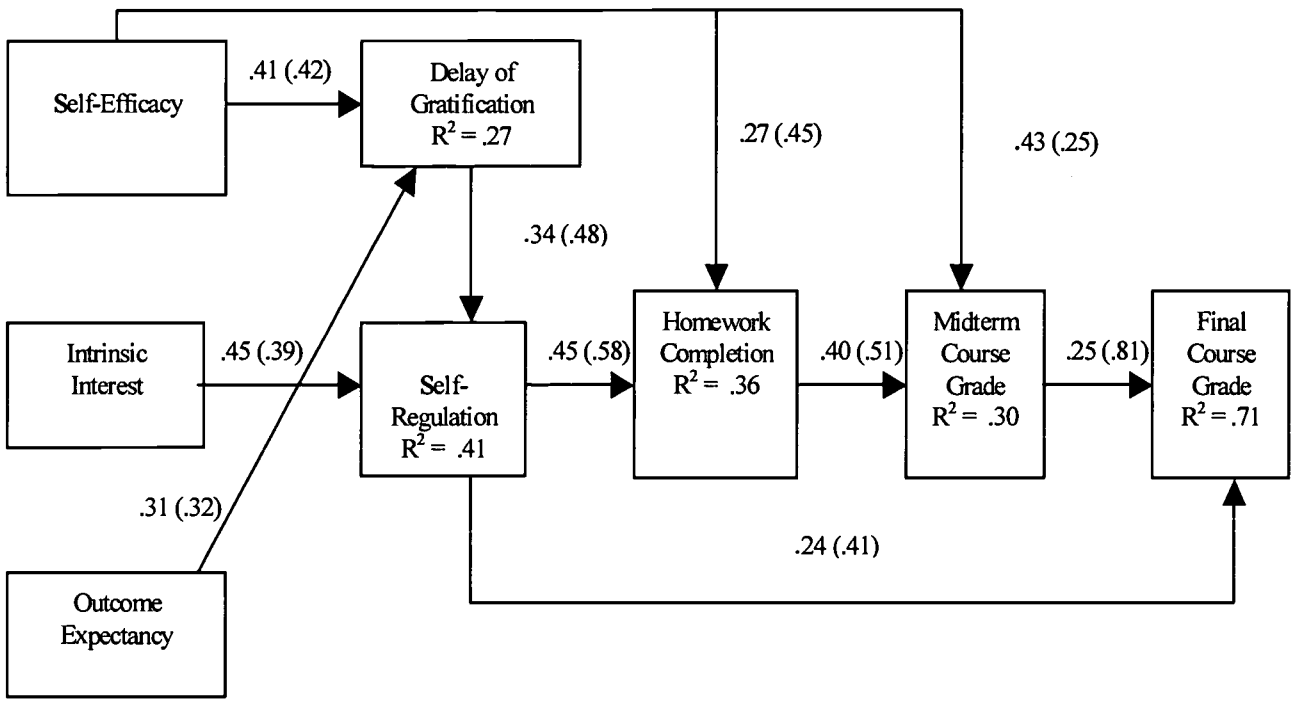


Figure 3. Path Model



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