# THE RELATIONSHIPS AMONG MOTIVATION, SELF-REGULATED LEARNING, AND ACADEMIC ACHIEVEMENT

A Dissertation

by

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ABSTRACT

This dissertation consists of two articles investigating the relationships among motivation, self-regulated learning (SRL), and academic achievement for adolescents: (a) a meta-analytic review of the literature, and (b) tests of a theoretical model using data from an instrument developed by the author and ecologically valid measures of academic achievement of secondary school students in South Korea in both mathematics and English. The theoretical backgrounds of these studies are underlain by the self-system in Bandura's reciprocal self-determinism and social cognitivism. I employed two research approaches for each of two articles of this dissertation: a meta-analytic review and path analyses of data on the motivation, SRL, and academic achievement in both mathematics and English of secondary school students in South Korea.

In the first article, a heuristic framework consisting of 11 core constructs of motivation and self-regulated learning (SRL) was extracted from existing theoretical frameworks and instruments. For the meta-analysis, the final samples came from 46 studies for 28,261 middle or high school students. The findings suggested that self-efficacy, effort, and persistence were the strongest factors on academic achievement. Interest and task value, intrinsic goal, cognitive and metacognitive strategy, and attribution also were substantial contributors to academic performance. As expected, test anxiety was a significant detriment to learning for adolescents.

The second article examines the relationships among initial motivation (i.e., self-efficacy, mastery goal orientation, performance avoidance goal orientation), three self-regulated learning processes (i.e., effort and persistence, cognitive and metacognitive

strategies, resource management), and midterm and final exam scores in mathematics and English for 952 middle and high school students in Seoul, South Korea. Prior achievement predicted initial motivation, primarily self-efficacy, which strongly influenced mastery goal orientation. Furthermore, initial motivation predicted students' adoption of self-regulatory functions, of which effort and persistence made the most substantial contribution to subsequent academic performance. However, cognitive and metacognitive strategies and resource management did not contribute to final exams.

In sum, this dissertation validated the reciprocal and dynamic relationships among motivation, SRL, and academic achievement for adolescents through multiple research approaches. The findings from both studies suggest that the constructs of motivation and SRL are strongly related to each other and contribute to students' academic achievement, supporting the suggestions in Bandura's reciprocal self-determinism and social cognitivism.

DEDICATION

To my family,

My husband, Changjoo Kwon, and My sons, Jinmoe and Seonghoon,

who made all of this possible,

for their patience, encouragement, and love.

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## NOMENCLATURE

| | |
|---|---|
| SRL | Self-Regulated Learning |
| SMLI | Self-Motivated Learning Inventory |
| MSLQ | Motivated Strategies for Learning Questionnaire |
| PALS | Patterns of Adaptive Learning Survey |
| SAL | Students' Approaches to Learning |
| OECD | Organization for Economic Cooperation and Development |
| SE | Self-Efficacy |
| IV | Interest & Task Value |
| IG | Intrinsic Goal orientation |
| EG | Extrinsic Goal orientation |
| MG | Mastery Goal orientation |
| PA | Performance Avoidance Goal orientation |
| TA | Test Anxiety |
| MS | Motivational Strategy |
| EP | Effort and Persistence |
| CM | Cognitive and Metacognitive Strategy |
| RM | Resource Management |
| TE | Time and Environment Management |
| PH | Peer Learning and Help Seeking |
| AB | Attribution |

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# CHAPTER I

# INTRODUCTION AND LITERATURE REVIEW

Based on social cognitive perspectives, Bandura (1978) describes a psychologically functioning self-system based on the reciprocal determinism of continuous interactions among behavioral, cognitive, and environmental factors. Additionally, the self-system in reciprocal determinism involves causal processes of psychological functioning when self-system renders selective interactions with multiple factors based on psychosocial phenomena (Bandura, 1978). Therefore, the theory has underlain a number of studies supporting the impact of motivation and self-regulated learning (SRL) on academic performance (Schunk & Zimmerman, 2008). Ultimately, the social cognitive theory based on reciprocal determinism suggests that for academic achievement, students' ongoing practices through self-influence should motivate and regulate their behaviors, cognitions, and use of environmental resources (Bandura, 1991).

## Literature Review

Schunk & Zimmerman (2008) suggests that students' academic motivations play multiple and pivotal roles in SRL processes as a precursor, mediator, concomitant, or exclusive outcomes of SRL. A precursor to SRL can vary in task interest depending on individual differences: a mediator of SRL induces motives to improve efforts to SRL: a concomitant of SRL is an outcome to produce changes in task interest; and an exclusive outcome is a primary outcome of SRL. These mutual functions between motivation and SRL affect students' academic attainment. In other words, motivation should contribute to academic achievement by (a) triggering the engine of students' SRL (Bandura, 1978,

1991), and (b) continuously interacting with SRL in students' learning processes (Bandura, 1991; Pintrich, 1988; Pintrich & Groot, 1990).

Also, Bandura (1991) proposes three functions of the ongoing self-regulatory mechanisms: "self-monitoring of one's behavior, its determinants and effects", "judgment of one's behavior in relation to personal standards and environmental circumstances", and "affective self-reaction". These self-regulatory systems work in the middle of causal processes providing the standards for purposeful action, and so mediate the effects of other factors on one's performance (Bandura, 1991). Based on Bandura's (1991) concept of self-regulation, Zimmerman and his colleagues (Cleary & Zimmerman, 2004; Zimmerman & Moylan, 2009; Zimmerman, 2008) delineate the cyclic system of SRL system with three circulated phases: in forethought phase, students initiate their motivation and plan for their purposeful learning activities; in performance phase, students practice self-regulatory mechanisms such as cognitive metacognitive strategy use, and environment management; and in self-reflection phase, students make self-judgment and self-reaction to their performance. The last phase, in turn, should influence motivations such as self-efficacy and goal orientations (Bembenutty, 2008; Cleary & Zimmerman, 2004; Pintrich, 2000; Zimmerman & Moylan, 200 9; Zimmerman, 2004, 2008).

Based on the theoretical frameworks of social cognitive perspectives, I developed the Self-Motivated Learning Inventory (SMLI) to estimate adolescents' learning traits on motivation and SRL. The SMLI was designed to measure six constructs: self-efficacy (SE), two goal orientations (GO), mastery goal (MG) and performance avoidance

(PA),effort and persistence (EP), cognitive, and metacognitive strategy (CM) of metacognition, and resource management (RM). The first three constructs that initiate students' motivation are assumed to be foregoing agents, while the last three constructs that operate students' learning activities for their achievement are assumed to be ongoing mechanisms. Considering construct specificity and factor loadings, the scales of the SMLI are originated from the following instruments: the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich, Smith, Garcia, & McKeachie, 1991); the questionnaire on goal orientation, invented by Elliot and Church (1997); and the original self-regulatory inventory developed by O'Neil, Baker, Ni, Jacoby, and Swigger (1994). The SMLI encompasses construct specifications and functional sequences with the assumption that initiating motivation of foregoing agents and self-regulatory functions of ongoing mechanisms work reciprocally for students' academic performance. The instrument was used for the empirical study of this dissertation to examine the relationships among motivation, SRL, and academic performance for the secondary school students in South Korea.

Moreover, adolescents often undergo a difficult transition from children to adults in body, emotion, and behavior, which may influence their academic activities (Bandura, Barbaranelli, Caprara, &Pastorelli, 2003; Klassen, 2002; Valentine, Dubois, & Cooper, 2004; Vukman & Licardo, 2010). Thus, many studies have examined the relationships among motivation, SRL, and academic achievement for adolescents. But, the number of studies addressing the comprehensive, specific, and systematic mechanisms in adolescents' learning activities is relatively small. Furthermore, a meta-analysis

accounting for the relationships among motivation, SRL, and learning outcomes for adolescents is needed for systematic and integrative information of the current state of studies on adolescents' learning. Although a few meta-analyses examined the contribution of academic motivation and self-regulation to learning performance, the populations were college students or older adults (e.g., Cellar, Stuhlmacher, Young, Fisher, Adair, Haynes, Twichell, Arnold, Royer, Denning, & Riester, 2010; Credé & Phillips, 2011; Sitzmann & Ely, 2011).

## Overview of the Dissertation

The purpose of this dissertation was to examine the relationships among motivation, SRL, and academic performance for adolescents. The research was fundamentally based on the theories of Bandura's reciprocal determinism of self-system and social cognitivism. The basic theoretical assumptions are depicted in Figure 1. Based on the assumptions and suggestions in the theoretical backgrounds and literature review, firstly, I pursued a heuristic framework for construct specification of motivation and SR, and meta-analytic findings on how motivation and SRL contribute to academic achievement for adolescents. Secondly, I collected the data through the survey of the SMLI and subject scores for secondary school students in South Korea. The SMLI includes six scales to measure motivation and SRL (i.e., SE, MG, PA, EP, CM, RM). Based on the theoretical backgrounds of motivation and SRL (e.g., Bandura, 1978, 1991; Pintrich & Groot, 1990; Cleary & Zimmerman, 2004; Zimmerman & Moylan, 2009; Zimmerman, 2008), I assumed that SE, MG, and PA should initiate students' motivation

as foregoing agents while EP, CM, and RM operate students' learning activities as ongoing mechanisms.


*Figure 1.* Assumptions on the relationships among motivation, SRL, and academic achievement based on Bandura's reciprocal determinism of self-system and social cognitivism.

Employing path analysis, I examined the relationships among Korean secondary school students' motivation, SRL, and academic performance in mathematics and in English. The two articles of this dissertation demonstrate how motivation and SRL contribute to adolescents' academic performance. The research questions of this dissertation are as follows:

Through a meta-analytic review,

1. How do the theoretical frameworks and existing instruments constitute the constructs of motivation and SRL for academic performance?
2. What should be a heuristic framework to address constitute motivation and SRL domains for adolescents' academic performance?
3. What are the reviewed studies' methodological characteristics as reflected in their methodological quality scores (MQS)?
4. How do the constructs of motivation and SRL relate to each other and contribute to students' academic performance?
5. Do school levels (middle, high, and mixed secondary school), domain specificity (or general academy), and MQS moderate the effects of motivation and SRL on academic achievement?

Through the path analyses,

6. How does the prior academic achievement affect initiating motivation and self-regulatory functions?
7. How are the constructs of motivation and SRL related to each other for adolescents' academic performance?
8. How do the constructs of motivation and SRL contribute to adolescents' academic achievement?
9. Do self-regulatory mechanisms mediate the relations between initiating motivation and subsequent academic achievement?

# CHAPTER II

# A META-ANALYTIC REVIEW OF THE RELATIONSHIPS OF MOTIVATION AND SELF-REGULATED LEARNING (SRL) WITH ACADEMIC ACHIEVEMENT FOR ADOLESCENTS

## Literature Review

Starting from the reciprocal determinism of self-system (Bandura, 1978) based on social cognitive perspective, a considerable number of studies have demonstrated the impact of motivation and self-regulated learning (SRL) on academic achievement (e.g., Bandura, 1982,1991; Bandura, Barbaranelli, Caprara, &Pastorelli,1996; Pintrich & De Groot, 1990; Pajares, 1996; Pajares & Valiante, 2002; Schunk, 1990, 1991, 1994, 2005; Schunk & Zimmerman, 2008; Wolters, Yu, &Pintrich, 1996; Zimmerman, 1990, 1995, 2004, 2008; Zimmerman, Bandura, & Martinez-Pons, 1992; Zimmerman & Martinez-Pons, 1990). Learning motivation should activate students' SRL, and they mutually influence each other in guiding learning activities, which should be substantially reflected in students' learning performance (Bandura, 1991; Bandura, Caprara, Barbarnelli, Gerbino, & Pastorelli, 2003; Pajares &Valiante, 2002; Pintrich, 1988; Pintrich & Groot, 1990; Pintrich, Smith, & Garcia, 1993; Wolters et al., 1996; Zimmerman, 1995; Zimmerman et al., 1992).

Adolescents often undergo a difficult transition from children to adults physically, emotionally, and behaviorally, which may influence their academic activities (Bandura et al., 2003; Klassen, 2002; Valentine, Dubois, & Cooper, 2004; Vukman & Licardo, 2010). Therefore, a review of the relationships among motivation, SRL, and

academic performance for adolescents is necessary for understanding of the comprehensive and specific mechanisms in their learning system. I tried to find a systematic or meta-analysis reviews on these issues within 111 databases available at the ProQuest. However, there were no reviews encompassing the contributions of both motivation and SRL to academic outcomes in the adolescents' learning activities. Even though there have been a few narrative reviews and meta-analyses on the effects of academic motivation and self-regulation on task performance, the populations were college students or older adults rather than teenagers(e.g., Cellar, Stuhlmacher, Young, Fisher, Adair, Haynes, Twichell, Arnold, Royer, Denning, & Riester, 2010; Credé & Phillips, 2011; Sitzmann & Ely, 2011).

The meta-analysis by Cellar et al. (2010) investigated trait goal orientation constructs and their relationships with self-regulation and task performance in college students and adults. The findings from 102 studies with 16,000 subjects indicated that mastery goal orientation construct had a positive relationship with self-regulation constructs and performance of which self-efficacy was the strongest ($\rho = .33$) and performance ($\rho = .13$) while performance avoidance had negative relation with those variables. However, the constructs of self-regulation were categorized into four variables (i.e., self-monitoring, self-evaluation, self-efficacy, and self-reaction), and did not include the specific components such as effort management, cognitive and metacognitive strategy use, and resource management.

Credé and Phillips (2011) reviewed studies in which the construct validity of the Motivated Strategies for Learning Questionnaire (MSLQ) developed by Pintrich, Smith,

Carcia, and Mckeachie (1991) was evaluated by its prediction of academic performance. They extracted 2158 correlations from 67 samples of 19,900 college students, and found moderate or weak relationships between the scores of the MSLQ and academic performance. Of the 15 subscales of the MSLQ, effort regulation was the best predictor of GPA ($\rho = .23$) and current class grades ($\rho = .40$), followed by self-efficacy for GPA ($\rho = .21$) and current class grades ($\rho = .37$). Even though this meta-analytic review investigated the effects motivation and SRL on academic outcomes, only those studies employing the MSLQ for college students were examined.

Sitzmann and Ely (2011) conducted a meta-analysis of SRL for college students and adults in work-related training or educational attainment encompassing several theory frameworks for SRL. Sitzmann and Ely identified 16 substantial constructs of SRL by looking across various theory frameworks. Their meta-analysis included 430 studies of 90,380 adults and revealed strong interrelationships among the constructs of SRL and achievement in adulthood. Particularly, Sitzmann and Ely (2011) found that goal level ($\rho = .44$), self-efficacy ($\rho = .35$), effort ($\rho = .28$), and persistence ($\rho = .27$) were the strongest factors on adults' learning achievement. However, the population for this review was limited only to people who were at least 18 years old in work-related training or college. As the different populations have different learning domains, they should be different to each other in the patterns of the effects of the motivation and SRL on learning performance. Therefore, pursuing the construct clarity of motivation and SRL, this systematic review aimed to investigate how motivation and SRL contribute to

adolescents' academic performance. I stated the specific objectives of the present review in the next section.

## The Objectives of the Current Review

This review has largely two research purposes. One is to develop a heuristic framework of motivation and SRL for the clarity of the constructs. The other is to investigate the relationships of motivation and SRL with academic achievement for secondary school students based on the heuristic framework.

The purpose of the heuristic framework is to specify the core constructs of motivation and SRL which are adopted for examination of the interrelationships among those constructs and the effects on academic attainment in this literature review (Sitzmann & Ely, 2011). Motivation and SRL have multidimensional framework, and the theories and measurement instruments that were adopted to measure the constructs in the studies varied in construct specification. Therefore, it is necessary to identify a comprehensive and manageable index of motivation and SRL (i.e., heuristic framework) for more clarity of learners' patterns on motivation and SRL (Sitzmann & Ely, 2011). In this context, this review proposed a heuristic framework of motivation and SRL. For developing of the heuristic framework, this review explored the construct specifications and extracted the substantial factors of motivation and SRL on academic achievement from the clarified theoretical frameworks and measures most frequently employed in the previous studies (Sitzmann & Ely, 2011).

Therefore, this review focuses on the following questions:

1. How do the theoretical frameworks and existing instruments represent the constructs of motivation and SRL for academic performance?
2. What should be a heuristic framework to address constitute motivation and SRL domains for adolescents' academic performance?
3. What are the reviewed studies' methodological characteristics as reflected in their methodological quality scores (MQS)?
4. How do the constructs of motivation and SRL relate to each other and contribute to students' academic performance?
5. Do school levels (middle, high, and mixed secondary school), domain specificity, and MQS moderate the effects of motivation and SRL on academic achievement?

## Method

In order to examine the effects of motivation and SRL on academic achievement for secondary school students, I searched and identified the studies meeting the specific criteria on this study through the *ProQuest* using Boolean operations and terms relevant to this study. After identifying the studies for this review, I extracted and arranged the data from the reviewed studies. Finally I calculated the effect size indicating the effects of motivation and SRL on academic achievement, and examined the contributions of moderator variables (i.e., school level, domain specificity/general academy, and MQS) to the relationships of motivation and SRL with academic performance.

### *Preliminary Criteria for Selecting Studies*

For this review, studies had to be (a) be quantitative research studies published in a peer-reviewed English language journals; (b) include examination of the relationships

of both SRL and motivation to academic achievement; (c) include participants of secondary school-aged adolescents aging from 13 to 18; (d) include such academic subject-domains as language, literature, mathematics, science, and social studies but not art, music and sports; and (e) be published between 1980 and 2013.

### *Search Methods for Identification of Studies*

The 111 databases available through ProQuest were employed to search the relevant articles. Using the searching tools in the databases, my searching range was converged from including only the terms representative of SRL and academic achievement to more focused searches including all four concepts: SRL, motivation, academic achievement, and adolescent; within peer-reviewed articles.

Initially, I searched the articles using Boolean operators and the key words: ("self-regulated learning" OR "self-regulation" OR "self-direction" OR "self-directed learning" OR "self-motivated learning" OR "self-control" OR "self-discipline" OR "learning strategies") AND ("academic achievement" OR " academic performance" OR "academic outcomes" OR "academic attainment" OR "GPA") AND ("motivation" OR "goal orientation" OR "self-efficacy") AND ("adolescent" OR "adolescence" OR "secondary school").

The initial search produced 274 articles. In order to be included in the current review, the abstracts and key words had to include the terms relevant to all variables: SRL, motivation, academic performance, and secondary school aged adolescent. A total of 156articles were selected in the second searching step. Of these, 97 were excluded from the final review due to gaps in the criteria: 43articles did not involve academic

outcomes, 11articles did not study adolescents, 12 articles did not involve SRL and/or motivation, and 30articles did not examine specific relationships among motivation, SRL, and academic achievement. Of the remaining 60articles, one article reported three studies with independent samples, and 62 studies were abstracted for final samples. The studies included 69 independent samples with a total of 256,698 middle or high school students.

### *Data Collection and Analyses*

I coded various variables to collect the information from extracted studies: sample size, sample characteristics (e.g., school level and/or age, gender, location and/or ethnicity), reliability of the scales and academic outcomes, statistical significances of the relationships correlations of the scales with academic achievement, correlations among the scales, domain specificity (specific, e.g., math, English, social studies; or general academic), and other variables for MQS.

From these studies, I reported the relationships of motivation and SRL with academic achievement through two approaches: statistical significance (i.e. positive, negative, no significant), and the corrected correlation coefficients with academic outcomes. The means of the corrected correlation coefficients were employed in order to compare the contributions of constructs to academic performance. I employed the interactive random-effects model as guided in Hunter and Schmidt (2004) to amount the findings across the studies. I addressed sampling error and unreliability for independent (i.e., motivation and SRL) and dependent constructs (i.e., academic achievement) to calculate the corrected mean and variance of the correlations across the studies.

Furthermore, I have found that 5 (8 %) and 49 (79 %) studies did not report the reliabilities for the measures of motivation and SRL and for academic outcomes, respectively. In order to solve the absence of the reliability in those studies, I employed the interactive meta-analytic method as explained in Hunter and Schmidt (2004). The solution is to apply artifact distributions to correct the distributions of observed effect sizes by using the reported artifact information (i.e., reliabilities) (Credé & Phillips, 2011). The information of the reliability distributions for the studies was provided in Table 1. All of the mean reliabilities reported in the studies for this review were high, ranging from .73 to .83. Of 62 studies, 15 studies were excluded from the correlation analysis because the studies reported just statistical significances or regression coefficients other than correlation coefficients. The studies including multiple independent groups were separately handled for the meta-analysis.

The various scales on motivation and SRL that were employed in the reviewed studies were assigned to the specific constructs of the heuristic framework developed for this review. Specifically, the scales with different labels that measured the similar constructs were transformed into the corresponding constructs specified in the heuristic framework. Therefore, many studies included multiple predictors as subscales of the same predictors and reported multiple correlations of single constructs with academic achievement. For example, Luo, Paris, Hogan, and Luo (2011) reported the correlations of class engagement and metacognitive self-regulation with academic achievement. However, the two constructs fell into the construct of cognitive and metacognitive strategy (CM) in the heuristic framework, and the two correlations with academic achievement in the

study should be assigned to CM as a single construct. Moreover, it is the violation of the assumption of statistical independence that causes the biased sampling error when adopting these multiple correlations in single studies for the aggregation of meta-analytic findings (Hunter & Schmidt, 2004). Therefore, I used the average correlations for single constructs with multiple subscales and the simple sample size to represent each study for the meta-analysis (Hunter & Schmidt, 2004).

I assigned a MQS to each study to assess methodological 12 measures of methodological soundness: construct classifications into motivation and SRL, subject-domain specificity, report of reliabilities for the scales on motivation and SRL, report of Reliabilities for academic outcomes, report of Validities, descriptions of data distribution, addressing missing data, theoretical frameworks, research design, sampling method, sample size, and statistical techniques (Goodson, Buhi, & Dunsmore, 2006).

Table 1

*Reliability Artifact Distribution*

| Construct | Mean $r_{xx}$ | SD $r_{xx}$ | *k* |
|---|---|---|---|
| **Foregoing Agents** | | | |
| Self-Efficacy | .82 | .07 | 80 |
| Interest & Task Value | .83 | .18 | 38 |
| Extrinsic Goal | .77 | .08 | 70 |
| Intrinsic Goal | .78 | .09 | 52 |
| Test anxiety | .78 | .10 | 23 |
| **Ongoing Mechanisms** | | | |
| Motivational Strategy | .81 | .06 | 14 |
| Cognitive and Metacognitive Strategy | .76 | .10 | 145 |
| Effort & Persistence | .78 | .06 | 22 |
| Time and Environment Management | .76 | .07 | 11 |
| Peer Learning & Help Seeking | .73 | .00 | 3 |
| **Self-Reflecting Appraisal** | | | |
| Attribution | .74 | .09 | 13 |
| **Academic Outcome** | .78 | .09 | 12 |

Also, I examined how potential moderator variables influence the findings of the contribution to academic achievement through the weighted least squared (WLS) regression analysis. The WLS regression analysis should produce the most accuracy in cases of multicolinearity and skewed distribution of study sample sizes (Steel & Kammeyer-Mueller, 2002).

In order to detect moderator effects of the relationships among 11 constructs and academic achievement, I selected three moderator variables: school level, domain specificity, and MQS. I weighted correlations with study sample size. I coded MQS as continuous variables and other moderators as dummy independent variables. If a study addressed the relationships of constructs with academic achievement for specific class domains, then the variable in the study coded 1, or if a study reported the relationships for general academic domain, it coded 0. School level has two dummy variables that middle and high school coded 1, separately, and then the secondary school was assigned as a reference group.

## Results

I have examined the theoretical frameworks and instruments that were most frequently cited and employed for the reviewed studies. As stated in the objectives of this review, this section presents a theoretical overview and the heuristic framework that was constructed.

### *Theoretical Overview and Heuristic Framework of Motivation and SRL*

The overview of theories and instruments accounting for motivation and SRL suggested that the ranges of the framework of the constructs were extremely broad

(Sitzmann & Ely, 2011). Therefore, a heuristic framework of motivation and SRL for academic outcomes should be constituted by extracting the core constructs from the most influential theories and inventories for the reviewed studies (Sitzmann & Ely, 2011).

Furthermore, even within educational psychology, several differential theoretical frameworks of motivation and SRL have been derived from different perspectives (e.g., Boekaerts, 1996; Corno, 2001; Eccles & Wigfield, 2002; Pintrich2000, 2003; Pintrich & Groot 1990; Ryan &Deci, 2000; Schunk & Zimmerman, 2008; Wigfield, Eccles, Schiefele, Roeser, Davis-Kean, 2006; Zimmerman & Moylan, 2009). Table 2 shows the overview of the theories and inventories adopted for the reviewed studies, and a heuristic framework of motivation and SRL. These theories and instruments, which stem from different views, vary in structuring prototypes, specifying constructs, and emphasizing the crux of components for motivation and SRL. Moreover, most of the frameworks integrated the constructs of motivation and SRL without a specific distinction between two dimensions, even though motivation and SRL should be different dimensions from each other. Therefore, it would not be simple to specify the constructs of each motivation and SRL by clearly differentiating from each other. However, most of the theoretical perspectives on motivation and SRL share the judgment that motivation should be the source of SRL as precursors, mediators, and concurrent outcomes. Also, they agree that motivation and SRL operate in a cyclic system through substantial interactions. Moreover, Bandura (1978) illustrated reciprocal self-determinism where self-system works through a continuous, selective, and reciprocal interaction between

behavioral, cognitive, and environmental components, and this mechanism should be embodied in self-regulatory process. Hence, I adapted Bandura's model of self-system in reciprocal determinism (1978) for a heuristic framework of motivation and SRL. Figure 2 depicts a heuristic framework adapted from Bandura's model of reciprocal self-determinism. Even though the constructs were categorized into the three dimensions in the order of time sequences, they may operate reciprocally, simultaneously, and interactively while students are learning (Pintrich, 2000; Zimmerman & Moylan, 2009).

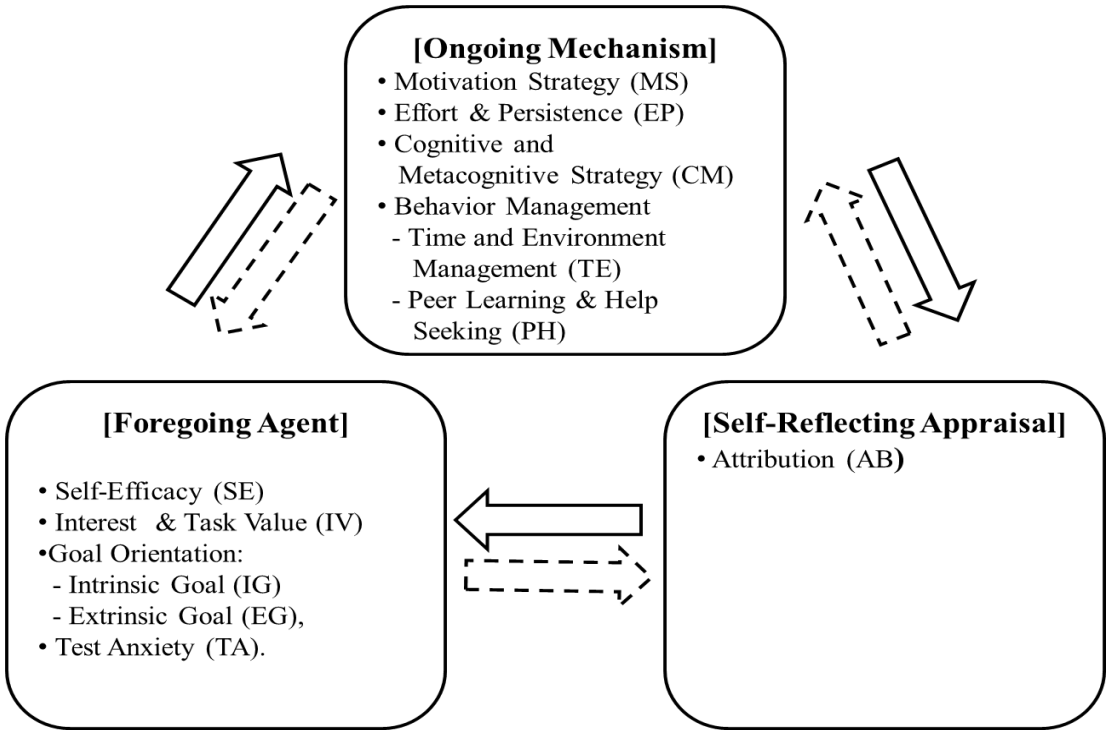


*Figure 2.* The heuristic framework of motivation and self-regulated learning adapted from Bandura's model of reciprocal self-determinism.

Table 2

*A Heuristic Framework of Motivation and Self-Regulated Learning Domains from the Theories and Inventories Adopted in the Studies*

| Construct | Pintrich (2000, 2003) | Ryan & Deci (2000) | Eccles & Wigfield (2002); Wigfield et al., 2006 | Schunk & Zimmerman (2008) | Boekaerts (1996) | Corno (2001) | Zimmerman & Moylan (2009) | MSLQ | PALS | SAL |
|---|---|---|---|---|---|---|---|---|---|---|
| **Foregoing Agent** | | | | | | | | | | |
| SE | X | | X | X | X | | X | X | X | X |
| IV | X | | X | X | X | | X | X | | X |
| TA | X | | | | | | | X | | |
| *Goal Orientation* | | | | | | | | | | |
| EG | X | X | X | X | X | | X | X | X | X |
| IG | X | X | X | X | X | | X | X | X | X |
| **Ongoing Mechanism** | | | | | | | | | | |
| MS | X | | | | X | X | X | | X | |
| EP | X | | | X | X | X | X | X | | X |
| CM | X | | | | X | X | X | X | | X |
| *Behavior Management* | | | | | | | | | | |
| TE | X | | | | | X | X | X | | |
| PH | X | | | | | X | X | X | | X |
| **Self-Reflecting Appraisal** | | | | | | | | | | |
| AB | X | | X | X | X | | X | X | | |

*Note.* SE = self-efficacy; IV = interest & task value; EG = extrinsic goal; IG = intrinsic goal; TA = test anxiety; MS = motivational strategy; CM = cognitive and metacognitive strategy; TE = time and environmental management; PH = peer learning & help seeking; AB = attribution.

**Motivation.** Based on the expectancy-value model (Eccles, 1983), Pintrich and Groot (1990) conceptualized motivation as divided into three categories: expectancy (e.g., self-efficacy, attributional style, control beliefs), value (e.g., learning vs. performance goals, intrinsic vs. extrinsic orientation, task value), and an affective component (e.g., test anxiety). Furthermore, Pintrich (2003) asserted the importance of "needs and motives" that are assumed to operate at a more implicit or unconscious level, in contrast to the emphases on cognitive and conscious processes in social cognitive models. And then, the researcher suggested a model where unconscious or implicit motives, needs, attitudes, beliefs, and goal pursuits are integrated with more conscious, intentional, and self-regulatory processes. Finally, based on the integrated model, Pintrich (2003) proposed the general principles of academic motivation and their implications for instructional design based on the social cognitivism:

- Adaptive self-efficacy and competence beliefs provide accurate and realistic feedback to students about their learning performance to help develop skills required for expertise, and tasks relevant to students' competence levels that should be neither too difficult nor too easy, but challenging enough to stimulate their interests. However, it should be noted that students may take multiple ways to reach their achievement depending on not only their self-efficacy but also their different personal and contextual factors (e.g., persistence, goals, task value beliefs and interests) which interact to generate differentiated patterns of motivated behavior.
- Adaptive attributions and control beliefs refer to judgment on the causes of success and failure and how much perceived control students have in their purposive

behaviors respectively, which provide the feedback on the importance of effort, strategies and potential self-control of learning. In contrast, those students who do not have personal beliefs to control their own learning and behavior are more likely to fail in effective behaviors and successful performance which, in turn, finally resulted in their learned helpless. Therefore, it is important to provide not only effective and cognitively understandable rationales, but also supportive caring and involvement by teacher or parent for students' adaptive personal control.

- Higher levels of interest and intrinsic motivation can be stimulated by novelty and variety in tasks and activities.
- Higher levels of value indicate the importance and utility of tasks, materials, and activities.
- Goals that motivate and direct students' behaviors in classroom contexts are bifurcated into goal contents and goal orientations. The goal content approach has the assumption that students can pursue multiple goals (e.g., social and academic goal) in a classroom while achievement goal orientations (e.g., mastery and performance goals) are defined as the reasons and purposes for students to engage in their task performance. However, students' goal adoption should be more dynamic and situated than single function of personal traits.

Based on self-determination theory (Ryan & Deci, 2000), intrinsic and extrinsic motivations are induced from the reasons for engagement. Intrinsic motivation indicates the tendencies toward assimilation, mastery, self-generated interest, and exploration. Extrinsic motivation, on the other hand, is related to the performance toward certain

outcomes. As Eccles and Wigfield (2002), and Wigfield and his colleagues (Wigfield et al., 2006) described the components of modern expectancy-value models:

- are "connected to a wide range of psychological and social/cultural determinants" (p. 938)
- have positive relationships to each other.
- "directly influence performance, persistence, and task choice" (p. 938).
- are "influenced by task-specific beliefs" (p. 939).

Additionally, Eccles and colleagues (Eccles, Adler, Futterman, Goff, Kaczala, Meede, &Midgley, 1983) define self-perceived beliefs as personal assessments of their competence in different areas. While the ability beliefs are conceived as broad beliefs about competence in a specific domain, expectancies for success are defined as personal beliefs about one's competence on a specific upcoming task. However, the researchers maintained that the differentiated functions between these two levels of beliefs for children and adolescents have not shown in empirical research. By contrast, the researchers delineate four elements of task-value:

- Attainment value as " personal importance of doing well on the task" (p. 89)
- Intrinsic value as the enjoyment of task
- Utility value as the relationship between task and future goals
- Cost as the "amount of effort for success" (p. 94).

Schunk and Zimmerman (2008) describe the key constructs of motivation and their roles in SRL as precursor (e.g., goal orientation, task values, self-efficacy, gender and cultural identity), mediators (e.g., goal setting and self-reactions, volition, social

motivation), and concomitant or exclusive outcomes (causal attributions, goal setting and self-reactions). Most of the motivational constructs play multiple roles in the process of SRL.

In sum, I integrated the various motivational components for academic performance into the most commonly principal constructs: self-efficacy, task interest, task value, goal orientations, volition (i.e., effort and persistence), and causal attributions. These motivational components work not only for foregoing agents SRL but also for ongoing processes during SRL to reach academic outcomes.

**Self-regulated learning.** SRL is processing at the conjunction of cognition, motivation, and behavior involving reciprocal iterations of cognitive, metacognitive, and motivational functions (Boekaerts, 1996; Pintrich, 2000; Zimmerman & Moylan, 2009). Boekaerts (1996) develop the model of SRL with six components that are bifurcated into the cognitive information processing system and the motivational-emotional system and positioned at three levels:

- Content domain and meta-cognitive knowledge and motivational beliefs in the level of domain specific knowledge
- Cognitive strategies and motivation strategies in the level of strategy use
- Cognitive regulatory strategies and motivational regulatory strategies in the level of goals.

Corno (2001) emphasizes volitional aspects of SRL other than just cognitive and motivational functions in SRL. The theory of volition differentiates volition from motivation, considering motivation as the generator of impulse or intention to act and

volition as the controller of intentions and impulses to trigger actions (Corno, 2001). Pintrich (2000) suggested a SRL model, assuming that self-regulated learners set their learning goals, monitor their learning processes, and control their cognition, motivation, and behavior as directed by their goals and environmental features. Pintrich's (2000) model of SRL is divided into four phases: forethought, monitoring, control, and reaction and reflection. Cognition, motivation/affect, behavior, and context were components of each phase:

- Cognition includes cognitive and metacognitive strategies, and knowledge of both content and strategy.
- Motivation and affect comprise self-efficacy beliefs, task values, and motivational strategies for volitional and emotional control to regulate motivation and affect.
- Behavior as the general effort for the successful task performance includes persistence, help seeking, and choice of behaviors.
- Context involves task types and environmental features.

Zimmerman (1986, 1995, 2008) described that learners manage their SRL based on three operating mechanisms:

- Motivational SRL comprises self-perceived competence, self-efficacy and autonomy.
- Metacognitive SRL consists of planning and organizing students' academic activities such as cognitive and metacognitive strategy use.
- Behavioral SRL includes managing efforts and utilizing environmental resources such as time and help seeking to achieve their academic goals.

Further, Zimmerman and Moylan (2009) proposed the social cognitive model of SRL where personal feedback loops operate cyclically in students' SRL based on social, environmental, and personal functions. They suggested the cyclic system should have three phases:

- Forethought phase involves motivational sources leading students' efforts to their SRL, and includes task analysis (e.g., goal setting, strategic planning) and self-motivation beliefs (e.g., self-efficacy, goal orientation).
- Performance phase involves processes occurring during learning, and includes self-control (e.g., Task Strategies, Time Management, help seeking) and self-observation (e.g., metacognitive monitoring, self-recording).
- Self-Reflection phase involves operations following learning efforts but impacting students' reactions to their learning experiences, and includes self-judgment (e.g., self-evaluation, causal attribution) and self-reaction (e.g., self-satisfaction).

As suggested in those social cognitive theories, SRL indicates multidimensionality and encompasses self-regulatory functions and motivational agents as well, regardless of the distinct dimensions between motivation and SRL. As derived from the motivation components above, SRL as self-regulatory functions should converge into: motivation strategy; effort and persistence; cognitive and metacognitive strategies; time and environmental resource management; and peer learning and help seeking.

Additionally, considering that the quality of the measures that were employed for studies may affect researchers' understanding of domains of motivation and SRL

(Sitzmann & Ely, 2011), I detected the characteristics of the three representative instruments, and described the construct specifications in the next section.

*Review of the Representative Instruments*

There were three the most frequently employed in the 63studies reviewed for this systematic literature review: The MSLQ (Pintrich, et al., 1991), the Patterns of Adaptive Learning Survey (PALS) (Midgley, Maehr, Hruda, Anderman, Anderman, Freeman, Gheen, Kaplan, Kumar, Middleton, Nelson, Roeser, &Urdan, 2000), and the Students' Approaches to Learning (SAL) instrument constructed by Organization for Economic Cooperation and Development (OECD) (Marsh, Hau, Artelt, Baumert, & Peschar, 2006). The MSLQ comprises two sections of motivation and learning strategies, and was the most frequently employed (25studies). The Motivation section has three sub-scales: Value (e.g., intrinsic/extrinsic goal orientation, task value), Expectancy (e.g., control beliefs, self-efficacy), and Affective (e.g., test anxiety). The Learning Strategy section has two subscales: Cognitive and Metacognitive Strategies (e.g., rehearsal, elaboration, organization, critical thinking, metacognitive self-regulation), and Resource Management Strategies (e.g., time and study environment, effort regulation, peer learning, help seeking). As the construct specification in MSLQ is so inclusive as to encompass both motivation and SRL, the measurement underlies most constructs in the heuristic framework.

The PALS (Midgley et al., 2000), which provides separate versions for students and teachers, was adopted for eight studies. The student scales are: student's perceptions of personal and teacher's Goal Orientations (e.g., mastery, performance-approach,

performance-avoid), Classroom Goal structures (e.g., mastery, performance-approach, performance-avoid), Academic-Perceived Beliefs and Strategies (e.g., academic efficacy, press, self-handicapping, avoiding novelty, disruptive behavior, success), and Perceptions of Parents, Home life, and Neighborhood (e.g., parent's goal orientations, dissonance between home and school). The teacher scales are: teacher's perceptions of School Goal Structure for Students (e.g., mastery, performance), Approaches to Instruction (e.g., mastery, performance), and Personal Teaching Efficacy. As the measurement focuses on goal orientations, the construct specification is very limited.

Even though only six studies adopted the SAL, the sum of participants for those studies was 115,839 of 256,698 (45%).The SAL comprises 14 factors to estimate SRL strategies, self-beliefs, motivation, and learning preferences (Marsh et al., 2006). Of 14 scales, 12 scales are focusing on Cognitive and Metacognitive Learning Strategies (e.g., elaboration, memorization, control strategies); Motivational Preferences (e.g., interest in reading/mathematics, instrumental motivation, effort and persistence); and Self-Related Cognitions and Beliefs (e.g., verbal/math self-concept, academic self-concept, self-efficacy, control expectations). The two scales measure Learning Preferences of Learning Situations (i.e., cooperative and competitive learning preferences). The scales of SAL are so specific to be overlapped in constructs. For example, the constructs of verbal/math, academic self-concept, and control expectancy are very similar with self-efficacy.

In order to derive the standard of the constructs on motivation and SRL, I extracted the commonalities by examining the various constructs with various terms and

items underlying in those frameworks. I found 104 scales employed for the reviewed studies and integrated them into the 11 constructs described below.

### *The Heuristic Framework of Motivation and SRL*

I constructed a heuristic framework of motivation and SRL with 11 essential constructs that serve as foregoing agents, ongoing mechanisms, and self-reflecting appraisal. Table 3 presents the information of the specified constructs including the definitions, scales, and sample items on each construct. Foregoing agents are motivational sources that trigger their students' volitional efforts for their learning performance and initiate their learning processes. Foregoing agents fall into five motivational constructs: self-efficacy (SE), interest and task value (IV), goal orientations of intrinsic goal (IG) and extrinsic goal (EG), and test anxiety (TA). Ongoing

Table 3

*Motivation and SRL Constructs*

| Construct | Definition | Scales on the Construct | Sample Item | # of Studies (/62) |
|---|---|---|---|---|
| **Foregoing Agent** | | | | |
| SE | Personal expectations and beliefs about one's abilities to accomplish a task | Eight Scales: Academic Self-Concept, Academic Self-Efficacy, Cognitive Competence, Control Expectation, Expectancy, Self-Concept, Self-Confidence, Self-Esteem | Academic Self-Efficacy (MSLQ): I am sure that I can do an excellent job on the problems and tasks assigned for this class<br>Control Expectation (SAL): If I decide not to get any problems wrong, I can really do it | 40 |
| IV | Students' interests and task values for learning | Eight Scales: Attitude, Choice, Interest Enhancement, Interest in school, Interest, Motivation, Task Value, Instrumental Motivation | Task Value (MSLQ): I like what I am learning in this class<br>Interest (Artelt, Baumert, Julius-McElvany, & Peschar, 2003): When I read, I sometimes get totally absorbed. | 34 |

Table 3

*Continued*

| Construct | Definition | Scales on the Construct | Sample Item | # of Studies (/62) |
|---|---|---|---|---|
| | *Goal Orientation* | | | |
| EG | Students' learning reasons as means for outcomes such as grades, rewards, and exhibitive competence | 14Scales: Autonomous Performance Goal, Competitive Goal, Controlled Performance Goal, Educational Goal, Ego Orientation, Extrinsic Motivation, Goal Investment, Performance Avoidance, Performance Avoidance Structure, Performance Goal Structure, Performance Goal, Relative Ability Goal, Social Motivation, Work Avoidance Goal | Extrinsic Motivation (PALS): The main reason I do my work is because we get grades. Performance Goal (Elliot & McGregor,2001): To me it is important that I outperform other students in this class. | 31 |
| IG | Students' challenge, curiosity, mastery, and learning as an end all to itself | Seven scales: Intrinsic Motivation, Intrinsic Value, Learning Goal, Mastery Avoidance, Mastery Goal Structure, Mastery Goal, Task Orientation | Learning Goal (PALS): In this class, understanding the work is more important to me than the grade I get. Mastery Goal (Elliot & McGregor's, 2001): I want to learn as much as possible from this class. | 36 |

Table 3

*Continued*

| Construct | Definition | Scales on the Construct | Sample Item | # of Studies (/62) |
|---|---|---|---|---|
| TA | Students' affective reactions to a task, and usually the worry of negative thoughts disrupting performance | Three Scales: Negative Affect, Test-Anxiety, Coping Focused on Emotion | Test Anxiety (Spielberger, 1980): My thoughts about failure distract me from focusing efficiently on questions in a test | 15 |
| **Ongoing Mechanism** | | | | |
| MS | students' selection and adaptation to manage motivation and emotion | 10 Scales: Emotional Regulation, Enhancement of Situational Interest, Mastery Self-Talk, Non-Productive Coping, Performance Self-Talk, Self-Consequating, Self-praise, Success encouragement, Task-value encouragement, Enhancement of Personal Significance | Self-Consequating (Schwinger, Laden,& Spinath,2007): I tell myself that after work I can do something nice, if I first keep on learning now. Mastery Self-Talk (Wolters, 1998): I tell myself that I should keep working just to learn as much as I can. | 7 |
| EP | Students' volitions and willingness and driven into purposeful behaviors toward successful accomplishment | Five Scales: Coping Focused on Solving the Problem, Effort & Persistence, Effort, Homework-Engagement, Persistence | Effort & Persistence (MSLQ): When the work in math is difficult, I give up (Reversed). | 17 |

Table 3

*Continued*

| Construct | Definition | Scales on the Construct | Sample Item | # of Studies (/62) |
|---|---|---|---|---|
| CM | Students utilize strategy use during their learning experiences to accomplish academic tasks. | 33 Scales: Attention Regulation, Awareness, Control Strategies, Checking and Correcting, Class-Engagement, Cognitive Strategy Use, Concentration, Control Strategies, Critical Thinking, Deep Strategy, Elaboration, Eliciting Context, Information Processing, Learning Strategy, Memorizing, Meta-Cog., Monitoring Content, Organization, Planning, Planning Ahead, Proximal Goal Setting, Reader awareness, Reading Strategy, Rehearsal, Selecting Main Ideas, Self-Checking, Self-Discipline, Self-evaluation, Self-Regulation, Study Approach, Surface Processing Strategy, Test Taking Strategies, Understanding, Verbalization | Planning (Malpass, 1994): I made sure I understood just what had to be done and how to do it<br>Cognitive Strategy Use (O'Neil, Baker, Ni, Jacoby, & Swigger, 1994): I use multiple thinking techniques or strategies to solve a problem.<br>Control Strategies (SAL): When I study, I start by figuring out exactly what I need to learn. | 54 |

Table 3

*Continued*

| Construct | Definition | Scales on the Construct | Sample Item | # of Studies (/62) |
|---|---|---|---|---|
| | *Behavior Management* | | | |
| TE | Students arrange time and environmental contingencies for efficiency to gain successful achievement. | Four Scales: Academic Delay Gratification, Procrastination, Time & Study Management, Environmental Control | Time Management (MSLQ): When I learn math, I make good use of my study time.<br>Academic Delay Gratification (Bembenutty & Karabenick, 1998): I do my homework before I meet my friends. | 12 |
| PH | Students can understand course materials more clearly and insightfully through collaborative learning with peers and help from the advanced peers and teachers | Four Scales: Cooperative, Coping with Reference to Others, Help Seeking, Peer Learning | Cooperative Learning (SAL): I like to work with other students.<br>Help Seeking (MSLQ): I ask the instructor to clarify concepts I don't understand well | 6 |

Table 3

*Continued*

| Construct | Definition | Scales on the Construct | Sample Item | # of Studies (/62) |
|---|---|---|---|---|
| **Self-Reflecting Appraisal** | | | | |
| AB | Students' judgment on the causes of outcomes such as their ability, effort, task difficulty and luck | Eight Scales: Ability Attribution, Control of Learning Beliefs, Effort Attribution, External Attribution, Locus of Control, Personal Control Belief, Strategy Attribution, Learned Helplessness | Control of Learning Beliefs (MSLQ): It is my own fault if I don't learn the material in this course.<br>Locus of Control (Trice, 1985): Grades most often reflected the effort you put into classes. | 12 |

*Note.* SE = self-efficacy; IV = interest & task value; EG = extrinsic goal; IG = intrinsic goal; TA = test anxiety; MS = motivational strategy; CM = cognitive and metacognitive strategy; TE = time and environmental management; PH = peer learning & help seeking; AB = attribution.

mechanisms involve students' strategies for efficiently managing their internal and external resources while engaging in studying. Students utilize motivational strategies to enhance their effort and persistence. Then they employ cognitive and metacognitive strategies to exert their cognitions, and direct their behaviors to manage their time and environment. If necessary, they also seek help from peers and the advanced persons for their successful learning performance. The five motivational and regulatory constructs are presumed as ongoing mechanisms: Motivation Strategy (MS), Effort and Persistence (EP), Cognitive and Metacognitive Strategy (CM), Behavior Management including Time and Environment Management (TE), and Peer Learning and Help Seeking (PH). The self-reflecting appraisal involves students' reactions to their learning outcomes, contributing to the changes in those constructs of foregoing phase, which implies their mutual and cyclic functions. Attribution (AB) is the only self-reflecting appraisal. The constructs that were the most frequently adopted for the reviewed studies were CM (54), SE (40), IG (36), IV (34), and EG (31) in order.

**Foregoing agents.** Foregoing agents are anticipatory for activating their motivational sources and volitions influencing students' preparation, willingness, and adaptation to their SRL (Zimmerman & Moylan, 2009). According to expectancy-value theory (Eccles & Wigfield, 2002; Wigfield et al., 2006), students' expectancy (e.g., self-efficacy), task value (e.g., interest, importance, utility), and goal orientations (e.g., intrinsic and extrinsic goal) should push them to making efforts and purposeful behaviors for successful attainment of tasks. Therefore, most constructs of expectancy and task value should be subject to the foregoing agents.

***Self-efficacy***. SE refers to personal expectations and beliefs about one's abilities to accomplish a task (Eccles & Wigfield, 2002; Pintrich, 2003; Schunk & Zimmerman, 2008; Wigfield et al., 2006; Zimmerman & Moylan, 2009). Many of the reviewed studies (40/62: 65%) adopted 8 scales on SE. Bandura (1982) proposed two different types of learners' beliefs on a task, and one is the beliefs about their SRL competence labeled as SE and the other is their expectations of outcomes through those competence labeled as outcome expectations. Many studies (e.g., Bandura, 1982; Pajares, 1996; Sitzmann & Ely, 2011; Zimmerman, 1995a; Zimmerman & Moylan, 2009) have shown that SE is one of the most substantial factors on students' motivational and behavioral preferences such as goal orientations, choice of activities, and cognitive efforts and persistence throughout their SRL which, in turn, leads students to achieve their learning outcomes. All of three measures (i.e., MSLQ, PALS, SAL) most frequently adopted for the reviewed studies include the scales on SE. Particularly, the factors of Academic Self-Concept, Self-Concept in specific subjects (i.e., reading, mathematics), Control Expectation, and Perceived Self-Efficacy in the SAL instrument were integrated into the construct of SE because those factors commonly reflect students' beliefs and expectations about their abilities to accomplish learning tasks.

***Interest and task value***. IV implies students' interests and task values for learning. Interest represents a source of task enjoyment and induces spontaneous willingness for task performance, and task value infers students' perceptions of the importance and utility of task performance (Eccles & Wigfield, 2002; Pintrich& Groot, 1990; Schunk & Zimmerman, 2008; Wigfield et al., 2006). IV is a predictor of students'

volitional efforts and persistence for tasks (Schunk & Zimmerman, 2008). The MSLQ and the SAL include items on IV, and also the scale of Instrumental Motivation in the SAL was aggregated into IV as the scale implies the utility of tasks. The PALS doesn't comprise IV in the revised scale because the instrument focuses on goal orientations other than specific behaviors or interests (Midgley et al., 2000). A considerable number (34/62: 55%) of studies employed 8 scales to measure IV.

***Goal orientations.*** Goal orientation addresses why students are learning for the purpose of learning. IG orientation involves students' challenge, curiosity, mastery, and learning as an end all to itself, while EG orientation concerns students' learning reasons as means for outcomes such as grades, rewards, and exhibitive competence (Pintrich et al., 1991). A considerable number of the reviewed studies adopted 7 scales on IG (36/62: 58%) and 14 scales on EG (31/62: 50%). Goal orientations are also significantly linked to students' strategic preferences (Zimmerman & Moylan, 2009). For example, those students' with high-leveled goal orientations tend to choose and employ effective learning strategies. The MSLQ includes the items of IG and EG. Even though the SAL does not include the items directly on goal orientations, the items of Competitive Learning fall into EG as they concern students' exhibitive competence. Moreover, the PALS has more specific scales on goal orientations: Students' Personal and Perception of Teacher Goal Orientations, and Class Goal Structures by Mastery, Performance Approach, and Performance Avoidance. Therefore, the goal orientations toward Mastery were combined in IG, and those toward Performance Approach/Avoidance were merged in EG.

***Test anxiety.*** TA refers to students' affective reactions to a task, and usually the worry of negative thoughts disrupting performance, and should be reduced by training for effective learning strategy use (Pintrich & Groot, 1990). The relationship of TA with students' SRL is not as straightforward as the connections of SE, GO, and IV with SRL. The MSLQ includes the items of TA, but the SAL and PALS don't comprise any scale on TA. The adaptation portion for TA of the reviewed studies was moderate (15/62: 24%) using 3 scales.

**Ongoing mechanism.** Ongoing mechanisms embrace students' ongoing activities, which are more dynamic and process-oriented. Students are planning, monitoring, and controlling their learning activities in terms of motivation, cognition, and behaviors during their SRL (Pintrich, 2000; Zimmerman & Moylan, 2009). Therefore, the ongoing mechanisms encompass most constructs of SRL including MS, EP, CM, and behavioral management of TE and PH.

***Motivation strategy*.** MS involves students' selection and adaptation of strategies such as self-consequence setting rewards or punishment contingencies for oneself (Zimmerman & Moylan, 2009) and mastery/performance self-talk to manage motivation and emotion (Pintrich, 2000). Students are reinforcing the current motivational bases and averting negative emotions such as test anxiety and depression (Eccles & Wigfield, 2002; Wigfield et al., 2006). Only seven of the reviewed studies (7/62: 11 %) adopted 10 scales on MS, and only the PALS includes one scale of Self-Handicapping Strategies as a motivational strategy.

***Effort and persistence.*** Effort and persistence are the most prevalent indicators of motivation (Pintrich, 2000). EP should be drawn from students' volitions and willingness and driven into purposeful behaviors toward successful accomplishment (Pintrich, 2000; Zimmerman & Moylan, 2009). Corno (2001) emphasized volitional functions of efforts on SRL because students deepen and manipulate their cognitive knowledge, and monitor and improve their learning processes by putting efforts forth. A moderate number of the reviewed studies (17/62: 27%) addressed EP employing 5 scales. Although some studies applied effort and persistence to separate the constructs from each other, the items on each construct were very similar indicating students' volitions for their success in task performance. The MSLQ includes the scale of Effort Regulation while the SAL instrument comprises the scale of Effort and Perseverance.

***Cognitive and metacognitive Strategy.*** Students utilize CM during their learning experiences to accomplish academic tasks. Cognitive strategies include rehearsal, elaboration, structuring, and critical thinking. Metacognitive strategies involve planning purposeful activities, controlling their cognition, and monitoring performance processes and outcomes (Boekaerts, 1996; Pintrich & Groot, 1990; Zimmerman & Moylan, 2009). Despite the conceptual difference between cognition and metacognition, they should be integrated into one construct because cognition works substantially with metacognitive functions (Pintrich & Groot, 1990; Sitzmann & Ely, 2011). Most of the reviewed studies (54/62: 87%) adopted 33 scales on CM. The MSLQ includes CM of five subscales: rehearsal, elaboration, organization, critical thinking, and metacognitive self-regulation. The SAL comprises Learning Strategies of 4 subscales on CM: Memorizing,

Elaboration, Transformation, and Control Strategies. The PALS does not address the items on CM.

***Behavior management.*** Students behaviorally manage their external resources such as time, environment, and help from peers and teachers.

*Time and environment management.* Students arrange time and environmental contingencies for efficiency to gain successful achievement. Students move away from disturbances such as noise and games and utilize relevant tools such as internet and dictionary (Corno, 2001). The 12 of the reviewed studies (12/62: 19 %) addressed TE adopting 4 scales. Only the MSLQ includes the scale on TE.

*Peer learning and help seeking.* Students can understand course materials more clearly and insightfully through collaborative learning with peers. Also, students may solve difficult problems and reach the higher-level knowledge with help from the advanced peers and teachers (Pintrich et al., 1991). Only six of the reviewed studies (6/62: 10%) applied PH adopting 4 scales. The MSLQ comprises the scales of Peer Learning and Help Seeking, and the SAL instrument includes the scale of Cooperative Learning. The PALS does not address the scale on PH.

**Self-reflecting appraisal.** Zimmerman and Moylan (2009) described students evaluate their leaning outcomes comparing with a standard (i.e., self-evaluation) that greatly affects their perceived efficacy and subsequent motivation implying cyclic interactions. Also, students judge the cause for the outcomes (i.e., attribution) that is directly reflected to their motivation and choice of behaviors. Only a single construct of AB constitutes the self-reflecting appraisal in the current review.

***Attribution.*** AB refers to students' judgment on the causes of outcomes such as their ability, effort, task difficulty and luck (Eccles & Wigfield, 2002; Wigfield et al., 2006)**.** Adaptive students tend to attribute their failures to controllable factors such as low efforts or poor-strategy use other than uncontrollable causes such as lack of abilities and task difficulty (Pintrich, 2000). A fair number of the reviewed studies (12/62: 19 %) adopted 8 scales on AB. In the MSLQ, the items on Control Beliefs indicate students' beliefs on effort attribution for their outcomes (e.g., "If I don't understand the course materials, it is because I did not try hard enough."). Therefore, even though the scale label of Control Beliefs may seem to less relevant to AB and was specified into one of the Expectancy Components as a foregoing agent, the scale was categorized to AB of self-reflecting appraisal in the present review, which may be induced from the reciprocal periodicity of SRL operations. The SAL inventory includes the scale of Implicit Theories of Learning including subscales of Stability, Effort, and Ability that concerns students' causal attributions.

*Study Characteristics*

Table 4 shows the descriptive statistics of the study characteristics. Of the 62studies from 60articles, 47studies (76 %) were published in the last decade since 2000. The participants were almost divided by gender, and 28 studies (45 %) included 5 % to 49 % male. None of the studies had fewer than 5% male or female students. The samples of 23 studies (37 %) and 24studies (39 %) came from middle and high schools, respectively. The students with normal academic ability were the subjects of 54 studies

(87%); gifted students and students at risk participated in only 3 (5 %) and 4 studies (6 %), respectively.

Table 4

*Descriptive Statistics of the Reviewed Studies*

| Variables | | Frequency (# of studies) | % |
|---|---|---|---|
| Pub-Year | 1988 | 1 | 2 % |
| | 1990-1999 | 14 | 23 % |
| | 2000-2009 | 26 | 42 % |
| | 2010-2013 | 21 | 34 % |
| Gender % | Less than 5% male | 0 | 0 % |
| | 5% to 49 % male | 28 | 45 % |
| | 50 % male | 4 | 6 % |
| | 51 % to 95% male | 23 | 38 % |
| | More than 95% male | 0 | 0 % |
| | Not reported | 7 | 11 % |
| School | Mid | 23 | 37 % |
| | High | 24 | 39 % |
| | Post-Secondary | 15 | 24 % |
| Academic Ability Level | At Risk | 4 | 6 % |
| | Gifted | 3 | 5 % |
| | High and Low | 1 | 2 % |
| | Normal | 54 | 87 % |
| Theoretical Frameworks for MV & SRL | Social Cognitive | 25 | 40 % |
| | Self-Determination Theory | 5 | 8 % |
| | Expectancy | 4 | 6 % |
| | Self-Regulation Theory by Boekaerts | 3 | 5 % |
| | Others | 4 | 6 % |
| | Not Reported | 24 | 39 % |
| Inventory | MSLQ | 25 | 40 % |
| | PALS | 8 | 13 % |
| | SAL | 7 | 11 % |
| | Others | 35 | 56 % |
| | Not Reported | 1 | 2 % |

Table 4

*Continued*

| Variables | | Frequency (# of studies) | % |
|---|---|---|---|
| # of adopted Constructs | 1-3 | 24 | 39 % |
| | 4-9 | 37 | 60 % |
| | 10 | 1 | 2 % |
| Relationship with | ANOVA | 4 | 6 % |
| Academic Achievement | Regression | 11 | 18 % |
| | Correlation | 47 | 76 % |
| # of Relations with | 1 | 1 | 2 % |
| Academic Achievement | 2-10 | 47 | 76 % |
| | 11-30 | 11 | 18 % |
| | 31-50 | 2 | 3 % |
| | 60 | 1 | 2 % |

The theoretical framework of 25studies (40 %) was based on the social cognitive perspectives. while 24 studies (39 %) did not describe their theoretical backgrounds. Other theories included self-determination theory ($n$ = 5, 8 %), expectancy theory ($n$ = 4, 6 %), and self-regulation theory by Boekaerts ($n$ = 3, 5 %). seven studies were based on multiple theories. By contrast, no theoretical background was provided for 24 studies (39 %).

A considerable number of studies employed multiple inventories to measure the constructs. The MSLQ, PALS, and SAL were employed for 25 (40 %), 8 (13 %), and 7 studies (11 %) respectively. Other measures were used in 35 studies (56 %). Of the 11 constructs specified in the heuristic framework for this review, 24 (39 %), 37(60 %), and one (2 %) studies employed one to three, four to nine, and 10 of the constructs respectively. No studies that included all of 11 constructs were found.

Most studies (*n* = 47/62, 76 %) reported the correlation coefficients of the constructs with academic achievement; analyses of variance were reported in four studies (6 %), regression analyses in 11 (18 %). Regarding the number of the relationships reported in studies through those analyses, 47 studies (76 %) yielded two to ten relationships, and 11 studies (18 %) produced 11 – 30 relationships. A few studies yielded 31 to 50 (2/62, 3%) or 60 relations (1/62, 1.6%). Moreover, as specified in the heuristic framework, each construct includes multiple subscales. Therefore, many studies addressed multiple subscales of single constructs, and yielded multiple relations with academic achievement for single constructs.

### *Methodological Quality*

Table 5 shows the MQS criteria and the frequency distributions of the 62 studies on each criterion. The MQS ranged 10 to 21 of the full score 24 with a mean of 14.79 and standard deviation of 2.50. As stated in the heuristic framework, more studies (*n* =41, 66 %) did not differentiate the constructs between motivation and SRL than the studies that classified the constructs of motivation and strategy use other than SRL. Nearly two-thirds of the studies (*n* = 39, 63%) addressed subject-domain specificity. While 57

studies (92%) reported the reliability of internal consistency for the constructs of motivation and SRL, only 13 studies (21 %) reported the reliabilities for academic outcomes. Twenty-one studies (34 %) reported construct validity for the adequacy of measurement. As parametric statistical analyses are based on assumption such as a normal distribution of the data, it is important to report a data distribution in a study (Thompson, 2008). Though many studies (55, 89 %) reported sampling distributions of mean and standard deviation, but only 10 studies (16 %) described specific information about the normality of their sample distributions. Moreover, despite the effects of missing data on statistical results (Marsh et al., 2006), 48 studies (77 %) did not inform how missing data were handled. As stated in the study characteristics, a moderate number of studies ($n$ = 24, 39 %) did not present the theoretical frameworks of the constructs. The seven studies (11 %) conducted longitudinal analysis. As expected, a considerable number of studies ($n$ = 47, 76 %) used convenience samples, while 8 studies (13 %) selected their samples in a random or systematic random, and 3 studies (5 %) did not report their sampling techniques. More than half of studies ($n$ = 33, 53%) had large samples more than 300 participants, 22 studies (35 %) had samples between 100 and 300, and seven studies (11 %) had samples of less than 100. All studies were correlational, so no study used univariate statistics. Most of studies conducted multiple or logistic regression analyses ($n$ = 22, 35 %), or employed multivariate statistics ($n$ = 35, 56 %) such as canonical correlation, path analysis, and structural equation modeling (SEM).

Table 5

*The Methodological Quality Score Criteria and Distributions for the 51 Reviewed Studies*

| Variables of Methodological Characteristics | Scoring options (Maximum total score 24 points) | # of studies | % |
|---|---|---|---|
| Construct Classifications into Motivation and SRL | Unspecified = 1 point | 41 | 66 % |
| | Specified = 2 points | 21 | 34 % |
| Subject-Domain Specificity | General = 1 point | 23 | 37 % |
| | Subject Specific = 2 points | 39 | 63 % |
| Report of Reliabilities for the Scales on Motivation and SRL | Not reported = 0 points | 5 | 8 % |
| | Reported = 1 point | 57 | 92 % |
| Report of Reliabilities for Academic Outcomes | Not reported = 0 points | 49 | 79 % |
| | Reported = 1 point | 13 | 21 % |
| Report of Validities | Not reported = 0 points | 41 | 66 % |
| | Reported = 1 point | 21 | 34 % |
| Descriptions of Data Distribution | Not reported = 0 points | 7 | 11 % |
| | Mean and Standard Deviation Reported = 1 point | 45 | 73 % |
| | Mean, Standard Deviation, and Normality Reported = 2 points | 10 | 16 % |
| Addressing Missing Data | Not reported = 0 points | 48 | 77 % |
| | Reported = 1 point | 14 | 23 % |
| Theoretical Frameworks | Not reported = 0 points | 24 | 39 % |
| | Reported = 1 point | 38 | 61 % |
| Research Design | Correlational/Cross-sectional Design = 1point | 55 | 89 % |
| | Longitudinal Design = 2 points | 7 | 11 % |
| Sampling Method | Cannot tell = 0 points | 3 | 5 % |
| | Non-random, convenience = 1 point | 47 | 76 % |
| | Non-random, post hoc matching = 2 points | 1 | 2 % |
| | Random after matching, stratification, blocking, etc.= 3 points | 3 | 5 % |
| | Random, simple (also includes systematic sampling) = 4 points | 8 | 13 % |

Table 5

*Continued*

| Variables of Methodological Characteristics | Scoring options (Maximum total score 24 points) | # of studies | % |
|---|---|---|---|
| Sample Size | Small sample (<100) = 1 point | 7 | 11 % |
| | Medium sample ( ≤ 100 and < 300) = 2 points | 22 | 35 % |
| | Large sample ( ≥ 300) = 3 points | 33 | 53 % |
| Statistical Techniques | Univariate statistics/descriptive = 1 point | 0 | 0 % |
| | Bivariate statistics/ANOVA = 2 points | 5 | 8 % |
| | Multiple/logistic regression = 3 points | 22 | 35 % |
| | Multivariate statistics (canonical correlation/ path analysis/ SEM = 4 points | 35 | 56 % |

### *Statistical Significances of the Constructs of Motivation and SRL for Academic Achievement*

I examined the distribution of statistical significances of the relationship between the 11 constructs based on the heuristic framework and academic performance. Table 6 reports the distribution of the statistical significances on the relationships between 11 constructs and learning outcomes. The reviewed studies yielded 578 findings for the subscales of single constructs. The findings indicate positive ($k$ = 329, 56.92 %), negative ($k$ = 69/329, 11.94 %), and no statistically significant ($k$ = 180/329, 31.14 %) associations of the various scales on motivation and SRL with academic outcome. Regarding the dimensions of motivation and SRL, the foregoing agent ($k$ = 192/323,

59.44 %) showed the most frequency of the positive relationship with academic outcome and the ongoing mechanism ($k$ = 132/238, 55.46 %) closely followed, exceeding the frequency of negative or no statistically significant relationship. Notably, the highest number of positive relations with academic performance were found for SE ($k$ = 83/96, 86.46 %), EP ($k$ = 23/27, 85.19 %), or IV ($k$ = 42/56, 75 %). No inverse relationship was found for IV; and EP.

Table 6

*Distribution of the Statistical Significances on the Relationships between 11Constructs and Learning Outcome*

| Construct | Nature of Findings/Relationship | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Positive | | Negative | | No Relationship | | Total | |
| | *k* | % | *k* | % | *k* | % | *k* | % |
| **Foregoing Agent** | ***192*** | ***59.44*** | ***48*** | ***14.86*** | ***83*** | ***25.70*** | ***323*** | ***55.88*** |
| SE | 83 | 86.46 | 5 | 5.21 | 8 | 8.33 | 96 | 16.61 |
| IV | 42 | 75.00 | 0 | 0.00 | 14 | 25.00 | 56 | 9.69 |
| EG | 27 | 31.76 | 24 | 28.24 | 34 | 40.00 | 85 | 14.71 |
| IG | 38 | 62.30 | 0 | 0.00 | 23 | 37.70 | 61 | 10.55 |
| TA | 2 | 8.00 | 19 | 76.00 | 4 | 16.00 | 25 | 4.33 |
| **Ongoing Mechanism** | ***132*** | ***55.46*** | ***17*** | ***7.14*** | ***89*** | ***37.39*** | ***238*** | ***41.18*** |
| MS | 2 | 14.29 | 3 | 21.43 | 9 | 64.29 | 14 | 2.42 |
| CM | 99 | 56.25 | 10 | 5.68 | 67 | 38.07 | 176 | 30.45 |
| EP | 23 | 85.19 | 0 | 0.00 | 4 | 14.81 | 27 | 4.67 |
| TE | 7 | 50.00 | 2 | 14.29 | 5 | 35.71 | 14 | 2.42 |
| PH | 1 | 14.29 | 2 | 28.57 | 4 | 57.14 | 7 | 1.21 |
| **Self-Reflecting Appraisal** | ***5*** | ***29.41*** | ***4*** | *23.53* | ***8*** | *47.06* | ***17*** | ***2.94*** |
| AB | 5 | 29.41 | 4 | 23.53 | 8 | 47.06 | 17 | 2.94 |
| **Total** | **329** | **56.92** | **69** | **11.94** | **180** | **31.14** | **578** | **100** |

*Note*. SE = self-efficacy; IV = interest & task value; EG = extrinsic goal; IG = intrinsic goal; TA = test anxiety; MS = motivational strategy; CM = cognitive and metacognitive strategy; TE = time and environmental management; PH = peer learning & help seeking; AB = attribution.

*k* = # of findings for the subscales of single constructs.

*Correlations between the Proceeding Constructs and Academic Achievement*

I excluded 15 studies (24 %) that did not report correlations. Additionally, a study with extremely large sample size (Marsh et al., 2006, $n$ = 107,899) was left out for estimation of effect sizes when the deviance caused a major discrepancy between two analyses of including and excluding the large sample study (Hunter & Schmidt, 2004). Finally, 46 studies for 28,261 adolescents were investigated to compute meta-analytic correlations. The meta-analytic results of the validity coefficients of 11 constructs for academic achievement are provided in Table 7. As illustrated in the Hunter and Schmidt (2004), the meta-analytic information included: $r_{obs,}$ mean of observed score correlations weighted by sample size; $\rho$, mean of true score correlations weighted by sample size and corrected for study artifacts; $Var_{obs}$, variance of observed score correlations; $Var_{\rho}$, variance of true score correlations; $Var_{res}$, variance of observed correlations after removal of variance due to study artifacts; Percentage variance of observed correlations due to study artifacts; 95 % Confidence Interval of observed correlation; and 80 % CrI for true score correlation distribution.

Table 7

*Meta-Analytic Correlations between the Proceeding Constructs and Academic Achievement*

| Construct | *k* | Total *N* | $r_{obs}$ | ρ | $Var_{obs}$ | $Var_{\rho}$ | $Var_{res}$ | Variance due to artifacts (%) | 95% CI | | 80% CrI | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Lower | Upper | Lower | Upper |
| **Foregoing Agent** | | | | | | | | | | | | |
| SE | 31 | 19,880 | .31 | .48 | .03 | .07 | .03 | 9.95 | .24 | .37 | .13 | .83 |
| IV | 22 | 16,908 | .17 | .27 | .01 | .03 | .01 | 21.78 | .12 | .22 | .06 | .47 |
| EG | 25 | 13,011 | .01 | .02 | .03 | .07 | .02 | 7.42 | -.05 | .08 | -.31 | .36 |
| IG | 29 | 19,076 | .16 | .26 | .01 | .02 | .01 | 23.72 | .12 | .19 | .08 | .44 |
| TA | 13 | 11,810 | -.21 | -.35 | .04 | .10 | .03 | 6.52 | -.32 | -.11 | -.75 | .04 |
| **Ongoing Mechanism** | | | | | | | | | | | | |
| MS | 5 | 776 | .01 | .03 | .01 | .02 | .01 | 49.08 | -.08 | .12 | -.14 | .19 |
| CM | 43 | 25,728 | .16 | .26 | .01 | .03 | .01 | 20.62 | .12 | .19 | .06 | .47 |
| EP | 11 | 7,932 | .26 | .43 | .01 | .02 | .01 | 23.70 | .20 | .33 | .24 | .63 |
| TE | 11 | 4,451 | .05 | .08 | .04 | .11 | .04 | 6.37 | -.07 | .16 | -.34 | .49 |
| PH | 2 | 108,186 | -.01 | -.03 | .00 | .00 | .00 | 26.64 | -.02 | .00 | -.04 | -.01 |
| **Self-Reflecting Appraisal** | | | | | | | | | | | | |
| AB | 8 | 1,546 | .17 | .29 | .04 | .10 | .03 | 14.75 | .03 | .31 | -.11 | .69 |

*Note.* $r_{obs}$ = mean of observed score correlations weighted by sample size; ρ = mean of true score correlations weighted by sample size and corrected for study artifacts; $Var_{obs}$ = variance of observed score correlations; $Var_{\rho}$ = variance of true score correlations; $Var_{res}$ = variance of observed correlations after removal of variance due to study artifacts; SE = self-efficacy; IV = interest & task value; EG = extrinsic goal; IG = intrinsic goal; TA = test anxiety; MS = motivational strategy; CM =cognitive and metacognitive strategy; TE = time and environmental management; PH = peer learning & help seeking; AB = attribution.

The corrected correlations between the proceeding constructs and learning outcomes ranged from weak to strong. The strongest corrected correlations with learning outcome were found for SE (ρ = .48, *k* = 30, *N* = 19,880) of foregoing agents, and EP (ρ = .43, *k* = 11, *N* = 7,932) of ongoing mechanisms. The constructs showing moderate relationship with academic achievement were IV (ρ = .27, *k* = 22, *N* = 16,908); IG (ρ = .26, *k* = 29, *N* = 19,076); CM (ρ = .26, *k* = 43, *N* = 25,728); and AB (ρ = .29, *k* = 8, *N* = 1,546). The findings provide the evidences on pivotal roles of the motivation and SRL in academic performance.

On the other hand, test anxiety (ρ = - .35, *k* = 13, *N* = 11,810) rendered negative correlations and the size was large enough to caution against the hazard of test anxiety to learning. Noticeably, four constructs (i.e., EG, MS, TE, PH) presented the weakest correlations less than .10 with academic performance, and their confidence intervals included zero indicating statistically no significance. This finding was supportive of the suggestions in the studies (e.g., Credé & Phillips, 2011; Hong & O'Neil, 2001) that those constructs which are subject to contextual states other than stable traits tend to have weak correlations with learning outcomes.

The variance due to study artifacts less than 75 % that are coincident with large variance of true score correlations should indicate the presence of moderators (Credé & Phillips, 2011; Hunter & Schmidt, 2004). Also, variance of true score correlations is used to construct credibility intervals of true-score correlation distribution. The population variance of this meta-analysis extended .00 to .11, indicating some variations across the examined studies other than corrected artifacts. Therefore, I detected the

effects of the moderators (i.e., school level, domain specificity/general academy, and MQS) on the criterion correlations. Further, Hunter and Schmidt (2004) cautioned that other factors that were not addressed in meta-analysis should still cause inflation of population variance. Moreover, many studies included conceptual replications from single constructs with multiple subscales which yielded multiple correlations for a single construct in single studies. Then, those replications may cause the large variance of population (Hunter & Schmidt, 2004).

*Intra- and Inter-correlations among the Proceeding Constructs*

The disattenuated correlations among 11 constructs including intra- and inter-correlations are reported in Table 8. Most studies produced multiple correlations of single constructs, so I examined intra-correlations to test for internal consistency among multiple subscales of single construct. The strong intra-correlations enough for internal consistency were found for SE ($\rho = .86$, $k = 8$, $N = 5{,}705$), EG ($\rho = .64$, $k = 14$, $N = 7{,}904$), IG ($\rho = .79$, $k = 3$, $N = 820$), EP ($\rho = .79$, $k = 2$, $N = 714$), and CM ($\rho = .94$, $k = 21$, $N = 15{,}078$). I found moderate intra-correlation of MS ($\rho = .54$, $k = 3$, $N = 550$), weak intra-correlation of AB ($\rho = .39$, $k = 2$, $N = 292$), and no availability for IV, TA, TE, and PH. I speculated that the weakest convergence of AB was due to the inclusion of divergent scales on causal attribution such as internal attributions (i.e., ability, effort) and external attributions (i.e., luck).

Table 8

*Disattenuated Correlations among the Proceeding Constructs*

| Constructs | 1. SE | | 2. IV | | 3. EG | | 4. IG | | 5.TA | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *k* (*N*) | ρ | *k* (*N*) | ρ | *k*(*N*) | ρ | *k* (*N*) | ρ | *k* (*N*) | ρ |
| 1. SE | 8 (5,705) | .86 | | | | | | | | |
| 2. IV | 16 (14,567) | .58 | NA | | | | | | | |
| 3. EG | 11 (5,358) | .06 | 10 (5,376) | .28 | 14 (7,904) | .64 | | | | |
| 4. IG | 17 (12,605) | .58 | 10 (9,751) | .90 | 25 (12,310) | .28 | 3 (820) | .79 | | |
| 5.TA | 10 (9,813) | -.40 | 6 (8,279) | -.25 | 8 (4,488) | .24 | 9 (9,905) | -.52 | NA | |
| 6. MS | 1 (201) | .63 | 1 (88) | .54 | 4 (894) | .54 | 3 (663) | .60 | NA | |
| 7. EP | 5 (6,744) | .69 | 7 (7,022) | .70 | 8 (3,503) | .02 | 7 (3,314) | .65 | 2(1,887) | -.19 |
| 8. CM | 27 (18,438) | .66 | 16 (14,073) | .68 | 26 (12,492) | .23 | 29 (17,846) | .83 | 11(11,126) | -.15 |
| 9. TE | 3 (2,472) | .25 | 5 (3,033) | .37 | 8 (4,977) | .22 | 6 (3,091) | .50 | 2(1,887) | -.00 |
| 10. PH | 2 (488) | .54 | 2 (574) | .64 | 2 (488) | .26 | 2 (488) | .69 | NA | |
| 11. AB | 7 (1334) | .09 | 4 (989) | .77 | 2 (159) | .27 | 2 (411) | .54 | NA | |

Table 8

*Continued*

| Constructs | 6. MS | | 7. EP | | 8. CM | | 9. TE | | 10. PH | | 11. AB | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *k*(*N*) | ρ | *k*(*N*) | ρ | *k*(*N*) | ρ | *k*(*N*) | ρ | *k*(*N*) | ρ | *k*(*N*) | ρ |
| 1. SE | | | | | | | | | | | | |
| 2. IV | | | | | | | | | | | | |
| 3. EG | | | | | | | | | | | | |
| 4. IG | | | | | | | | | | | | |
| 5.TA | | | | | | | | | | | | |
| 6. MS | 3 (550) | .54 | | | | | | | | | | |
| 7. EP | 3 (550) | .37 | 2 (714) | .79 | | | | | | | | |
| 8. CM | 3 (550) | .54 | 11 (9,398) | .77 | 21 (15,078) | .94 | | | | | | |
| 9. TE | 3 (550) | .54 | 9 (5,107) | .47 | 13 (6,330) | .60 | NA | | | | | |
| 10. PH | NA | | 1 (107,899) | .31 | 2 (108,186) | .33 | NA | | NA | | | |
| 11. AB | NA | | NA | | 5 (942) | .19 | NA | | NA | | 2 (292) | .39 |

*Note*. SE = self-efficacy; IV = interest & task value; EG = extrinsic goal; IG = intrinsic goal; TA = test anxiety; MS = motivational strategy; CM = cognitive and metacognitive strategy; TE = time and environmental management; PH = peer learning & help seeking; AB = attribution.

Of 55 inter-correlations, 46 relationships were available and nine were not available for disattenuated correlations. The large corrected inter-correlations were found for 54 % ($k$ = 25/46) ranging ρ = .47 to .90, and the medium inter-correlations were found for 39 % ($k$ = 18/46) ranging ρ = .19 to .40. Only 3 of the corrected correlations are ρ < .10. This finding supports the theoretical literature of significant relationships between motivation and SRL. Also, the pattern of inter-correlations among motivation and SRL was coherent with Bandura's reciprocal self-determinism and social cognitivism. Disattenuated correlations over .80 were found for the constructs: IV with IG (ρ = .90, $k$ = 10, $N$ =9,751); and IG with CM (ρ = .83, $k$ = 29, $N$ =17,846), signifying non-trivial construct overlap (Brown, 2006; Credé & Phillips, 2011). Considering that IV and IG involve self-generated willingness and challenge as foregoing agent, students with high task value and interest are most likely to pursue task mastery (Pintrich & Groot, 1990; Pintrich et al., 1991; Schunk & Zimmerman, 2008).

Further, students' spontaneous willingness toward task mastery is most likely to trigger effective strategy use during their learning activities (Bandura, 1978, 1991; Pintrich, 2000; Zimmerman & Moylan, 2009). Other disattenuated correlations that were around or more .70 were: between SE with EP (ρ = .69, $k$ = 5, $N$ =6,744) and CM (ρ = .66, $k$ = 27, $N$ =18,438); IV with EP (ρ = .70, $k$ = 7, $N$ =7,022) and CM (ρ = .68, $k$ = 16, $N$ =14,073); IG with EP (ρ = .65, $k$ = 7, $N$ =3,314) and PH (ρ = .69, $k$ = 2, $N$ =488); EP with CM (ρ = .77, $k$ = 11, $N$ =9,398); and AB with IV (ρ = .77, $k$ = 4, $N$ =989). These relationships should parallel with the mutual and cyclic functions in the heuristic framework. In other words, SE, IV, and IG of foregoing agents are immediately

connected to EP, CM, and PH of ongoing mechanisms, and, in turn, AB of self-reflecting appraisal is closely linked to IV of foregoing agents.

By contrast, TA was negatively associated with all constructs except EG. Particularly, I found the most negative effect sizes for TA with IG ($\rho$ = -.52, $k$ = 9, $N$ =9,905) and SE ($\rho$ = - .40, $k$ = 10, $N$ =9,813), but positive relationship for TA with EG, showing the evidence that TA should be a disadvantageous affect for learning. Additionally, very weak relationships ($\rho$ < .10) were found for EG with SE ($\rho$ = .06, $k$ = 11, $N$ =5,358) and EP ($\rho$ = .02, $k$ = 8, $N$ =3,503); TA with TE ($\rho$ = - .00, $k$ = 2, $N$ =1,887); AB with SE ($\rho$ = .09, $k$ = 7, $N$ =1,334). These negligible relationships should be ascribed to those passive learning attitudes of EG and TA; and the divergence of AB in causal attributions of learning outcomes.

*Moderator Effects on the Criterion Correlation*

I examined the effects of moderators on the meta-analytic findings of the contribution of the constructs of learning attributes to academic outcomes and reported those results in Table 9. The variables from school levels include three types for middle, high, and secondary school. They are dummy variables that middle and high school coded 1, separately, and then the secondary school is a reference group. Thus, I assigned four moderators (i.e., middle school, high school, domain specificity/general academy, MQS). Due to the limitation of cases, PH was not available for this analysis. These moderators explained 7 % to 78 % of the variances for the criterion correlations of 10 constructs, showing fair to strong moderator effects on the meta-analytic findings.

Table 9

*Moderator Effects on the Criterion Correlations through Weighted Least Squares Regression Analysis*

| Moderator / Construct | Middle School | High School | Domain Specificity | MQS | $R^2$ |
|---|---|---|---|---|---|
| SE | .32** | .40** | .46** | -.07 | .35 |
| IV | .16 | -.04 | -.25 | -.10 | .14 |
| EG | .03 | -.11 | -.28** | .52** | .27 |
| IG | -.03 | .37** | .36** | -.19 | .22 |
| TA | .05 | -.20 | -.74** | .14 | .63 |
| MS | NA | -.56 | NA | .22 | .33 |
| CM | .25** | -.02 | -.04 | .07 | .07 |
| EP | .82** | .39 | -.21 | .18 | .58 |
| TE | .50 | .68 | -.90* | -1.01* | .65 |
| PH | NA | NA | NA | NA | NA |
| AB | -.23 | -.70* | -.62* | .20 | .78 |

*Note*. SE = self-efficacy; IV = interest & task value; EG = extrinsic goal; IG = intrinsic goal; TA = test anxiety; MS = motivational strategy; CM = cognitive and metacognitive strategy; TE = time and environmental management; PH = peer learning & help seeking; AB = attribution.

* $p < 0.05$, 2-tailed; ** $p < 0.01$.

The statistical significant impacts of middle school were found for the criterion correlations of SE (β = .32, $p < .01$), CM (β = .25, $p < .01$), and EP (β = .82, $p < .01$), indicating that the contribution of SE, CM, and EP to academic achievement were higher in middle school. Also, the variable of high school significantly influenced the relationships of SE (β = .40, $p < .01$), IG (β = .37, $p < .01$), and AB (β = -.70, $p < .05$). High school students were more likely to benefit from SE and IG for their academic performance, but to disfavor AB for their learning. The moderator effect of domain specificity was statistically significant for the correlations of SE (β = .46, $p < .01$), EG (β = - .28, $p < .01$), IG (β = .36, $p < .01$), TA (β = -.74, $p < .01$), TE (β = -.90, $p < .05$), and AB (β = -.62, $p < .05$) with academic achievement. The studies that addressed domain specificity for construct measurement were more likely to report positive effects of SE and IG, but negative impacts of TA, TE, and AB. MQS significantly affected the meta-analytic findings on the contribution of EG (β = .52, $p < .01$) and TE (β = -1.01, $p < .05$) to academic achievement. The studies with higher MQS reported the stronger effect of EG and more negative impact of TE on learning outcome.

Additionally, I examined the correlations of the effect sizes of 11 constructs on academic outcomes (ρ) with the number of theories/instruments (See Table 2) and the number of studies where a specific construct was addressed. Noticeably, the findings indicated that the effect size of a construct on learning was strongly associated with the number of theories/instruments ($r = .68$) and the number of studies ($r = .48$) which treated a given construct. Also, I found that the construct discussed in more theories was more likely to be employed for studies ($r = .56$). These findings support that the heuristic

framework of the current review includes a succinct list of 11 constructs extracted from the theories and instruments which were the most frequently adopted for the reviewed studies (Sitzmann & Ely, 2011).

## Discussion

I developed a heuristic framework by examining several theoretical frameworks and instruments for construct specifications of motivation and SRL. As the result, the heuristic framework consists of 11 core constructs. The theories and measurement inventories showed the diversity in construct specifications and the core components of motivation and SRL while they largely agreed with the contribution of motivation and SRL to academic performance and the relationships among those constructs. The intra and inter-correlations generally verified the adequacy of the heuristic framework of motivation and SRL for construct specification. Of valid intra-correlations ($n$ = 7/11), most constructs ($n$ = 5/7) showed strong internal consistency. Moreover, the stronger intra-correlations than inter-correlations were found for four constructs (SE, EG, EP, CM), indicating the discrimination among the constructs.

Comparing the heuristic frameworks between the previous meta-analytic review by Sitzmann and Ely (2011) for adult learning and this review for secondary school students, the frameworks show some differences in construct specification. As presented in Table 10, the framework by Sitzmann and Ely (2011) suggested 16 constructs of SRL for adults, while the present review specified 11 constructs of motivation and SRL for adolescents. The major difference is that the heuristic framework of the current review is

based on a cyclic system of foregoing agents, ongoing mechanisms, and self-reflecting appraisal.

Table 10

*The Constructs of the Heuristic Frameworks*

| Salzmann and Ely (2011) | The Present Review |
|---|---|
| **Regulatory Agents** | **Foregoing Agents** |
| Goal Level | Self-Efficacy |
| **Regulatory Mechanisms** | Interest & Task Value |
| Planning | *Goal Orientation* |
| Monitoring | Extrinsic Goal |
| Metacognition | Intrinsic Goal |
| Attention | Test Anxiety |
| Learning Strategies | **Ongoing Mechanism** |
| Persistence | Motivational Strategy |
| Time Management | Effort & Persistence |
| Environmental Structuring | Cognitive and Metacognitive Strategy |
| Help Seeking | *Behavior Management* |
| Pre-training Motivation | Time and Environment Management |
| Motivation | Peer Learning & Help Seeking |
| Emotion Control | **Self-Reflecting Appraisal** |
| Effort | Attribution |
| **Regulatory Appraisals** | |
| Attributions | |
| Pre-training Self-Efficacy | |
| Self-Efficacy | |

Sitzmann and Ely (2011), on the other hand, focused on regulatory processes and constructs that operate during the act of studying (i.e., ongoing mechanisms). In addition, the heuristic framework presented here includes more condensed constructs in

metacognition than that of Sitzmann and Ely (2011). Therefore, the index of motivation and SRL in the heuristic framework presented here may help researchers understand and select effective implementation to measure adolescents' learning traits on motivation and SRL.

Regarding the meta-analytic findings, the results of the current meta-analysis are supportive of the theoretical literature of the relationship among motivation, SRL, and learning, and generally consistent with the previous meta-analyses on SRL for college and adult population (i.e., Credé & Phillips, 2011; Sitzmann & Ely, 2011). Specifically, the seven constructs (i.e., SE, IV, IG, TA, CM, EP, AB) were substantially related with student academic performance, while the rest of constructs (i.e., EG, MS, TE, PH) involving contextual states (Credé & Phillips, 2011; Hong & O'Neil, 2001) were not significantly associated. In other words, the strong inter-correlations among the constructs of foregoing agent (i.e., SE, IV, IG), ongoing mechanism (i.e., EP, CM), and self-reflecting appraisal (i.e., AB) is consistent with Bandura's reciprocal self-determinism and social cognitivism. Moreover, SE of foregoing agents and EP of ongoing mechanisms were the greatest predictors of academic achievement. Therefore, the findings suggested that students who initiate their learning with high self-efficacy, task value, and intrinsic goal should activate cognitive and metacognitive strategy behaviors (Bandura 1978, 1991; Boekaerts, 1996; Eccles & Wigfield, 2002; Pintrich, 2000; Pintrich & Groot, 1990; Ryan & Deci, 2000; Schunk, 1990, 1991; Wigfield et al., 2006; Zimmerman, 1990, 2008). Most of all, the initiating motivation of foregoing agents should enable them to make effort and persistence toward successful performance,

and finally reflect their appraisal of learning outcomes appropriately on further learning (Corno, 2001; Pintrich, 2003; Schunk, 1994; Schunk & Zimmerman, 2008; Zimmerman & Moylan, 2009). Conversely, the significantly negative correlations with learning outcomes for TA and its negative inter-correlation with the essential constructs (i.e., SE, IV, IG, EP, CM) clearly indicated the disadvantage of TA for learning by adopting inappropriate learning approaches toward their academic performance (Pintrich & Groot, 1990).

Notably, strong correlations ($\rho > .80$) were found between IG and IV, and between IG and CM. Those high disattenuated correlations between constructs imply weak construct discrimination and that the constructs should be combined into a broader construct (Brown, 2006; Credé & Phillips, 2011). The two constructs of IG and IV were very similar in their relationships with the other motivational and SRL constructs and also with academic performance. Encouragingly, those relationships for IG and IV were also found in Credé and Phillips's (2011) meta-analysis of the MSLQ. Moreover, the foregoing agents IG and IV involve why students are learning (Pintrich & Groot, 1990; Schunk & Zimmerman, 2008). Sitzmann and Ely (2011) suggested three criteria for merging constructs: strong inter-correlations to each other, similar patterns of inter-correlations with the other constructs and criterion correlations, and theoretical literature suggesting a strong relationship. Therefore, IG and IV should be combined for improvement of construct redundancy. However, CM should be distinguished from other constructs of motivation and SRL (e.g., IG, IV, EP), and excluded from the parsimonious framework. In other words, IG and CM should not be merged into single

construct because they were theoretically and conceptually distinguished from each other. Therefore, they have been specified as apparently distinct constructs in the literature review of motivation and SRL (Pintrich & Groot, 1990; Sitzmann & Ely, 2011). Also, IG and CM work independently as foregoing agent and ongoing mechanism, respectively, in the heuristic framework of the current review.

As described above, I have found three meta-analytic reviews (e.g., Cellar et al., 2010; Credé & Phillips, 2011; Sitzmann & Ely, 2011) that are the most relevant to the current study although the populations for the research were college-level students or adults. Cellar et al. (2010) focused on the effects of only goal orientations on other constructs and performance and did not inclusively address self-regulatory constructs, whereas the other reviews (e.g., Credé & Phillips, 2011; Sitzmann & Ely, 2011) included the constructs of motivation and SRL enough to compare with the current review. Credé and Phillips (2011) conducted a meta-analytic review of the MSLQ, and examined the 15 predictors on GPA and current class grades. For the comparison of findings to the present meta-analysis, I chose only the predictions of the constructs for class grades considering the assumption of domain specificity. Moreover, Sitzmann and Ely (2011) examined a heuristic framework comprising 16 constructs of SRL and conducted a meta-analysis in work-related training and adults' education, which provided considerable cues and guidelines to the present meta-analysis. Table 11 describes the comparison of the findings of the relationships with learning outcome in the meta-analyses of SRL conducted by Credé and Phillips (2011), Sitzmann and Ely (2011), and the one reported

here. Credé and Phillips's (2011) meta-analysis of the MSLQ for college students shared most of the findings on the pattern of criterion correlations with the current study.

Table 11

*The Comparison of Findings on the Relationships of Motivation and SRL with Academic Achievement Among Three Meta-Analyses*

| Strength of Impact on Learning Outcome | Salzmann and Ely, 2011 | Credé and Phillips, 2011 ( the effect sizes on course grades) | Current Review |
|---|---|---|---|
| **Strong** ρ = .50 | Goal level | | Self-efficacy |
| | Self-efficacy | | Effort & persistence |
| | | Effort regulation | Test anxiety (reversely) |
| | | Self-efficacy | |
| | | Time and study environment | |
| **Medium** ρ = .30 | Effort | | Attribution |
| | Persistence | | Cognitive and metacognitive strategy |
| | Attention | Meta-cognitive self-regulation | Interest & task value |
| | Time management | Task value | Intrinsic goal |
| | Environmental structuring | Intrinsic goal orientation | |
| | Motivation | Control of learning beliefs | |
| | Attribution | Test anxiety reversely) | |
| | Monitoring | Elaboration | |
| | Meta-cognition | Critical thinking | |
| | Learning strategy | Rehearsal | |
| | Planning | Organization | |
| **Weak** ρ = .10 | Help seeking | Extrinsic goal | Time and environment management |
| | Emotion control | Peer learning | Extrinsic goal |
| | | Help seeking | Motivational strategy |
| | | | Peer learning & help seeking |

Most notably, the meta-analyses shared the findings: SE and EP were the strongest factors on academic achievement; IG, IV, CM, and AB (i.e., control of learning beliefs in the MSLQ) were the substantial contributors to students' academic performance; whereas TA was a significant disturbance to learning. In Sitzmann and Ely's (2011) meta-analysis of SRL in work-related training, goal level had the strongest correlation with learning performance. Goal level was defined as the trainees' standards for training performance (Sitzmann & Ely, 2011), which should be a proximal goal that the current literature review for adolescent's population did not include. Following goal level, SE and EP had the strongest relationship with learning outcome, which was common in all of those meta-analyses. However, despite some differences in populations and construct specifications of SRL among the meta-analyses, SE and EP had the strongest relationship with learning outcome while the effect of PH on learning performance was negligible in all reviews.

On the other hand, it should be suspected that some of criterion correlations that were not statistically significant might be ascribed to curvilinear relationships (Credé & Phillips, 2011). Particularly, PH should be more favorable and effective for those students with middle level of academic ability than high or low performing students. However, unlike the meta-analyses of SRL for college students and adults (i.e., Credé & Phillips, 2011; Sitzmann & Ely, 2011), the current review found that TE was weakly connected to learning performance for secondary school students. It is likely that the resources of time and environment should be more malleable for adults than for adolescents. Additionally, students with different learning abilities and/or enrolled in

courses of different characteristics (e.g., level of challenge) should be differently motivated and employed different learning strategies contextually for given courses and tasks (Credé & Phillips, 2011). For example, when students encounter more challenging course, or perceive more values on a given task, they are more likely to use high level of cognitive strategies such as critical thinking and elaboration. Thus, the research that accounts for the intrapersonal variables in motivation and SRL across courses and tasks is necessary for better understanding of students' act of learning (Credé & Phillips, 2011).

By contrast, the meta-analytic findings on the contribution of motivation and SRL to academic performance for adolescent would support the importance of motivation and SRL. Furthermore, the findings implicate how to improve adolescents' motivation and SRL for their academic betterment. For example, the most contributors of 11 constructs such as SE of foregoing agent, EP of ongoing mechanism should be focused as prime factors on academic achievement for adolescents, which was the same as shown in the prior meta-analyses for adult education. Moreover, adolescents may need more prudent and productive support for their academic development than adults. Additionally, the transition between middle and high school may also yield some changes in students' learning traits and attainment, which indicates the need for differentiated interventions for students' academic improvement between two school levels. As shown in the moderator effects of middle and high school, middle school students were likely to take advantages of SE, CM, and EP, while high school students were likely to have benefit from SE and IG.

In conclusion, the current review verified that the 11 constructs of the heuristic framework adequately account for learning attributes of motivation and SRL for secondary school students. Also, the meta-analytic findings largely supported the suggestions in the theoretical literature including Bandura's reciprocal self-determinism (1978), social cognitivism, and the recent meta-analyses of SRL (e.g., Credé & Phillips, 2011; Sitzmann & Ely, 2011). The findings suggested that foregoing agent SE and ongoing mechanism EP have the strongest relationships with academic achievement while foregoing agent TA has the strongest negative relationship with students' learning. Also, the strong inter-correlations among the substantial constructs (i.e., SE, IV, IG, EP, CM, and AB) showed evidence of the reciprocal and cyclic functions of students' learning performance. However, the present meta-analysis still has several limitations that should be addressed in the further studies.

## Limitations and Future Directions

One of the limitations in the current review is the restriction in database sources. Even though I exhaustively searched the studies by not only using *ProQuest* but also all databases that the *PsycINFO* offers, more databases need to be used for a comprehensive range of articles. Moreover, there were missing correlations among the 11 constructs of motivation and SRL in the heuristic framework in the studies analyzed. This deficiency can be addressed by conducting more studies that address those understudied constructs (Sitzmann & Ely, 2011). Second, the meta-analytic findings supported the nature of a reciprocal and cyclic system in the process of motivation and SRL. However, a review that accounts for causal relationships among the constructs of motivation, SRL, and

academic achievement, as opposed to the relationships of each to academic achievement, is still necessary (Sitzmann & Ely, 2011). In order to add more clarity to the dynamic system of students' academic motivation and SRL, longitudinal research is needed. Specifically, a meta-analytic path analysis that addresses causal and reciprocal relationships among motivation, SRL and learning outcomes based on a longitudinal model should increase the validity of theoretical assumptions of Bandura' reciprocal self-determinism and social cognitivism. Lastly, there may be important moderator variables that were not addressed in this review. Particularly, students adopt different approaches of SRL with different motivations across their academic tasks and courses, and those variations should impart the variance in effect size, and/or curvilinear relationship with academic performance (Credé & Phillips, 2011; Sitzmann & Ely, 2011). Therefore, further research should examine the degree of variance in motivation and SRL across tasks and courses, and also the moderated effects of specific task (or course) characteristics on the contributions of motivation and SRL to academic performance (Credé & Phillips, 2011). Also, as suspected in the non-significant relationships with academic outcomes for some constructs (e.g., EG, MS, TE, PH), those constructs may be more favorable to those students achieving in middle level than in high or low levels, implying curvilinear relationships between those constructs and academic outcomes. Thus, the moderator of students' achievement levels should be detected in the future.

# CHAPTER III

# THE RELATIONSHIPS AMONG MOTIVATION, SELF-REGULATED LEARNING, AND ACADEMIC ACHIEVEMENT FOR SECONDARY SCHOOL STUDENTS IN SOUTH KOREA

In Bandura's (1978) the theory of the reciprocal determinism of self-system, psychological functioning involves a continuous interactive reciprocal determinism among behavioral, cognitive, and environmental factors. Based on the reciprocal self-determinism, many social cognitive theorists have examined motivation and self-regulated learning (SRL) that play pivotal roles for academic achievement and suggested their reciprocal and strong relationships (e.g. Bandura, 1993; Bandura, Barbaranelli, Caprara, & Pastorelli, 1996; Pajares, 1996; Pintrich & De Groot, 1990; Schunk, 2005; Zimmerman, 2008; Zimmerman, Bandura, & Martinez-Pons, 1992; Zimmerman & Martinez-Pons, 1990). Academic self-efficacy, intrinsic value, and goal orientation have been described as initiating motivation prior to the first step of SRL such as goal-setting and planning of strategy use (Zimmerman, 1990, 1995, 2008; Zimmerman & Moylan, 2009). Self-efficacy is one's judgment on his or her capabilities to reach the expectations, and influences peoples' cognitive processes, emotional functions, and behavioral paradigms (Bandura, 1978, 1982, 1993). Goal-orientation and intrinsic motivation constitute the value of motivation, and are fundamentally related to students' perceptions on why they should learn (Pintrich, 1990). Goal-orientation is commonly defined as the purpose of task engagement, and individuals show some differences in personal goal-orientations (Elliot & Church, 1997).

Drawing on Bandura's (1991) concept of self-regulation, Zimmerman and his colleagues (Cleary & Zimmerman, 2004; Zimmerman & Moylan, 2009; Zimmerman, 2008) defined SRL as students' management of their study activities (e.g., planning, choosing, and employing strategies, self-monitoring) to attain their learning goals. Also, SRL has a cyclic system with three circulated phases: forethought phase includes motivational functions and the initial plans such as self-efficacy, goal orientation, goal setting, and planning for using strategies; performance phase consists of actual practices with self-regulatory functions related to cognitive and metacognitive strategies; and self-reflection involves self-judgment and self-reaction to performing outcomes. Even though the specification of the components of academic motivation and self-regulated learning (SRL) varied in the studies, findings commonly suggested that motivation and SRL work reciprocally with close relationships and make substantial contributions to academic performance.

Moreover, adolescents stand on the steep transition from children to adults in body, emotion, and behavior. Moreover, their emotional and behavioral changes are associated with their environment should be noticeably reflected to the academic activities in the adolescent ages (Bandura, ,Barbaranelli, Caprara, & Pastorelli, 2003; Klassen, 2002; Valentine, Dubois, & Cooper, 2004; Vukman & Licardo, 2010). Accordingly, several studies examined the relationships among students' motivation, SRL, and academic attainment for adolescents, (e.g. Caroll, Houghton, Wood, Unsworth, Hattie, Gordon, & Bower, 2009; Crockett, Moilanen, Raffaelli, & Randall, 2006; Feldmann & Matinez-Ponz, 1995; Joo, Bong, & Choi, 2000; Kaplan, Lichtinger,

& Gorodetsky, 2009; Malpass, O'Neil,& Hocevar, 1999; McCoach & Siegle, 2003; Pajares & Graham, 1999; Pintrich & Groot, 1990; Rao, Moely, & Sachs, 2000; Turner, Trotter, Lapan, Czajka, Yang, & Brissett 2006; Vecchio, Gerbino, Pastorelli, Del Bove, & Caprara, 2007;Wolters, 2004; Zimmerman, Bandura, & Martinez-Pons, 1992).

Most studies have investigated the relationships among academic self-efficacy, SRL, and academic outcomes without the specificity of subcomponents (e.g., Caroll et al., 2009; Crockett et al., 2006; Feldmann & Matinez-Ponz, 1995; Joo et al., 2000; Malpasset. Al, 1999; Pajares et al., 1999; Turner et al., 2006; Vecchio et al., 2007; Zimmerman et al., 1992), while a few studies examined the relationships of specific sub-functions of both motivation and SRL with academic achievement (e.g. Kaplan et al., 2009; McCoach & Siegle, 2003; Pintrich & Groot, 1990; Rao et al., 2000; Wolters, 2004). However, the studies did not address the inclusive and structural relationship among motivation, SRL, and academic performance. The most recent studies by Diseth (2011) and Sins, Joolingen, Savelsbergh, and Hout-Wolters (2008) examined the structural relationships among motivation, self-regulation, and academic performance. The former was for college students rather than secondary school students, and the later was only for eleventh-graders. The studies adopted self-efficacy and goal-orientation as motivational constructs and cognitive strategy use of deep or surface approach as self-regulatory functions. Sitzmann and Ely (2011) cautioned that the property of the employed instruments may limit researchers' understanding of construct domain to measure for their research. Particularly, social cognitive theory (e.g., Zimmerman, 1990, 1995, 2008; Zimmerman & Moylan, 2009) suggested that SRL should not be confined to

a single construct, but extended to multiple dimensions (i.e., motivational, cognitive, metacognitive, and behavioral). Therefore, the current study examined the reciprocal relationships among comprehensive and specific components of motivation and SRL. Then, this article reports the test of two research models based on a systematic review of the relationships among motivation, SRL, and academic achievement (Bae & Goetz, manuscript in revision). A summary of key studies that supported hypotheses in the research model tested in the current study is presented below.

Moreover, OECD review of tertiary education for Korea (2009) reported Korean fervent educational interest and fierce competitiveness for college entrance in Korea. Nevertheless there are only a few studies for Korean adolescent's traits on motivation and SRL with proper psychometric measurement (e.g., Hong & O'Neil, 2001; Joo, Bong, & Choi, 2000; Kim, Schallert, & Kim, 2010; Yoon, 2009). Hong and O'Neil (2001) investigated construct validity of a trait self-regulation model with high school students in Korea, adopting original self-regulatory inventory developed by O'Neil et al. (1994). The study suggested two scales of metacognition (i.e., planning, self-checking) and motivation (i.e., effort and persistence, self-efficacy), respectively, with permissible reliabilities over .60 and good model fit. Particularly, 7 items on effort management demonstrated good reliability ($\propto$ = .83) and construct validity (factor loading = .77 to .88). Thus, the scale on effort and persistence was adopted for the present study. However, the study addressed neither specification in subject-domain nor initial motivation of goal orientations, and also did not account for the relationship with academic attainment.

Joo et al. (2000) and Yoon (2009) examined the effects of both motivation and SRL on academic outcomes, using a Korean version of the Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich, Smith, Garcia & Mckeachie, 1991). Joo et al. (2000) detected the effects of self-efficacy and learning strategies on academic performance in web-based instruction for high school students in Korea. Additionally, the study revealed statistically significant and positive correlations between academic self-efficacy, learning strategies, and academic outcomes ($r$= .25 to .48) with good reliabilities (Cronbach's alpha =.77 to .90). Also, Yoon (2009) investigated the relationships among the self-efficacy, mastery goal (i.e., intrinsic goal), regulatory strategy, and scientific inquiry tendencies of the gifted middle school students in Korea. The study found moderately positive associations between self-efficacy, mastery goal, self-regulatory strategies, and scientific inquiry tendencies ($r$= .18 to .41) with good reliabilities (Cronbach's alpha = .77 to .89). However, both studies were lacking in: construct specificity and inclusiveness to measure learners' traits on motivation and SRL; and population representativeness of secondary school students in Korea.

Of the representative instruments to measure students' learning traits on motivation and SRL, the MSLQ includes the specific and comprehensive scales and has been the most frequently used (Dunn, Lo, Mulvenon, & Sutcliffe, 2011; Rao & Sachs, 1999; Zimmerman, 2008). However, the inventory was initially designed for college students and comprises 81 items. Thus, the number of items may be tedious for adolescents that the items need to be trimmed down to a concise form for more effectiveness to teenagers. Also, the Patterns of Adaptive Learning Survey (PALS;

Midgley, Maehr, Hruda, Anderman, Anderman, Freeman, Gheen, Kaplan, Kumar, Middleton, Nelson, Roeser, & Urdan, 2000), and the Students' Approaches to Learning (SAL) instrument constructed by Organization for Economic Cooperation and Development (OECD) has been frequently adopted for the studies on motivation and SRL. The PALS specialized academic motivation focusing on goal orientations, and has some deficiency in the constructs of SRL while the SAL includes items that are too general to discriminate the constructs indicated by items. For example, regarding a study for secondary school students' academic performance of mathematics (Pietsch, Walker, & Chapman, 2003), Marsh, Dowson, Pietsch and Walker (2004) accounted for the multicollinearity matters due to a close correlation between self-concept and self-efficacy ($r$ = .93)

Consequently, I assumed that the initiating motivation (i.e., self-efficacy, goal orientations) and self-regulatory functions as foregoing agents and ongoing mechanisms, respectively, should reciprocally work for academic performance. Then, I developed the self-motivated learning inventory (SMLI) (Bae, Goetz & Yoon, manuscript in revision) stemming from three existing instruments, considering construct specificity and relevance (i.e. factor loadings): the MSLQ (Pintrich et al., 1991), the scales on goal orientations developed by Elliot and Church (1997), and the original self-regulatory inventory developed by O'Neil and his colleagues (O'Neil, Baker, Ni, Jacoby, and Swigger, 1994). The items of each scale came from the original instruments based on factor-loadings in previous studies that adopted the original inventories for each construct. The SMLI consists of 43 items on 6 constructs: self-efficacy (SE), mastery

goal (MG), performance avoidance goal (PA), effort and persistence (EP), cognitive and meta-cognitive strategy use (CM), and resource management (RM). Despite a brief form with only 43 items on 6 scales, the SMLI was designed for measurement of both motivation and SRL addressing construct specificity and effectiveness for teen-agers.

Researchers have proposed the importance of domain specificity in a various kind of educational constructs (Green, Martin, & Marsh, 2007). Particularly, expectancy-value motivation (e.g., task value, self-efficacy) is more domain- and task-specific than other engagement constructs (e.g., planning and task management) (Bandura, 1986; Green et al, 2007; Pajares, 1996). For example, self-efficacy for mathematics is one's beliefs about their capacity for mathematics rather than other subject fields, and that is more task-specific such as calculus and geometry. Green et al. (2007) examined the multidimensional domain specificity of motivation and engagement in English, mathematics, and science for high school students. The researchers reinforced the need of subject-specific measure and the merit of domain specificity in intervention programs. Accordingly, the present study adopted two subject-specific measures for students' motivation and SRL: English literature and mathematics as the representativeness of literature and science subjects, respectively.

In sum, I adopted the six scales of SMLI (Bae et al., manuscript in revision) to assess students' learning traits for their academic performance. Specifically, I assumed that SE, MG, and PA should be foregoing agents of initiating motivation while EP, CM, and RM should be ongoing mechanisms of self-regulatory functions. Then, I examined the comprehensive and structural relationships among motivation, SRL, and academic

performance in English and Mathematics, respectively for middle and high school students in Korea. In the next section, I illustrated the empirical and theoretical background for the definition of each construct, their structural relationships, and contributions to academic achievement.

## Literature Review

### *Motivation as Foregoing Agents*

During learning activities, motivation affects learners' self-assessment and their reaction to academic outcomes, which, in turn, influence subsequent motivation and plans for learning activities that initiates the next cycle (Martinez-Pons, 1999; Zimmerman, 2004, 2008). In this vein, the present study specified motivation (i.e. self-efficacy, goal orientation) as foregoing agents that should reflect self-reaction to prior outcomes. Regarding the impacts of prior academic performance, the studies (Diseth, 2011; Wolters, 2004) showed the consistency in the positive impact of prior academic achievement on self-efficacy, but some difference in the effect of the previous outcomes on goal orientations. Diseth (2011) examined the relationships among self-efficacy, goal orientation and learning strategies for college students' academic performance. The study reported high school GPA (i.e., prior achievement) was connected positively to self-efficacy, no significantly to mastery goal, and negatively to performance avoidance goal. Wolters (2004) also examined the relationships among motivation, SRL, and achievement for junior high school students. The study found that prior achievement worked positively for both self-efficacy and mastery goal, but reversely for performance avoidance goal. Therefore, I examined the pathways between prior academic

performance and initiating motivation, controlling the relations between prior and subsequent outcomes.

Academic self-efficacy refers to students' self-perceived beliefs on their learning capability (Bandura, 1993). The students with high self-efficacy tend to set the mastery-oriented goal, to make a great effort and overcome obstacles in their learning, to employ various and effective strategies in their cognitive process, and also to select and effectively utilize the external resources, and then, finally reach successful academic attainment (Bandura, 1986, 1993; Bandura et al., 1996; Pajares 1996, 2002; Pajares, Britner, & Valiante, 2000; Pintrich, 2000; Schunk, 1990, 1994, 2008; Zimmerman, 1995b).

Goal orientation can be bifurcated into mastery or learning goal-orientation and performance or ability goal-orientation (Pintrich, 2000). Additionally, Elliot and Church (1997) proposed the separation of approach and avoidance in performance goal orientation. Those students pursuing mastery goals focus their learning on the development of competence and task mastery; those students directing toward performance approaches involve their learning to the performance of favorable judgments of competence; and those students with performance-avoidance goal tend just to avoid unfavorable judgments of competence. Therefore, the current study adopted the mastery goal for a high-level goal orientation and the performance avoidance goal for a low-level goal orientation.

Furthermore, the literature reviews (Bae & Goetz, manuscript in revision; Credé & Phillips, 2011; Sitzman & Ely, 2011) have found that the contributions of self-efficacy

to effective components of SRL and academic performance are coherent across studies. Additionally, the positive relationships of mastery goal with self-efficacy and SRL processes were constant across the studies while the associations of performance avoidance with self-efficacy and SRL functions varied in the studies (Diseth, 2011). The studies (Elliot, McGregor, & Gable, 1999; Kaplan et al., 2009; Wolters, 2004) generally showed that mastery goals were positively associated with adapted SRL. Meanwhile, Kaplan et al. (2009) conducted the study for 211 Jewish high school students in Israel. The researchers found that performance avoidance goal was positively correlated with self-efficacy, and positively or non-significantly associated with self-regulatory strategies. In contrast, another study (Wolters, 2004) for high school students in the U.S. showed performance avoidance goal was negatively associated with self-efficacy and negatively or non-significantly with self-regulatory functions including motivational engagement and learning strategies. The study for undergraduate students in the U.S. (Elliot et al., 1999) found that performance avoidance goal was negatively connected to effort, persistence and deep processing, and positively related to surface processing and disorganization. Some studies found that those students with Asian family background were more likely to orient performance avoidance goal than those students with typical Western family background (e.g., Elliot, Chirkov, Kim, & Sheldon, 2001; Zusho, Pintrich, & Cortina, 2005). Connecting the finding to the studies for Korean adolescents, Bong (2008) and Kim, Kim, and Schallert (2010) maintained that Korean students' motivation including goal orientations should be related to parental variables and classroom goal structures. Bong (2008) examined the causal relations among students'

perceptions of parent-related variables (e.g., feeling of obligation for parents, parental support, conflict with parents, parental academic pressure) and classroom goal structures, students' goal orientations, and their maladaptive learning behaviors for 753 high school students in South Korea. The study maintained that some of parental variables negatively or positively predicted students' self-efficacy and both performance approach and avoidance goal while only classroom goal structures predicted students' mastery goal orientation. Moreover, the study reported the positive correlations of performance avoidance goal with cognitive and self-regulatory strategy use although the research did not address the causal relations among the constructs. Kim et al. (2010) conducted path analyses to investigate the effects of parental variables (students' perceptions of parent goal orientations for them, parental motivating styles) and classroom goal structures on students' goal orientations via students' self-regulated motivations for middle and high school students. The study asserted that classroom goal structures directly and indirectly influence students' goal orientation while parental variables only indirectly impact those constructs. Specifically, the study showed the indirect effects of parent mastery goal autonomy support for their kids on students' mastery goal via identified regulation and the mediated effect of parent performance approach goal on students' performance avoidance goal through introjected and external regulation (Kim et al., 2010). However, the studies did neither include specific self-regulatory constructs nor address the connections between goal orientations and self-regulatory processes. Thus, the current study examined the relationships within the foregoing agents of initiating motivation (i.e.

SE, MG, PA), their interrelationships with ongoing self-regulatory mechanisms (EP, CM, RM), and their contributions to academic performance for Korean adolescents.

### *Self-Regulated Learning as Ongoing Mechanisms*

Zimmerman (1990, 1995, 2008) and Zimmerman and Moylan (2009) classified SRL into three operational mechanisms: motivational, cognitive and metacognitive, and behavioral. Motivational functions include self-assessment and self-reaction to their performing outcomes, which precede academic effort and willingness for students' SRL. Metacognition consists of goal-setting and planning, organizing and transforming, searching information, and cognitive skills such as rehearsal and elaboration. Behavioral activities involve managing resources such as time management, environmental structuring, and help seeking (Hong & O'Neil, 2001; Zimmerman, 1990, 1995, 2008; Zimmerman & Moylan 2009). Also, Zimmerman and Moylan (2009) described the process of SRL through three cyclic phases. The first phase of forethought phase includes the initial plans and motivational functions such as goal-orientation, self-efficacy, goal setting, and planning for using strategies. The second phase of performance phase consists of actual practices with self-regulatory functions such as cognitive metacognitive strategy use, and environment management. The third phase of self-reflection involves self-judgment and self-reaction to performing outcomes, which, in turn, affect the following motivation (e.g., self-efficacy, goal orientations) (Bembenutty, 2008; Cleary & Zimmerman, 2004; Pintrich, 2000; Zimmerman & Moylan, 2009; Zimmerman, 2004, 2008). With accordance with this literature, a few studies (e.g., Diseth, 2011; Elliot et al., 1999; Meneghetti & Beni, 2010; Sins et al., 2008)

found the mediation effects of learning strategy use between foregoing motivation and academic outcome. However, those studies treated only the limited constructs in SRL (i.e., learning strategies), and only one study (e.g., Meneghetti & Beni, 2010) was conducted for secondary school students. In this vein, I detected the direct and indirect effects between foregoing motivational agents and subsequent achievement via ongoing self-regulatory mechanisms. Hong and O'Neil (2001) suggested that the students' stable traits should be differentiated from the transitory state in SRL. The traits on SRL are considered as the relatively stable property, and also functions as a temporary state that varies across situations. However, these two forms of SRL have a close relationship to each other. We can distinguish between stable traits and transitory states in SRL by using different tenses in measurements: traits are presented using present tense, while states are presented using past tense (Hong & O'Neil, 2001). In terms of students' learning traits, the SMLI includes three self-regulatory functions as ongoing mechanisms: EP (i.e. motivation), CM (i.e. meta-cognition), and RM (i.e. behavior). Therefore, the present study addressed the multiple dimensions of SRL by using the SMLI.

*Cyclic System of Motivation, Self-Regulated Learning, and Academic Performance*

Pintrich (2000) and Zimmerman (2004, 2008) describe a cyclic system of SRL in which students' reactions to prior academic outcomes are an important factor in motivating students' subsequent learning. Adding to the suggestions in the literature, there have been a few meta-analyses of the relationship between motivation, SRL, and learning performance (e.g., Bae & Goetz, manuscript in revision; Cellar et al., 2011;

Credé & Phillips, 2011; Sitzmann & Ely, 2011). Though the studies varied in the population (i.e., college students or adults, adolescents), the strong relation between self-efficacy and learning performance was common if they accounted for the relationship (i.e., Bae & Goetz, manuscript in revision; Credé & Phillips, 2011; Sitzmann & Ely, 2011). Specifically, the stronger correlation of self-efficacy with concurrent performance ($\rho = .58$) than with prospective performance ($\rho = .31$) was found in the meta-analytic review of the MSLQ (Credé & Phillips, 2011). The finding implied that self-efficacy was more related to preceding performance than to subsequent learning outcomes. Additional evidence was provided by the longitudinal studies for secondary school students (e.g.; Patrick, Ryan, & Pintrich, 1999; Pokay & Blumenfeld, 1990). Therefore, I hypothesized that prior subject scores directly influence subsequent subject grades (Hypothesis 1) and self-efficacy (Hypothesis 2). Only a few studies addressed the associations between prior academic outcomes and goal orientations. Negative relations between performance avoidance goal and the previous performance were commonly found in the studies (Diseth, 2011; Wolters, 2004), but a weak relation of mastery goal with prior achievement was found in only one study (Wolters, 2004). The findings indicate that self-efficacy was more consistently related with prior outcomes than goal orientations were (Diseth, 2011). Thus, a path between prior achievement and goal orientations was added in an alternative model.

Previous research (Diseth, 2011; Elliot and Church, 1997; Elliot et al.,1999; Wolters, 2004) also has examined the causal relationship among self-efficacy, goal orientations, and/or learning strategies for academic performance. The general finding of

these studies was that self-efficacy was positively linked to mastery goal and performance approach, but negatively or non-significantly connected to performance avoidance goal. In this sense, I supposed that self-efficacy should be connected positively to mastery goal but reversely to performance avoidance goal (Hypothesis 3). Also, Diseth (2011) and Wolters (2004) proposed that self-efficacy predict students' self-regulatory mechanisms and also subsequent performance. Specifically, one study (Wolters, 2004) showed the positive effects of self-efficacy on persistence and subsequent course grade, but non-significant impacts on cognitive and meta-cognitive strategy use. Another study (Diseth, 2011) reported that self-efficacy worked positively for subsequent course grade, but non-significantly and negatively for deep and surface strategy use, respectively. Thus, it was assumed that self-efficacy should influence the adoption of the ongoing self-regulatory mechanisms (Hypothesis 4). Also, the research (Diseth, 2011; Elliot et al., 1999; Wolters, 2004) maintained that mastery goal predicted adapted self-regulatory functions (e.g., effort, cognitive and metacognitive strategy use, or deep learning strategy use) while performance avoidance goal predict maladapted strategy use. Hence, I hypothesized that goal orientations should predict students' adoption of self-regulatory functions (Hypothesis 5).

As for reaching subsequent achievement, self-efficacy predicts goal orientations and subsequent performance (Diseth, 2011; Elliot & Church, 1997; Wolters, 2004), and those foregoing agents influence ongoing SRL, which, in turn, should contribute to subsequent academic performance (Bandura, 1993; Elliot et al., 1999; Pintrich & De Groot, 1990; Pajares, 1996; Schunk, 2005; Zimmerman, 2008). Then, self-efficacy

predicts subsequent subject scores directly and indirectly via goal orientations and/or self-regulatory functions (Diseth, 2011; Elliot & Church, 1997; Wolters, 2004). Therefore, I hypothesized that: self-efficacy and the ongoing self-regulatory functions should directly predict subsequent performance (Hypothesis 6 & 7); and the effects of self-efficacy on subsequent academic performance should be partially mediated by goal orientations and/or self-regulatory mechanisms (Hypothesis 8). Lastly, goal orientations should be connected to subsequent performance indirectly via self-regulatory functions (Diseth, 2011; Elliot et al., 1999; Meneghetti & Beni, 2010; Sins et al., 2008). Thus, I assumed that the ongoing self-regulatory mechanisms should fully mediate the relation between n goal orientations and subsequent outcomes (Hypothesis 9). In sum, the current study assumed that students activate their motivation of foregoing agents, and direct self-regulatory functions of ongoing mechanisms for their academic achievement based on the dynamic and reciprocal system.

## Hypotheses

The study aimed to investigate the relationships among motivation, SRL, and academic achievement for secondary school students, using the SMLI (Bae et al., manuscript in revision). Specifically, I adopted six constructs of academic motivation and SRL (SE, MG, PA, EP, CM, RM). I assumed that foregoing agents of the initiating motivation (SE, MG, PA) and ongoing mechanisms of self-regulatory functions (EP, CM, RM) should reciprocally work for academic performance. Students' learning traits for motivation and SRL in their academic performance should be meaningfully connected through reciprocal or causal relationships (Bandura, 1978). These connections

should contribute to their subsequent academic attainment, which influences the subsequent self-functions on learning performance in turn. Therefore, I conducted a test of a theoretical model of the relationships from prior to subsequent academic achievement via motivation and SRL in mathematics and English, respectively, for secondary school students in South Korea. Also the mediation effects of motivation and SRL for subsequent performance were detected. Figure 3 depicts the hypothesized research model, and the specific hypotheses of the current research are:

H1. Prior academic achievement will predict subsequent academic performance.

H2. Prior academic achievement will predict self-efficacy.

H3. Self-Efficacy will predict mastery and performance avoidance goal orientations, with an inverse relation to performance avoidance.

H4. Self-efficacy will predict students' adoption of self-regulatory processes (i.e., effort and performance, cognitive and meta-cognitive strategy use, resource management).

H5. Goal orientations will predict students' adoption of self-regulatory processes.

H6. Self-efficacy will predict subsequent academic performance.

H7. Self-regulatory processes will predict subsequent academic performance.

H8. Goal orientations and self-regulatory processes will partially mediate the effects of self-efficacy on subsequent academic performance.

H9. Self-regulatory processes will mediate the effects of goal orientations on subsequent academic performance.

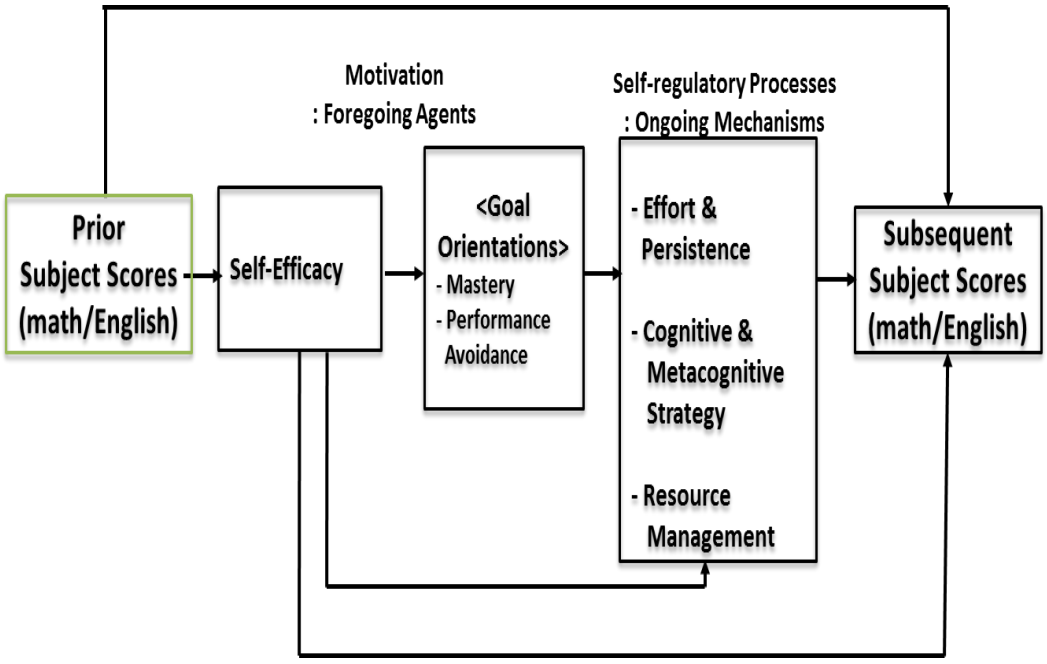


*Figure 3.* Hypothesized research model

## Method

Prior to the current study, I developed the SMLI to measure six constructs of motivation and SRL, and employed all scales of the instrument for this study. I have conducted a research to examine the construct validations of the SMLI for 952 students from middle and high schools in South Korea, and this study has been submitted for a journal publication. The current study used the SMLI data collected from the sample in the previous study (Bae et al., manuscript in revision) that tested the construct validity of the SMLI. However, in that study, academic achievement data were used only for the purposes of describing the sample and testing for criterion validity. By contrast, the focus of this study was on the reciprocal relationships among prior academic

achievement, initiating motivation, self-regulatory functions, and subsequent academic outcomes.

*Participants*

Final sample included 556 boys (58.4 %) and 396 girls (41.6 %); 541(56.8 %) were middle school students (freshmen / $7^{th}$:191; junior / $8^{th}$:350), and 411(43.2 %) were high school students (freshmen/$10^{th}$:207; junior/$11^{th}$:204). All of the three middle schools and two high schools were located in the capital of South Korea, Seoul. The schools were focused on college preparatory education because the competition for college entrance is very rigorous in Korea. All of the schools had broad distributions in academic performance and socioeconomic status. Table 12 reported the descriptive statistics of academic achievement for mathematics and English. Data commonly used as indices of the socioeconomic status (e.g., free and reduced price lunches were not available from the schools. Thus, students were to report their perceived socioeconomic status on a 7-point scale ranging from “very poor” to “very rich” (Table 13).

Table 12

*Descriptive Statistics on Participants' Academic Achievement and Socioeconomic Status*

| | Middle School A ($n$ = 195) | | | | Middle School B ($n$ = 179) | | | | Middle School C ($n$ = 167) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Mean* | *SD* | *SK* | *KR* | *Mean* | *SD* | *SK* | *KR* | *Mean* | *SD* | *SK* | *KR* |
| Math_mid | 61.15 | 23.43 | -.19 | -1.00 | 60.79 | 20.96 | -.12 | -.83 | 66.96 | 23.44 | -.30 | -1.16 |
| Engl_mid | 66.74 | 26.67 | -.59 | -.85 | 74.67 | 21.36 | -.97 | .20 | 65.70 | 25.37 | -.33 | -1.15 |
| Math_final | 67.31 | 18.71 | -.52 | -.53 | 60.27 | 25.45 | -.20 | -1.14 | 61.91 | 24.73 | -.10 | -1.21 |
| Engl_final | 64.21 | 23.65 | -.43 | -1.03 | 66.24 | 22.56 | -.55 | -.68 | 58.12 | 25.69 | -.09 | -1.27 |
| | Hi School D ($n$ = 215) | | | | Hi School E ($n$ = 196) | | | | Total ($n$ = 952) | | | |
| | *Mean* | *SD* | *SK* | *KR* | *Mean* | *SD* | *SK* | *KR* | *Mean* | *SD* | *SK* | *KR* |
| Math_mid | 48.67 | 22.75 | .17 | -.93 | 60.08 | 27.61 | -.23 | -1.34 | 59.06 | 24.49 | -.13 | -1.08 |
| Engl_mid | 58.11 | 27.77 | -.11 | -1.33 | 59.69 | 27.83 | -.31 | -1.25 | 64.65 | 26.65 | -.46 | -1.04 |
| Math_final | 45.17 | 25.56 | .42 | -.96 | 47.05 | 26.91 | .19 | -1.15 | 55.87 | 25.96 | -.11 | -1.14 |
| Engl_final | 51.64 | 25.81 | .11 | -1.20 | 55.31 | 26.76 | -.15 | -1.29 | 58.85 | 25.53 | -.23 | -1.18 |

*Note.*SD = standard deviation; SK = skewness; KR = kurtosis; Math_mid, Engl_mid, Math_final, Engl_final = raw scores of midterm and final exam for mathematics and English graded by percentage.

Table 13

*Frequency of Socioeconomic Status*

| Middle School A (*n* = 195) | | | Middle School B (*n* = 179) | | | Middle School C (*n* = 167) | | |
|---|---|---|---|---|---|---|---|---|
| SES | Frequency | % | SES | Frequency | % | SES | Frequency | % |
| 1 | 11 | 6 | 1 | 2 | 1 | 1 | 13 | 8 |
| 2 | 18 | 9 | 2 | 14 | 8 | 2 | 11 | 7 |
| 3 | 22 | 11 | 3 | 19 | 11 | 3 | 28 | 17 |
| 4 | 71 | 36 | 4 | 67 | 37 | 4 | 69 | 41 |
| 5 | 33 | 17 | 5 | 36 | 20 | 5 | 22 | 13 |
| 6 | 27 | 14 | 6 | 31 | 17 | 6 | 10 | 6 |
| 7 | 9 | 5 | 7 | 9 | 5 | 7 | 10 | 6 |
| Missing | 4 | 2 | Missing | 1 | 1 | Missing | 4 | 2 |
| Total | 195 | 100 | Total | 179 | 100 | Total | 167 | 100 |

| Hi School D (*n* = 215) | | | Hi School E (*n* = 196) | | | Total (*n* = 952) | | |
|---|---|---|---|---|---|---|---|---|
| SES | Frequency | % | SES | Frequency | % | SES | Frequency | % |
| 1 | 24 | 11 | 1 | 14 | 7 | 1 | 64 | 7 |
| 2 | 21 | 10 | 2 | 29 | 15 | 2 | 93 | 10 |
| 3 | 53 | 25 | 3 | 43 | 22 | 3 | 165 | 17 |
| 4 | 74 | 34 | 4 | 68 | 35 | 4 | 349 | 37 |
| 5 | 26 | 12 | 5 | 26 | 13 | 5 | 143 | 15 |
| 6 | 10 | 5 | 6 | 14 | 7 | 6 | 92 | 10 |
| 7 | 4 | 2 | 7 | 2 | 1 | 7 | 34 | 4 |
| Missing | 3 | 1 | Missing | 0 | 0 | Missing | 12 | 1 |
| Total | 215 | 100 | Total | 196 | 100 | Total | 952 | 100 |

*Note.* SES = socioeconomic status scores self-reported by students based on 7 point Likert scale.

*Measures*

The SMLI (Bae et al., manuscript in revision) was adopted for the measurement of motivation and SRL. The complete set of items is shown in Table 3 (with factor loadings). All items of the SMLI were translated into Korean. They were then reverse translated to English by Korean graduate students studying in the U.S. to confirm translation accuracy between the two versions. Each item was presented using a 7-point Likert scale (1 = never true of me, to 7 = very true of me). The measure included separate sets of the items pertaining to English and mathematics, yielding a total of 86 items. All items were described in present tense to reflect students' stable traits on their learning habits (Hong & O'Neil, 2001), and subject-specificity of the relationships among constructs for mathematics and English was indicated by the reference phrases of "studying mathematics/English" in each item and at the top of each page.

Prior to the main study, a pilot study was conducted to check the reliability of the SMLI that was administered to 208 students from a middle school in South Korea. The results demonstrated good or acceptable reliabilities with Cronbach's alpha coefficients over .68 on all scales. Therefore, the main study was conducted without any revision to the SMLI.

**Motivation scales.** The motivational construct of the SMLI has three sub-scales of foregoing agents: SE, MG, and PA. I adopted MG for the highest level goal of intrinsic motivation, and PA for the lowest level goal of extrinsic motivation (Elliot & Church, 1997).

***Self-Efficacy (SE).*** The nine items of academic self-efficacy scale were selected from the MSLQ (Pintrich et al., 1991), which assesses students' beliefs about their academic competence (e.g., "I expect to do mathematics/English very well in school."). Two items are negatively-worded (i.e., reverse-scored) in order to reduce the consequences of respondents' inattention (e.g., "I think I am poor at Math class assignment and homework."). Cronbach's alphas were .90 and .86 for mathematics and English, respectively.

***Goal Orientation (GO).*** The original scales on goal orientation (Elliot & Church, 1997) contain six items on both MG and PA, and only the four items with the highest factor loadings on each were selected for use in the SMLI. The four MG items assess how much students focus on the development of their learning competence toward task mastery (e.g., "It is important for me to understand the content of Math/English course as thoroughly as possible."). The four PA items measure how much students were involved in their learning goal just to avoid unfavorable outcomes (e.g.," I just want to avoid doing poorly in mathematics/English."). Cronbach's alphas for MG were .83 for both mathematics and English, and those for PA were.67 for mathematics and .69 for English.

**Self-regulated learning scales.** The SMLI contains three subscales of ongoing mechanisms: EP, CM, and RM. The EP items stemmed from the original self-regulatory inventory developed by O'Neil et al. (1994). The items on CM and RM came from the MSLQ (Pintrich et al., 1991) based on factor loadings.

***Effort & Persistence (EP).*** The EP scale consists of seven items that measure how well students control their effort and persistence during their learning performance (e.g., "I keep working even on difficult tasks of mathematics/English class."). Also, as stated above, the scale on EP operates as a multi-dimensional construct on both motivation and SRL in the SMLI. One item is negatively worded to avoid erroneous results from respondents' inattention (e.g., "I give up if mathematics/English task is hard."). Cronbach's alphas were .89 for both mathematics and English.

***Cognitive and Metacognitive Strategies (CM).*** Although metacognition is conceptually different from cognitive strategies, cognitive strategies and metacognition operate in concert in academic performance (Pintrich & Groot, 1990; Sitzmann & Ely, 2011). Therefore, cognitive and metacognitive were combined into a single scale in the SMLI. The CM scale includes five subscales and estimates how well students adopt learning strategies. It consists of seven items on cognitive strategy use of four subscales and five items on metacognitive strategies of one subscale: two items for each of "rehearsal," "elaboration," and "critical thinking" (e.g., "When a theory, interpretation, or conclusion is presented in mathematics/English class, I try to decide if there is good supporting evidence."), a single item for "organization" (e.g., "When I study for Math/English course, I go over my class notes and make an outline of important concepts."), and five items for metacognitive strategy use (e.g., "When I study for mathematics/English class, I set goals for myself in order to direct my activities in each study period."). Cronbach's alphas were .94 for both mathematics and English.

***Resource Management (RM).***The RM scale rates how well students manage their external resources using seven items: three items on "time and environment" (e.g., "I make good use of my studying time for mathematics/English."); two items on "peer-learning" (e.g., "When studying for Math/English course, I often try to explain the material to a classmate or a friend."), and two items on "help-seeking" (e.g., "I ask the instructor to clarify concepts when I don't understand well in studying Math/English."). Cronbach's alphas for mathematics and English were .84 and .86 respectively.

**Academic Achievement.** Generally, in Korean middle and high schools, academic outcomes include performance evaluations (e.g., assignment, participation in class, and quizzes) and the written examinations conducted at mid-term and final term of each semester. Also, most secondary schools share the basic education curriculums of mathematics, English, and other subjects within each of school year levels. The mathematics curriculum for each school year consists of all dimensions of algebra, calculus, geometry, and statistics, while the English curriculum for each school year comprises the four linguistic functions of reading, writing, listening, and speaking, emphasizing the integration of those functions. The course contents are successively connected, gradually increasing in depth and complexity, and specific curriculums vary between schools and even classes in the same school.

The faculty in each school provided the data files of participants' mid-term and final-term exams for mathematics and English through email approximately two months after conducting the SMLI when it was one month before final terms in each school. The survey was administered between mid-term and final-term examination with the interval

of about one month. Therefore, I used mid-term scores for prior academic achievement and final term scores for subsequent academic achievement. Academic outcomes from all five schools were recorded by percentage and converted to the *Z* scores within each class of each school to address the differences among classes of each school in grading policies (Wolters, 2004).

### *Procedure*

The SMLI questionnaires were randomly distributed to about 2,000 students in three middle schools and two high schools located in the capital of South Korea during the intermediate time between mid-term and final term examinations through June and July, 2011 (the Korean school year runs from March to December). Participants were asked to answer two questionnaires on mathematics and English independently and voluntarily at their home. The questionnaires were initially retrieved from 1,072 students. After excluding 73 questionnaires without parental permission and 47 questionnaires with random responses and / or more than 50 % items incompleted in either mathematics or English, the final sample contained 952 students. After entering and organizing the data, all information revealing students' identities were removed to produce an anonymous dataset.

## Analyses

In a prior study (Bae, Goetz, &Yoon, manuscript in revision), construct validities of the measurement model were tested through the confirmatory factor analysis (CFA) using AMOS 16. Complying with the domain specificity (Bandura, 1986; Green et al., 2007; Pajares, 1996), all of the analyses were conducted separately for the two subject

domains of mathematics and English. Results showed good internal consistency of all constructs, with Cronbach's alphas ranging from .67 to .94. As reported in Table 14, the CFAs on each measurement model of motivation and SRL in the SMLI yielded relevant factor loadings, except for negatively-worded items, which had low factor loadings due to wording effects (Schrietheim, Schrietheim, & Eisenbach, 1995). Also, Table 15 provides the descriptive information about the six construct composites of the SMLI and students' academic outcomes. The composite of each construct is the averages of item scores.

Table 14

*The 43 Items and Factor Loadings for Six Scales in the SMLI for Mathematics and English through CFA.*

| Construct | | Item | Factor Loadings (Standardized) | |
|---|---|---|---|---|
| | | | Math | Engl |
| SE | 1 | Compared to other students in Math/English class, I expect to do well. | .86 | .86 |
| | 11 | My study skills are excellent compared with others in Math/English class. | .89 | .90 |
| | 15 | I know that I will be able to learn the Math/English materials for the tests and exams. | .75 | .70 |
| | 20® | I think I am poor at Math/English class assignments and homework. | .22 | .11 |
| | 22 | Compared with other students in Math/English class I think I know a great deal about the subjects I am studying. | .82 | .82 |
| | 25 | Compared with others in Math/English class, I think I am a good student. | .90 | .92 |
| | 31 | I am certain that I can understand the ideas taught in Math/English classes. | .72 | .74 |
| | 36® | I think I will receive poor grades in my Math/English exams. | .39 | .39 |
| | 41 | I expect to do Math/English very well in school. | .82 | .83 |

Table 14

*Continued*

| Construct | | Item | Factor Loadings (Standardized) | |
|---|---|---|---|---|
| | | | Math | Engl |
| MG | 2 | I want to learn as much as possible from Math/English class. | .80 | .71 |
| | 16 | I hope to have gained a broader and deeper knowledge of Math/English when I am done with Math class. | .80 | .71 |
| | 21 | I desire to completely master the material presented in Math/English class. | .72 | .81 |
| | 42 | It is important for me to understand the content of Math/English course as thoroughly as possible. | .66 | .75 |
| PA | 3 | I often think to myself, "What if I do badly in Math/English class?" | .75 | .68 |
| | 12 | I worry about the possibility of getting a bad grade in Math/English class. | .80 | .84 |
| | 23 | I just want to avoid doing poorly in Math/English class. | .21 | .27 |
| | 28 | My fear of performing poorly in Math/English class is often what motivates me. | .61 | .63 |
| EP | 4 | I work as hard as possible on all tasks of Math/English class. | .84 | .85 |
| | 5 | I keep working even on difficult tasks of Math/English class. | .88 | .88 |
| | 6 | The lack of ability for the task of Math/English class can be compensated for by working hard. | .76 | .75 |
| | 14 | I work hard to do well even if I don’t like a Math/English task. | .78 | .76 |
| | 17 | I concentrate fully when doing a Math/English task. | .79 | .79 |
| | 38 | I put forth my best effort on Math/English tasks. | .79 | .74 |
| | 32 ® | I give up if the Math/English task is hard. | .34 | .34 |

Table 14

*Continued*

| Construct | | | Item | Factor Loadings (Standardized) | |
|---|---|---|---|---|---|
| | | | | Math | Engl |
| CM | RH | 35 | When I study for Math/English class, I practice saying the material to myself over and over. | .77 | .80 |
| | | 19 | When studying for Math/English class, I read my class notes and the course readings over and over again. | .78 | .76 |
| | EB | 34 | When reading for Math/English class, I try to relate the material to what I already know. | .75 | .79 |
| | | 43 | I try to understand the material in Math/English class by making connections between the readings and the concepts from the lectures. | .76 | .78 |
| | OG | 13 | When I study for Math/English course, I go over my class notes and make an outline of important concepts. | .70 | .74 |
| | CT | 26 | When a theory, interpretation, or conclusion is presented in Math/English class, I try to decide if there is good supporting evidence. | .79 | .80 |
| | | 30 | Whenever I read or hear an assertion or conclusion in Math/English class, I think about possible alternatives. | .72 | .75 |
| | MC | 7 | When I study Math/English, I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying. | .71 | .73 |
| | | 8 | I ask myself questions to make sure I understand the material I have been studying in Math/English class. | .74 | .75 |
| | | 10 | Before I study new Math/English course material thoroughly, I often skim it to see how it is organized. | .70 | .74 |
| | | 27 | When I study for Math/English class, I set goals for myself in order to direct my activities in each study period. | .80 | .80 |
| | | 37 | When studying for Math/English course I try to determine which concepts I don't understand well. | .62 | .60 |

Table 14

*Continued*

| Construct | | Item | Factor Loadings (Standardized) | |
|---|---|---|---|---|
| | | | Math | Engl |
| RM | 9 | I try to work with other students from Math/English class to complete the course assignments, | .54 | .56 |
| | 18 | When studying for Math/English course, I often try to explain the material to a classmate or a friend. | .73 | .73 |
| | 24 | I have a regular place set aside for studying Math/English. | .70 | .74 |
| | 29 | I ask the instructor to clarify concepts when I don't understand well in studying Math/English. | .73 | .77 |
| | 33 | I make good use of my study time for Math/English course. | .78 | .78 |
| | 40 | When I can't understand the material in Math/English course, I ask another student in English class for help rather than do on my own. | .38 | .45 |
| | 39 | I make sure I keep up with the weekly readings and assignments for Math/English course. | .76 | .77 |

*Note.*® : Reversely- scored item.

SE = self-efficacy; MG = mastery goal orientation; PA = performance-avoidance goal; EP = effort and persistence; CM = cognitive strategy use; RH = rehearsal; EB = elaboration; OG = organization; CT = critical thinking; MC = metacognitive strategy use; RM = resource management.

All factor loadings were standardized.

Table 15

*Descriptive Statistics and Reliabilities (Alpha) for 6 Construct Composites*

| Construct | | Mathematics ($n$ = 952) | | | | | English ($n$ = 952) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *M* | *SD* | *SK* | *KR* | *Alpha* | *M* | *SD* | *SK* | *KR* | *Alpha* |
| Motivation (Foregoing agents) | SE | 3.79 | 1.25 | .11 | -.33 | .90 | 3.84 | 1.22 | .07 | -.25 | .86 |
| | MG | 4.64 | 1.39 | -.32 | -.34 | .83 | 4.74 | 1.39 | -.43 | -.17 | .83 |
| | PA | 4.54 | 1.30 | -.32 | -.21 | .67 | 4.43 | 1.32 | -.39 | -.15 | .69 |
| Self-regulatory processes (Ongoing Mechanisms) | EP | 4.44 | 1.27 | -.22 | -.18 | .89 | 4.44 | 1.25 | -.21 | -.11 | .89 |
| | CM | 3.88 | 1.24 | -.11 | -.03 | .94 | 3.82 | 1.25 | -.11 | .02 | .94 |
| | RM | 3.91 | 1.18 | -.17 | .08 | .84 | 3.77 | 1.19 | -.09 | .12 | .86 |

*Note.* Each construct composites was the average of the item scores corresponding to each factor.

SE=self-efficacy; MG = mastery goal orientation; PA = performance avoidance goal orientation; EP = effort & persistence; CM = cognitive and metacognitive strategy; RM = resource management; M = mean; SD = standard deviation; SK = skewness; KR = kurtosis

The chi-square and degree of freedom (i.e. $\chi^2/df$), Root Mean Square Error of Approximation (RMSEA), and Comparative Fit Index (CFI) were adopted for model fit indices (Brown, 2006). Due to large sample size, all chi-square tests were statistically significant that is inappropriate for the evaluation of a single model (Marsh, Hau, Artelt, Baumert, & Peschar, 2006). The CFI > .95 and RMSEA < .05 indicate a good fit (Brown,

2006; Marsh et al., 2006). The $\chi 2/ df$ for motivation was 950.50/107 for mathematics and 922.66/107 for English. For SRL, $\chi 2/ df$ was 166.48/296 for mathematics and 1714.11/296 for English. The RMSEA for motivation was .091 for mathematics and .090 for English. For SRL, RMSEA was .070 for mathematics and .071 for English, reflecting mediocre and acceptable fit, respectively (Brown, 2006; Marsh et al., 2006). The CFI for motivation was .909 for mathematics and .911 for English. For SRL, the CFI was .917 for both mathematics and English, indicating acceptable fit. The factor loadings extended from .21 to .90 in mathematics, and from .11 to .92, in English. The average factor loadings were .70 for both mathematics and English, and the medians were .74 for mathematics and .75 for English. As shown in the previous study (Bae et al., manuscript in revision), CFA/SEM multiple indicators and causes analyses (MIMIC) yielded evidence of substantial relationships between the six motivation and SLR constructs of the SMLI and academic outcomes. Table 16 shows the correlations among the six constructs of motivation and SRL measured by the SMLI and academic achievement in mathematics and English. The six construct composites for motivation and SRL hypothesized in the SMLI were the averages of the item scores assigned to each latent factor. The associations among SE, MG, EP, CM, and RM were positive and strong, showing the close connections of motivational constructs with SRL traits.

Table 16

*Zero-Order Correlations among Motivation, SRL Variables, and Academic Achievement in Mathematics and English*

| | SE math | MG math | PA math | EP math | CM math | RM math | Z_Math _mid | Z_Math_ final | SE Engl | MG Engl | PA Engl | EP Engl | CM Engl | RM Engl | Z_Engl_ mid |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MG math | .58** | | | | | | | | | | | | | | |
| PA math | -.07* | .26** | | | | | | | | | | | | | |
| EP math | .74** | .79** | .17** | | | | | | | | | | | | |
| CM math | .76** | .73** | .16** | .82** | | | | | | | | | | | |
| RM math | .72** | .69** | .22** | .79** | .87** | | | | | | | | | | |
| Z_Math_ mid | .58** | .40** | .09** | .49** | .47** | .48** | | | | | | | | | |
| Z_Math_ final | .58** | .44** | .09** | .52** | .48** | .50** | .88** | | | | | | | | |
| SE Engl | .55** | .33** | .04 | .42** | .52** | .53** | ,37** | .40** | | | | | | | |
| MG Eng | .33** | .62** | .28** | .51** | .51** | .51** | .29** | .25** | .55** | | | | | | |
| PA Engl | .03 | .24** | .56** | .17** | .15** | .19** | .12** | .08* | -.05 | .29** | | | | | |
| EP Engl | .43** | .48** | .20** | .56** | .56** | .55** | .33** | .32** | .74** | .76** | .16** | | | | |
| CM Engl | .48** | .42** | .17** | .49** | .67** | .61** | .33** | .32** | .75** | .65** | .20** | .75** | | | |
| RM Engl | .50** | .46** | .15** | .52** | .64** | .68** | .31** | .33** | .76** | .68** | .19** | .79** | .89** | | |
| Z_Engl_ mid | .41** | .30** | .13** | .37** | .37** | .40** | .76** | .77** | .55** | .40** | .13** | .47** | .46** | .45** | |
| Z_Engl_ final | .42** | .32** | .14** | .39** | .38** | .40** | .77** | .80** | .55** | .40** | .10** | .47** | .45** | .43** | .92** |

*Note.* SE = self-efficacy; MG = mastery goal orientation; PA = performance avoidance goal orientation; EP = effort & persistence; CM = cognitive and metacognitive strategy; RM = resource management.

* $p < 0.05$, 2-tailed; ** $p < 0.01$, 2-tailed.

Z_Math_mid, Z_Math_final , Z_Engl_mid, Z_Engl_final = midterm and final exam scores for mathematics and English were converted to the standardized *z* scores within class

I conducted path analysis for multivariate structural models based on the SEM for mathematics and English using the MPLUS. I adopted the chi-square and degree of freedom (i.e. $\chi^2/df$), RMSEA, and CFI for model fit indices (Brown, 2006). Additionally, indirect effects were estimated using the delta method standard error as available in the MPLUS (Muthén & Muthén, 1998-2012). The maximum likelihood estimation (MLE) was employed for the analysis of the theoretical structural model, and missing data were addressed through the full information maximum likelihood (FIML) under the MPLUS (Muthén & Muthén, 1998-2012).

## Results

As shown in Figure 4, although the initially hypothesized research model (i.e., Model 1) did not include a direct path from prior subject scores to goal orientations. However, there is some research that provides evidence for the importance of this link. Figure 5 shows a modified model (i.e., Model 2) where the direct paths from prior subject grades to goal orientations were added. The subsequent analyses revealed significant coefficients of the direct path from prior subject scores to goal orientations for both math and English. However, other alternative analyses did not produce any meaningful path coefficients. Considering that MG and PA are goal orientations, and also EP, CM, and PA fall into self-regulatory functions, those constructs share the impacts of the latent sources other than the specified paths. Thus, the residual correlations between MG and PA (i.e., goal orientations), among EP, CM, and RM (i.e., self-regulatory functions) were specified for mathematics and English (Brown, 2006). As depicted in Figure 4 and 5, the differences between Model 1 and Model 2 are whether

to include the paths from prior achievement to goal orientations or not. Both models explained 79 % and for mathematics and 85 % for English of the variances in subsequent academic outcomes. Overall, the patterns of the reciprocal paths were consistent across mathematics and English.

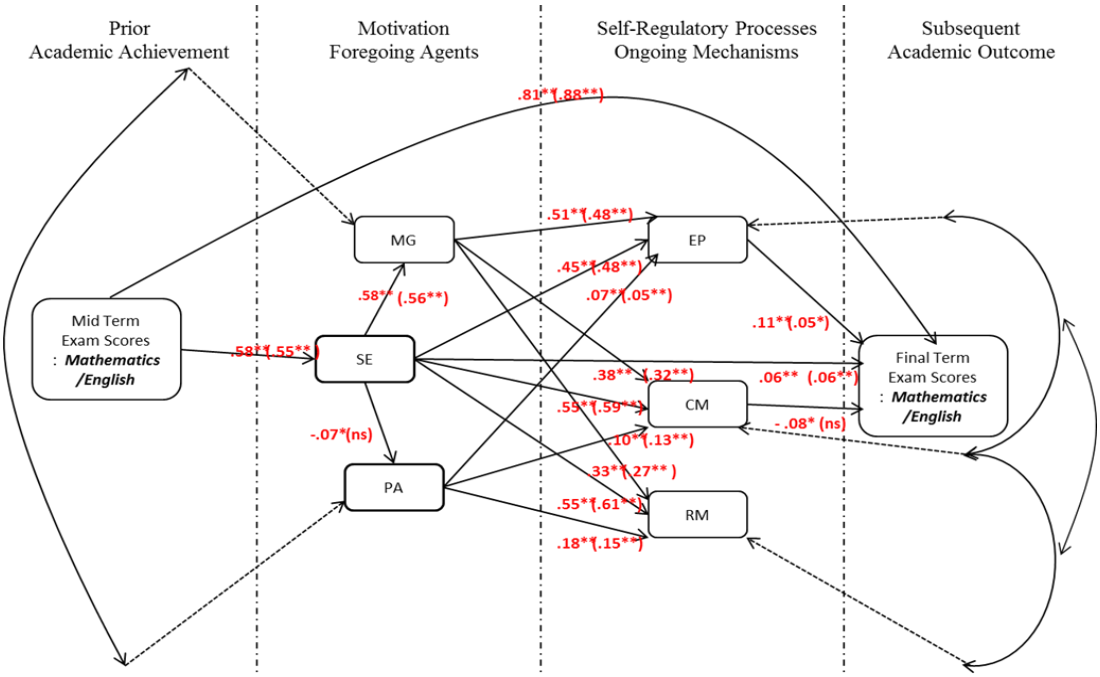


*Figure 4.* Model 1: standardized coefficients for hypothesized model of the relationships among 6 constructs of motivation and SRL, and academic achievement in mathematics and English (n = 952).
*Note*. The values in parentheses indicate the path coefficients in English..
SE = self-efficacy; MG = mastery goal orientation; PA = performance avoidance goal orientation; EP = effort & persistence; CM = cognitive and metacognitive strategy; RM = resource management.
* $p < 0.05$, 2-tailed; ** $p < 0.01$, 2-tailed; ns: statistically non-significance
Midterm and final term math and English exam scores were converted to the standardized *z* scores within class.

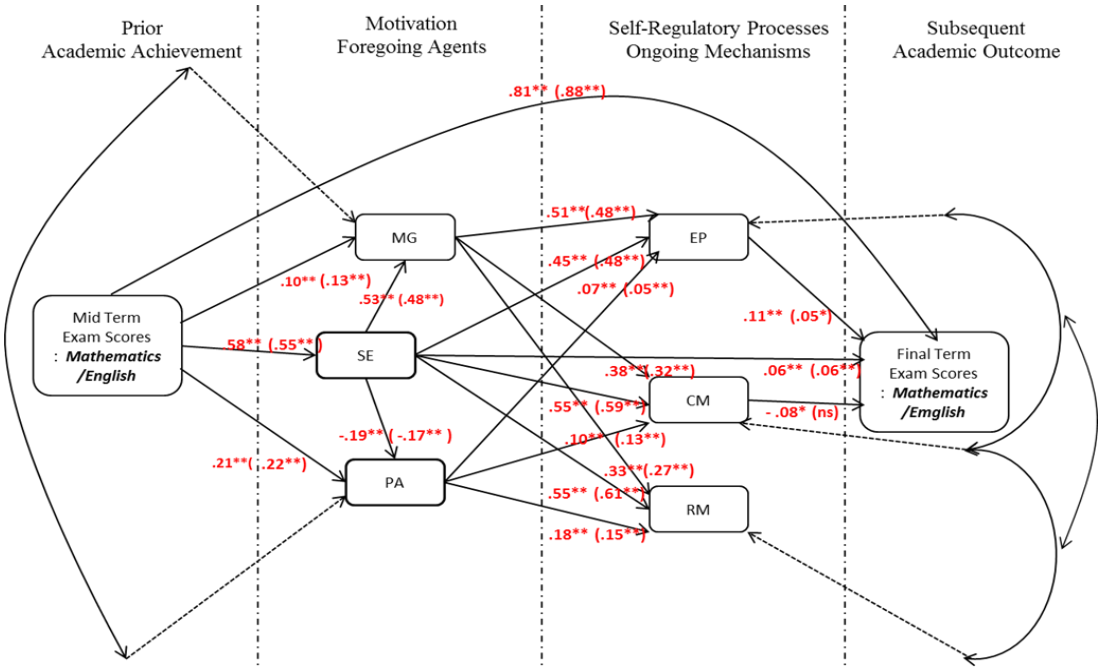


*Figure 5.* Model 2: standardized coefficients for modified model of the relationships among 6 constructs of motivation and SRL, and academic achievement in mathematics and English (n = 952).
*Note*. The values in parentheses indicate the path coefficients in English..
SE = self-efficacy; MG = mastery goal orientation; PA = performance avoidance goal orientation; EP = effort & persistence; CM = cognitive and metacognitive strategy; RM = resource management.
* $p < 0.05$, 2-tailed; ** $p < 0.01$, 2-tailed; ns: statistically non-significance
Midterm and final term math and English exam scores were converted to the standardized *z* scores within class.

*Model 1*

The model fit indices of Model 1 are good: $\chi^2/df$ = 42.19/7, CFI = .99, RMSEA = .07for mathematics, and $\chi^2/df$ = 40.29/7, CFI = .99, RMSEA = .07 for English. As predicted in the first hypothesis (H1), midterm exam scores strongly influenced final term outcomes in both subjects ($\beta$ = .81 for mathematics; $\beta$ = .88 for English). Midterm subject grades also predicted SE for both subjects ($\beta$ = .58 for mathematics; $\beta$ = .55 for

English), supporting H2. As predicted by H3, SE had strong impacts on MG ($\beta$ = .58 for mathematics; β = .56 for English), but negative or non-significant effects on PA ($\beta$ = -.07 for mathematics; non significance for English).

Consistent with H4, self-efficacy predicted self-regulatory functions for English and mathematics ($\beta$ = .45 to .61). Tests of H5 confirmed the prediction that mastery goal orientation predicted self-regulatory functions for both subjects ($\beta$ = .27 to .51). , The relationships between performance avoidance goal orientation and self-regulatory functions also were positive ($\beta$ = .05 to .18). The finding that PA was connected positively to all of SRL constructs differed from previous studies by Elliot et al. (1999) and Wolters (2004), which is discussed more in the following section.

Examination of the predictors of subsequent academic achievement revealed that SE predicted final exam grades ($\beta$ = .06 for both mathematics and English), as predicted in H6. Results regarding the prediction that self-regulatory functions would predict subsequent academic achievement (H7), the results were mixed. Consistent with the hypothesis, EP made a statistically significant contribution to final term grades for both mathematics and English ($\beta$ = .11, for mathematics; $\beta$ = .05 for English). However, no statistically significant impact on final term scores was found for CM or RM when controlling the effects of SE and EP. Specifically, although both CM and RM were positively correlated with subsequent academic outcomes, CM and RM made no contribution to subsequent subject grades, even showing negative effect of CM for mathematics ($\beta$ = -.08). The correlations between CM and EP for mathematics were very strong ($r$ = .82), and EP was a better predictor of performance than CM. Then, EP

overwhelmingly accounted for the variance of the performance entailing the negative relation of CM with the remaining variance of the academic outcome (Pintrich & Groot, 1990).

*Model 2*

Model 2 showed very good model fit: $\chi^2/df$ = 13.26 /5, CFI = .99, RMSEA = .04 for mathematics, and $\chi^2/df$ = 3.18/5, CFI = 1.000, RMSEA = .00 for English. As the direct paths from prior subject scores to goal orientations were added in Model 2, the differences between two models were found in the additional paths and the effects of SE on goal orientations.

Specifically, midterm subject scores predicted PA ($\beta$ = .21 for mathematics; $\beta$ = .22 for English) and MG ($\beta$ = .10 for mathematics; $\beta$ = .13 for English) when controlling the effect of SE on both goal orientations. As similar to Model 1, SE strongly influenced MG ($\beta$ = .53 for mathematics; $\beta$ = .48 for English), but negatively affected PA ($\beta$ = -.19 for mathematics; $\beta$ = -.17 for English). The other paths were same in both Models.

Lastly, the mediated effects were detected through the delta standard error method under the MPLUS (Muthén & Muthén, 1998-2012). Table 17 reported the indirect effects in Model 2 that included the additional paths to Model 1. As for the significant indirect effects between self-efficacy and subsequent academic achievements (H8), SE influenced final term outcomes for mathematics indirectly via EP ($z$ = 3.66, p < .01), via MG and EP ($z$ = 3.58, $p$ < .01), and via PA and EP ($z$ = - 2.39, $p$ < .05); and for English via EP ($z$ = 2.05, $p$ < .05), and via MG and EP ($z$ = 2.03, $p$ < .05). As hypothesized in H8, some of goal orientations and/or self-regulatory processes mediated

partially between self-efficacy and subsequent academic achievement. Furthermore, as assumed in H9, the mediated effects of self-regulatory processes between goal orientations and subsequent academic performance were found. EP mediated between MG and final term scores ($z = 3.66$, $p < .01$, for mathematics; $z = 2.05$, $p < .05$, for English) and between PA and subsequent achievement ($z = 2.74$, $p < .01$, only for mathematics). Besides, since CM operated as a negative suppressor variable for subsequent achievement of mathematics (Pintrich & Groot, 1990), the mediation effects of CM on subsequent performance for mathematics were excluded for the clarity of interpretation.

Table 17

*Mediated Effects*

| Mediated Pathway: Mathematics | Z | *P* |
|---|---|---|
| *SE → goal orientations (MG or PA) and/or SRL → final term exam scores* | 3.66 | .01. |
| • SE → EP → final term exam scores | 3.58 | 01 |
| • SE → MG → EP → final term exam scores | -2.39 | .05 |
| • SE → PA → EP → final term exam scores | | |
| *Goal orientation →ongoing SRL → final term exam scores* | 3.66 | .01 |
| • MG → EP → final term exam scores | 2.74 | .01 |
| • PA → EP → final term exam scores | | |
| Mediated Pathway: English | Z | *P* |
| *SE → goal orientations (MG or PA) and/or SRL → final term exam scores* | 2.05 | .05 |
| • SE → EP → final term exam scores | 2.03 | .05 |
| • SE → MG → EP → final term exam scores | | |
| *Goal orientation →ongoing SRL → final term exam scores* | 2.05 | .05 |
| • MG → EP → final term exam scores | | |

*Note.* SE=self-efficacy; MG = mastery goal orientation; PA = performance avoidance goal orientation; EP = effort & persistence; CM = cognitive and metacognitive strategy; RM = resource management.

## Discussion

With the evidence on the specific structure of the relationships among motivation, SRL, and academic achievement, the findings supported the theory of Bandura's self-system in reciprocal determinism (1978) and the theoretical literature of motivation and SRL for students' learning. Starting from preceding academic performance, the path analyses precisely showed that the foregoing motivational agents and the ongoing self-regulatory mechanisms interacted in a dynamic and reciprocal manner, , which, in turn, substantially contributed to subsequent academic outcomes.

As expected, preceding achievement primarily predicted subsequent students' performance and SE as well. Prior achievement also significantly and weakly influenced MG and PA but none of the ongoing self-regulatory functions in alternative models. The results were coherent with the previous studies (e.g., Diseth, 2011; Elliot et al., 1999; Wolters, 2004). This finding supports that the self-regulatory functions be ongoing mechanisms other than foregoing agents resulting from the previous academic outcomes (Diseth, 2011).

In terms of the relationships among the six constructs (SE, MG, PA, EP, CM, RM), the results from the path analyses generally supports the theoretical literature and the prior studies (e.g., Diseth, 2011; Elliot & Church, 1997; Elliot et al., 1999; Pintrich & Groot, 1990; Wolters, 2004). The findings suggested that SE was related positively to MG but negatively to PA. Also, the foregoing agents (SE, MG, PA) were substantially connected to the ongoing self-regulatory functions, signifying their reciprocal functions for students' academic performance. The findings imply that the students with high self-efficacy tend to pursue their high-level learning goals, and adopt more effective learning strategies making effort and persistence for their academic performance (Bandura, 1982, 1986, 1991; Pajares & Graham, 1999; Pintrich, 2000; Schunk, 2005; Zimmerman, 1995b, 2004).

By contrast, the present study showed some distinct from the previous research (e.g., Elliot et al., 1999; Wolters, 2004) in the relations between PA and the self-regulatory functions. The current study found the positive impacts of PA on all of the self-regulatory processes while the studies for college students (Elliot et al., 1999) and

for high school students (Wolters, 2004) in the USA commonly found of PA had negative or non-significant effects on EP and deep processing (or cognitive metacognitive strategy use) and only positive impact on surface processing or disorganization. Marsh et al. (2006) cautioned that the tendency of those psychological educational constructs should vary in nationalities, cultural settings. For example, those students educated in Asian culture tend to have strong family orientation and sense of obligation for their family members, which may lead to students' performance goals (Bong, 2008; Fuligni & Tseng, 1999; Kim et al., 2010; Urdan, 2004). Moreover, Bong (2008) described that Korean parents are likely to deliver the fervent aspiration and support for their kids' education, and also Korean students tend to emotionally and psychologically depend on their parents' expectations. Additionally, OECD reviews of tertiary education (2009) reported the rapid growth of tertiary institutions and high competitions for prestige universities. Regarding the goal orientations for Korean adolescents, the previous studies (Bong, 2008; Kim et al., 2010) commonly suggested that parent-related factors affected students' performance approach and avoidance goal orientations. As put in line with the previous findings (Bong, 2008; Fuligni & Tseng, 1999; Kim et al., 2010; OECD, 2009; Urdan, 2004), the present study implied that Korean students in high academic competition and parental expectations evenly struggle for their learning performance whichever their goal orientation is. The suggestions were corroborated by the report of Education at a Glance (EAG: OECD, 2013) that over 60 % of 25-34 year-old has attained tertiary-education as the top of the OECD countries in 2011.

Finally, the path analyses showed that SE and EP were the best predictors of six constructs for subsequent academic outcomes, which are in line with the findings of meta-analyses (Credé & Phillips, 2011; Sitzmann & Ely, 2011). By contrast, goal orientations did not directly contribute to subsequent performance, but indirectly via self-regulatory functions underpinning the suggestions in the previous research (Diseth, 2011; Elliot et al., 1999; Meneghetti & Beni, 2010; Sins et al., 2008). Unexpectedly, CM and RM had no or negative impacts on subsequent academic achievement for both subject domains. The results are similar to the findings of the previous studies (Diseth, 2011; Elliot et al., 1999; Wolters, 2004). Pintrich and Groot (1990) speculated that CM should operate a suppressor effect and make no or negative contribution to academic achievement despite its positive correlation with academic achievement when controlled for stronger factors (i.e., SE, EP) on subsequent outcomes.

Furthermore, it would be noted that the strong correlations among the ongoing self-regulatory mechanisms (EP, CM, RM) were found. However, the self-regulatory constructs showed the differentiated patterns of relationships with subsequent academic performance, and should be theoretically and conceptually distinguished from each other (Pintrich & Groot, 1990; Sitzman & Ely, 2011). When the self-regulatory factors which had positive correlations with the academic achievement predict subsequent academic outcomes all together, EP was the most contributor but CM was a negative suppressor for subsequent academic outcomes (Pintrich & Groot, 1990). Moreover, the path analyses in the current study yielded very good model fits and no excessively large standard errors that signified unstable solution in the interpretation of the results (Marsh

et al., 2004). The unstandardized standard errors of the path coefficients for all predictors of subsequent academic outcomes were less than .03, indicating no signal of multicolinearity and solution problem (Marsh et al., 2004). Therefore, Pintrich & Groot (1990) proposed that without accompanying other self-regulatory mechanisms (effort and metacognitive management), cognitive strategy use would hardly contribute to academic achievement. As the present study adopted the combined construct of cognitive and metacognitive strategy use to CM, the finding suggested that EP should be the critical factor on academic attainment. Zimmerman and Schunk (2008) and Corno (2001) proposed that the volitional aspects enable students to keep persistence and make efforts during students' self-regulatory processes, which critically contribute to their learning performance. The suggestion is in line with the finding of the meta-analyses of motivation and SRL for learning performance that the effect size of effort and persistence was the greatest of self-regulatory processes (Bae & Goetz, manuscript in revision; Credé & Phillips, 2011; Sitzman & Ely, 2011).

All in all, prior achievement predicted the foregoing agents, primarily SE that strongly influenced MG within the foregoing motivation. Then, the foregoing motivation predicted students' adoption of the ongoing self-regulatory constructions, of which EP made the substantial contribution to subsequent academic performance. EP was also the most critical mediator between the foregoing motivation and academic performance.

## Limitations and Implications

The present study validated the reciprocal determinism of self-system (Bandura, 1978) where motivation and SRL work interactively for academic performance through

path analysis. However, it should be cautioned that assumptions of causality must be clarified by the use of theoretical rationales (Diseth, 2011; Pearl, 2000).

Since most variables except academic achievement were self-reported, the evaluation of students' motivational and self-regulatory traits was nearly dependent on students' subjective judgment rather than objective criteria. The measures by other parties such as teachers and parents may reinforce the validity of the construct measurements. Additionally even though the current study addressed the differences in grading policies and cultures among classes in each school by using the standardized values, it still has some limitations of the observed scores and the scores of standardized tests would guarantee more validity of the academic outcomes.

Furthermore, the sampling was conducted from a capital city in Korea in a convenient manner, so the sample for this study may not be enough for representativeness of target populations. Moreover, the variables of nationalities, cultures, and settings are very closely related with a tendency toward situating constructs in educational psychological research (Marsh et al., 2006).Therefore, the evidence from the current study may not be generalizable to populations in other countries or levels of education. In order for the generalizability of the SMLI across diverse cultures and countries, future studies with more representative populations should follow. Additionally, the further study needs to address contextual factors (e.g., parental variables, classroom goal structures) adding to the impacts of motivation, and self-regulatory processes on students' academic performance.

Finally, the current research model adopted path analysis to address the dynamic and reciprocal relationships among foregoing agents of motivation, ongoing mechanisms of SRL, and academic achievement in time-based procedures. It would be regarded that ongoing self-regulatory mechanisms and self-reflective processes may be more situational other than stable (Credé & Phillips, 2011; Hong & O'Neil, 2011). But, although the SMLI was administered between midterm and final term examinations with about one month interval, there was no reflective measure immediately after midterm final term exam. Hence, the interpretations of the findings would be more supportive with the timely measures.

In sum, as the study addressed the specific constructs including both motivational and self-regulated learning components based on the reciprocal operating processes, students' learning traits may be interpreted in a more precise way. The specific information on students' learning traits should enable teachers or educators to design effective educational interventions. Actually, students' learning performance should be influenced by a considerable number of variables as explicit and implicit, and internal and external factors. Therefore, educational treatments may require prior examinations on students' learning properties as in a detailed manner as possible for the practical educational productivity.

# CHAPTER IV

# SUMMARY AND CONCLUSIONS

This dissertation consists of two manuscripts pursuing the findings on the relationships among adolescents' motivation, SRL, and academic achievement. The theoretical backgrounds for these studies are underlain by the self-system in reciprocal determinism (Bandura, 1978) and social cognitivism. The first article reports the development of a heuristic framework and a meta-analytic review of the relationship of motivation and SRL to adolescents' academic performance. The second manuscript reports a study that investigated how motivation and SRL contribute to the academic performance of secondary school students in South Korea. Students completed the SMLI, which I developed, providing data on six constructs of motivation and SRL for mathematics and for English. Path analyses were used to test a model of the contributions of motivation and SRL to achievement in the two subject domains.

Both studies indicated that the relationships between motivation and SRL are substantial, and that both contribute to academic performance for adolescents. Overall, the findings support the theories of Bandura (1978) and social cognitivism (e.g., Pintrich & Groot, 1990; Schunk & Zimmerman, 2008) and are in line with the previous findings of the relationships among motivation, SRL, and academic achievement (e.g., Credé & Phillips, 2011; Diseth, 2011; Elliot et al., 1999; Sitzmann & Ely, 2011; Wolters, 2004).

In the systematic review reported in the first manuscript, I examined the most influential theories and instruments of motivation and SRL and found that they varied considerably in construct specifications. However, from my analysis I was able to

construct a heuristic framework consisting of 11 core constructs that can be classified as foregoing agents, ongoing mechanisms, and self-reflecting appraisal. Foregoing agents fell into five motivational constructs: self-efficacy (SE), interest and task value (IV), goal orientations of intrinsic goal (IG) and extrinsic goal (EG), and test anxiety (TA). The five motivational and regulatory constructs are assumed to function as ongoing processes: motivation strategy (MS); effort and persistence (EP); cognitive and metacognitive strategy (CM), behavior management, including time and environment management (TE); and peer learning and help seeking (PH). Attribution (AB) is the only self-reflecting appraisal. Finally, the 11 core constructs were employed for the meta-analysis of the first study.

The heuristic framework that emerged from the systematic review differed from the one employed in a previous meta-analysis of adult learning conducted by Sitzmann and Ely (2011). Sitzmann and Ely proposed 16 core constructs of SRL focusing on regulatory processes and construct operation during the act of studying. By contrast, the current review defined 11 constructs of motivation and SRL for adolescents are based on a cyclic system of foregoing agents, ongoing mechanisms, and self-reflecting appraisal.

The meta-analysis conducted using the heuristic framework developed in the study suggest that seven constructs (i.e., SE, IV, IG, TA, CM, EP, AB) had substantial effect sizes on student academic performance. Additionally, strong correlations were found among the foregoing agents (i.e., SE, IV, IG), ongoing mechanism (i.e., EP, CM), and self-reflecting appraisal (i.e., AB), supporting Bandura's reciprocal determinism of self-system and social cognitivism. As expected, it was found that TA was negatively

correlated not only with academic outcomes, but also with the constructs most closely related to academic achievement (i.e., SE, IV, IG, EP, CM), indicating the deleterious effect of test anxiety on adolescents' learning (Pintrich & Groot, 1990).

Moreover, I investigated the effects of four moderators (i.e., middle school, high school, domain specificity/general academy, MQS) on the associations of 11 constructs with learning outcomes. The moderators accounted for 7 % to 78 % of the variances for the corrected correlations of 10 constructs with academic outcomes. The findings indicate that middle school students were likely to take advantage of SE, CM, and EP for their learning, whereas high school students tend to benefit from SE and IG, but disfavor AB for their learning. The positive effects of SE and IG and negative impacts of TA, TE, and AB were frequently found in the studies taking account of domain specificity for construct measurement. Additionally, the studies with higher MQS reported stronger effect of EG and more negative impact of TE on learning outcomes.

Adding to the meta-analytic findings, the results of the second study, in which a theoretical model of the effect of motivation and SRL on academic achievement was tested using path analysis, also were supportive of Bandura's reciprocal determinism of self-system (1978) and the theoretical literature on the effect of motivation and SRL to students' learning. The path analyses yielded evidence on the relationships of motivation and SRL to academic achievement of adolescents in two subject domains. The findings show dynamic and reciprocal interactions among the foregoing agents of motivation (SE, MG, PA) and the ongoing mechanisms of SRL (EP, CM, RM), and their impacts on students' academic performance. Notably, the foregoing motivational constructs

predicted students' adoption of the ongoing self-regulatory processes in determining students' academic outcomes. SE and EP were the best predictors of six constructs. Goal orientations had indirect effects on subsequent achievement via EP of self-regulatory functions. However, CM and RM did not make any contribution to students' academic outcomes.

In conclusion, this dissertation, a meta-analysis and a test of a theoretical model accounting for students performance in two academic domains supported the reciprocal and dynamic relationships among the motivation, SRL, and academic achievement of adolescents. The findings of both studies suggest that motivation and SRL are strongly related to each other, and, in turn, contribute to students' academic achievement, supporting the suggestions in Bandura's reciprocal self-determinism (1978) and social cognitivism. Specifically, the studies in this dissertation share the finding that foregoing agent SE and ongoing mechanism EP are the best factors on academic achievement. Therefore, the findings of this dissertation may provide teachers or educators with the integrative and specific information on students' learning traits which should help develop effective interventions for the betterment of students' learning.

On the other hand, further studies are needed to add clarity to the nature of relationship of motivation and SRL to students' academic achievement. The meta-analytis yielded findings on the reciprocal and dynamic system in the process of motivation, SRL, and achievement of adolescents. However, reviews of research are needed to examine how motivation and SRL are related to achievement in other populations and for other outcomes.

The findings of the path analyses of data from secondary school students in South Korea also are in line with the suggestions of the current meta-analytic review and the theoretical literature of motivation and SRL for students' academic attainment. However, the students who participated in current study constituted a convenience sample from a single city in Korea. Therefore, additional research is needed to assess the generalizability of the findings across diverse cultures and countries. Moreover, the SMLI is a self-report measure not tied to any specific academic activity. Behavioral measures of students' SRL activities accompanied with proximal measures of their motivation immediately after prior and subsequent exams, might prove illuminating.

Finally, longitudinal research is needed to provide a better understanding of the ongoing, dynamic system of interactions among students' academic motivation, SRL and achievement. However, despite these limitations, the congruence of findings between the meta-analysis and original study reported here should add to our knowledge base of the interactions among these components of academic learning.

# REFERENCES


Bae, Y., Goetz, E., & Yoon, M. (manuscript in revision). Development and Validation of the Self-Motivated Learning Inventory.

Bae, Y., & Goetz, E. T. (manuscript in revision). The Relationship of Motivation and Self-Regulated Learning to Academic Achievement for Adolescents: A Meta-Analysis.

Bandura, A. (1978). The self-system in reciprocal determinism. *American Psychologist, 33*(4), 344-358. doi:http://dx.doi.org/10.1037/0003-066X.33.4.344

Bandura, A. (1982). Self-efficacy mechanism in human agency. *The American Psychologist, 37*(2), 122.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory* Prentice-Hall, Inc, Englewood Cliffs, NJ.

Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes, 50*(2), 248.

Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. *Educational Psychologist, 28*(2), 117-148.

Bandura, A., Barbaranelli, C., Caprara, G. V., & Pastorelli, C. (1996). Multifaceted impact of self-efficacy beliefs on academic functioning. *Child Development, 67*(3), 1206-1222. doi:10.2307/1131888

Bandura, A., Caprara, G. V., Barbaranelli, C., Gerbino, M., & Pastorelli, C. (2003). Role of affective self-regulatory efficacy in diverse spheres of psychosocial functioning. *Child Development, 74*(3), 769-782.

Boekaerts, M. (1996). Self-regulated learning at the junction of cognition and motivation. *European Psychologist, 1*(2), 100-112. doi:10.1027/1016-9040.1.2.100

Bong, M. (2008). Effects of parent-child relationships and classroom goal structures on motivation, help-seeking avoidance, and cheating. *The Journal of Experimental Education, 76*(2), 191-201,203-204,206-217.

Brown, T. A. (2006). *Confirmatory factor analysis for applied research*. New York, NY: Guilford.

Carroll, A., Houghton, S., Wood, R., Unsworth, K., Hattie, J., Gordon, L., & Bower, J. (2009). Self-efficacy and academic achievement in Australian high school students: The mediating effects of academic aspirations and delinquency. *Journal of Adolescence, 32*(4), 797-817. doi:http://dx.doi.org/10.1016/j.adolescence.2008.10.009

Cellar, D. F., Stuhlmacher, A. F., Young, S. K., Fisher, D. M., Adair, C. K., Haynes, S., & Riester, D. (2011). Trait goal orientation, self-regulation, and performance: A meta-analysis. *Journal of Business and Psychology, 26*(4), 467-483. doi: 10.1007/s10869-010-9201-6

Cleary, T. J., & Zimmerman, B. J. (2004). Self-regulation empowerment program: A school-based program to enhance self-regulated and self-motivated cycles of student learning. *Psychology in the Schools, 41*(5), 537-550. doi:10.1002/pits.10177

Corno, L. (2001). *Volitional aspects of self-regulated learning. Self-regulated learning and academic achievement: Theoretical perspectives* (2nd ed.) (pp. 191-225). Mahwah, NJ: Erlbaum.

Credé, M., & Phillips, L. A. (2011).A meta-analytic review of the motivated strategies for learning questionnaire. *Learning and Individual Differences, 21*(4), 337-346. doi: 10.1016/j.lindif.2011.03.002

Crockett, L. J., Moilanen, K. L., Raffaelli, M., & Randall, B. A. (2006). Psychological profiles and adolescent adjustment: A person-centered approach. *Development and Psychopathology, 18*(1), 195-214. doi:http://dx.doi.org/10.1017/S0954579406060111

Diseth, Å. (2011). Self-efficacy, goal orientations and learning strategies as mediators between preceding and subsequent academic achievement. *Learning and Individual Differences,* doi:10.1016/j.lindif.2011.01.003

Dunn, K. E., Lo, W., Mulvenon, S. W., & Sutcliffe, R. (2011). Revisiting the motivated strategies for learning questionnaire: A theoretical and statistical reevaluation of the metacognitive self-regulation and effort regulation subscales. *Educational and Psychological Measurement,* doi:10.1177/0013164411413461

Eccles J. S., Adler, T. F., Futterman, R., Goff, S. B., Kaczala,C. M., Meece, J. L., & Midgley, C. (1983). Expectancies, values, and academic behaviors. In J. T. Spence (Ed.), *Achievement and achievement motivation* (pp. 75–146). San Francisco, CA: W. H. Freeman.

Eccles, J., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology, 53*(1), 109. doi:10.1146/annurev.psych.53.100901.135153

Elliot, A., & Church, M. (1997). A hierarchical model of approach and avoidance achievement motivation. *Journal of Personality and Social Psychology, 72*(1), 218 -232. doi:http://dx.doi.org/10.1037/0022-3514.72.1.218.

Elliot, A. J., Chirkov, V. I., Kim, Y., & Sheldon, K. M. (2001). A cross-cultural analysis of avoidance (relative to approach) personal goals. *Psychological Science, 12*(6), 505-510. doi:http://dx.doi.org/10.1111/1467-9280.00393

Elliot, A. J., McGregor, H. A., & Gable, S. (1999). Achievement goals, study strategies, and exam performance: A mediational analysis. *Journal of Educational Psychology, 91*(3), 549-563. doi:10.1037/0022-0663.91.3.549

Feldman, S. C., Martinez-Pons, M., & Shaham, D. (1995). The relationship of self-efficacy, self-regulation, and collaborative verbal behavior with grades: Preliminary findings. *Psychological Reports, 77*(3), 971-978.

Goodson, P., Buhi, E. R., & Dunsmore, S. C. (2006). Self-esteem and adolescent sexual behaviors, attitudes, and intentions: A systematic review. *Journal of Adolescent Health, 38*(3), 310-319. doi: 10.1016/j.jadohealth.2005.05.026

Green, J., Martin, A. J., & Marsh, H. W. (2007). Motivation and engagement in english, mathematics and science high school subjects: Towards an understanding of multidimensional domain specificity. *Learning and Individual Differences, 17*(3), 269-279. doi:http://dx.doi.org/10.1016/j.lindif.2006.12.003

Harackiewicz, J. M., Barron, K. E., Pintrich, P. R., Elliot, A. J., & Thrash, T. M. (2002). Revision of achievement goal theory: Necessary and illuminating. *Journal of Educational Psychology, 94*(3), 638-645. doi:10.1037/0022-0663.94.3.638

Hong, E., & O'Neil, H. F. (2001). Construct validation of a trait self-regulation model. *International Journal of Psychology, 36*(3), 186-194. doi:10.1080/00207590042000146

Joo, Y., Bong, M., & Choi, H. (2000). Self-efficacy for self-regulated learning, academic self-efficacy and internet self-efficacy in web-based instruction. *Educational Technology Research and Development, 48*(2), 5-17.

Hunter, J. E., & Schmidt, F. L. (Eds.). (2004). *Methods of meta-analysis.* (2nd ed.). Thousand Oaks, CA: SAGE. doi: http://dx.doi.org/10.4135/9781412985031

Kaplan, A., Lichtinger, E., & Gorodetsky, M. (2009). Achievement goal orientations and self-regulation in writing: An integrative perspective. *Journal of Educational Psychology, 101*(1), 51-69. doi:10.1037/a0013200

Kim, J., Schallert, D. L., & Kim, M. (2010). An integrative cultural view of achievement motivation: Parental and classroom predictors of children's goal orientations when learning mathematics in Korea. *Journal of Educational Psychology, 102*(2), 418-437. doi:http://dx.doi.org/10.1037/a0018676

Klassen, R. (2002). Writing in early adolescence: A review of the role of self-efficacy beliefs. *Educational Psychology Review, 14*(2), 173-203. doi:10.1023/A:1014626805572

Malpass, J. R., O'Neil, H. F., Jr., & Hocevar, D. (1999). Self-regulation, goal orientation, self-efficacy, worry and high-stakes math achievement for mathematically gifted high school students. *Roeper Review: A Journal on Gifted Education, 21*(4), 281-288.

Marsh, H. W., Hau, K., Artelt, C., Baumert, J., & Peschar, J. L. (2006). OECD's brief self-report measure of educational psychology's most useful affective constructs: Cross-cultural, psychometric comparisons across 25 countries. *International Journal of Testing, 6*(4), 311-360. doi: 10.1207/s15327574ijt0604_1

Marsh, H. W., Dowson, M., Pietsch, J., & Walker, R. (2004). Why multicollinearity matters: A reexamination of relations between self-efficacy, self-concept, and achievement. *Journal of Educational Psychology, 96*(3), 518-522. doi:http://dx.doi.org/10.1037/0022-0663.96.3.518

Martinez-Pons, M. (1999). Emotional intelligence as a self-regulatory process: A social cognitive view. *Imagination, Cognition and Personality, 19*(4), 331-350.

McCoach, D. B., & Siegle, D. (2003). Factors that differentiate underachieving gifted students from high-achieving gifted students. *Gifted Child Quarterly, 47*(2), 144-154. doi:http://dx.doi.org/10.1177/001698620304700205

Meneghetti, C., & De Beni, R. (2010). Influence of motivational beliefs and strategies on recall task performance in elementary, middle and high school students. *European Journal of Psychology of Education, 25*(3), 325-343. doi:10.1007/s10212-010-0019-4

Midgley, C., Maehr, M. L., Hruda, L. Z., Anderman, E., Anderman, L., Freeman, K. E., et al. (2000). *Patterns of Adaptive Learning Survey(PALS).* Ann Arbor: University of Michigan.

Muthén, L. K., & Muthén, B.O. (1998-2012). *Mplus user's guide* (7th Edition). Los Angeles, CA: Muthén & Muthén

Pajares, F. (1996). Self-efficacy beliefs in academic settings. *Review of Educational Research, 66*(4), 543-578.

Pajares, F., & Graham, L. (1999). Self-efficacy, motivation constructs, and mathematics performance of entering middle school students. *Contemporary Educational Psychology, 24*(2), 124-139.

Pajares, F., &Valiante, G. (2002). Students' self-efficacy in their self-regulated learning strategies: A developmental perspective. *Psychologia: An International Journal of Psychology in the Orient, 45*(4), 211-221. doi:10.2117/psysoc.2002.211

Patrick, H., Ryan, A. M., & Pintrich, P. R. (1999). The differential impact of extrinsic and mastery goal orientations on males' and females' self-regulated learning. *Learning and Individual Differences, 11*(2), 153-171.

Pearl, J. (2000). *Causality: Models, reasoning, and inference.* , New York, NY: Cambridge University Press

Pietsch, J., Walker, R., & Chapman, E. (2003). The relationship among self-concept, self-efficacy, and performance in mathematics during secondary school. *Journal of Educational Psychology, 95*(3), 589-603. doi:http://dx.doi.org/10.1037/0022-0663.95.3.589

Pintrich, P. (1988). A process-oriented view of student motivation and cognition. *New Directions for Institutional Research, 15*(1), 65-79.

Pintrich, P. R. (2000). *The role of goal orientation in self-regulated learning. Handbook of self-regulation* (pp. 451-502). San Diego, CA: Academic Press. doi:http://dx.doi.org/10.1016/B978-012109890-2/50043-3

Pintrich, P. R. (2003). A motivational science perspective on the role of student motivation in learning and teaching contexts. *Journal of Educational Psychology*, 95(4), 667-686. doi:http://dx.doi.org/10.1037/0022-0663.95.4.667

Pintrich, P. R., & de Groot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology, 82*(1), 33-40. doi:10.1037/0022-0663.82.1.33

Pintrich, P. R., & Schunck, D. H. (2002). *Motivation in education*. what city?, NJ: Merrill Prentice Hall.

Pokay, P., & Blumenfeld, P. C. (1990). Predicting achievement early and late in the semester: The role of motivation and use of learning strategies. *Journal of Educational Psychology, 82*(1), 41-50. doi:http://dx.doi.org/10.1037/0022-0663.82.1.41

Rao, N., Moely, B. E., & Sachs, J. (2000). Motivational beliefs, study strategies, and mathematics attainment in high- and low-achieving Chinese secondary school students. *Contemporary Educational Psychology*, *25*(3), 287-316.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American*

*Psychologist*, 55(1), 68-78. doi:http://dx.doi.org.lib-ezproxy.tamu.edu:2048/10.1037/0003-066X.55.1.68

Schunk, D. H. (1990). Goal setting and self-efficacy during self-regulated learning. *Educational Psychologist. Special Issue: Self-Regulated Learning and Academic Achievement, 25*(1), 71-86. doi:10.1207/s15326985ep2501_6

Schunk, D. (1991). Self-efficacy and academic motivation. *Educational Psychologist, 26*(3-4), 207.

Schunk, D. H. (2005). Self-regulated learning: The educational legacy of Paul R. Pintrich. *Educational Psychologist, 40*(2), 85-94. doi:10.1207/s15326985ep4002_3

Schunk, D. H. (. (1994). *Self-regulation of self-efficacy and attributions in academic settings.* Hillsdale, NJ: Erlbaum.

Schunk, D. H., & Zimmerman, B. J. (2008). *Motivation and self-regulated learning : Theory, research, and applications*. New York, NY: Erlbaum.

Schunk, D. H. (2005). Commentary on self-regulation in school contexts. *Learning and Instruction. Special Issue: Development and Modification of Motivation and Self-Regulation in School Contexts, 15*(2), 173-177. doi:10.1016/j.learninstruc.2005.04.013

Schrietheim, C. A. E., Schrietheim, C., & Eisenbach, R. (1995). An exploratory and confirmatory factor-analytic investigation of item wording effects on the obtained factor structures of survey questionnaire measures. *Journal of Management, 21*(6), 1177.doi:10.1177/014920639502100609

Sins, P. H. M., van Joolingen, W., Savelsbergh, E., & van Hout-Wolters, B. (2008). Motivation and performance within a collaborative computer-based modeling task: Relations between students' achievement goal orientation, self-efficacy, cognitive processing, and achievement. *Contemporary Educational Psychology, 33*(1), 58 -77. doi:http://dx.doi.org/10.1016/j.cedpsych.2006.12.004.

Sitzmann, T., & Ely, K. (2011). A meta-analysis of self-regulated learning in work-related training and educational attainment: What we know and where we need to go. *Psychological Bulletin, 137*(3), 421-442. doi:10.1037/a0022777

Steel, P. D., & Kammeyer-Mueller, J. (2002). Comparing meta-analytic moderator estimation techniques under realistic conditions. *Journal of Applied Psychology, 87*(1), 96-111. doi:http://dx.doi.org/10.1037/0021-9010.87.1.96

Turner, S. L., Trotter, M. J., Lapan, R. T., Czajka, K. A., Yang, P., & Brissett, A. E. A. (2006). Vocational skills and outcomes among native American adolescents: A test of the integrative contextual model of career development. *The Career Development Quarterly, 54*(3), 216-226.

Valentine, J. C., DuBois, D. L., & Cooper, H. (2004). The relation between self-beliefs and academic achievement: A meta-analytic review. *Educational Psychologist, 39*(2), 111-133.

Vecchio, G. M., Gerbino, M., Pastorelli, C., Del Bove, G., & Caprara, G. V. (2007). Multi-faceted self-efficacy beliefs as predictors of life satisfaction in late adolescence. *Personality and Individual Differences, 43*(7), 1807-1818. doi:http://dx.doi.org/10.1016/j.paid.2007.05.018

Vrugt, A., & Oort, F. J. (2008). Metacognition, achievement goals, study strategies and academic achievement: Pathways to achievement. *Metacognition and Learning, 3*(2), 123-146. doi:http://dx.doi.org/10.1007/s11409-008-9022-4

Vukman, K. B., & Licardo, M. (2010). How cognitive, metacognitive, motivational and emotional self-regulation influence school performance in adolescence and early adulthood. *Educational Studies, 36*(3), 259-268. doi:10.1080/03055690903180376

Wigfield, A., Eccles, J. S., Schiefele, U., Roeser, R. W., & Davis-Kean, P. (2006). Development of achievement motivation. In N. Eisenberg (Ed.), In *Handbook of child psychology, Vol. 3* (pp. 933-1002). Hoboken, NJ: John Wiley & Sons.

Wolters, C. A. (2004). Advancing achievement goal theory: Using goal structures and goal orientations to predict students' motivation, cognition, and achievement. *Journal of Educational Psychology, 96*(2), 236-250. doi:10.1037/0022-0663.96.2.236

Wolters, C. A., Yu, S. L., & Pintrich, P. R. (1996).The relation between goal orientation and students' motivational beliefs and self-regulated learning. *Learning and Individual Differences, 8*(3), 211-238. doi:10.1016/S1041-6080(96)90015-1

Yoon, C. (2009). Self-regulated learning and instructional factors in the scientific inquiry of scientifically gifted Korean middle school students. *Gifted Child Quarterly, 53*(3), 203-216. doi:http://dx.doi.org/10.1177/0016986209334961

Zimmerman, B. J. (1986). Becoming a self-regulated learner: Which are the key sub processes? *Contemporary Educational Psychology, 11*(4), 307-313. doi:http://dx.doi.org/10.1016/0361-476X(86)90027-5

Zimmerman, B. (1990). Self-regulating academic learning and achievement: The emergence of a social cognitive perspective. *Educational Psychology Review, 2*(2), 173-201.

Zimmerman, B. (1995a). *Self-efficacy and educational development.* Cambridge, UK: University Press.

Zimmerman, B. J. (1995b). Self-regulation involves more than metacognition: A social cognitive perspective. *Educational Psychologist. Special Issue: Current Issues in Research on Self-Regulated Learning: A Discussion with Commentaries, 30*(4), 217-221.

Zimmerman, B. (2004). *Self-regulating intellectual processes and outcomes: A social cognitive perspective.* Mahwah, NJ: Erlbaum.

Zimmerman, B. J. (2008). Investigating self-regulation and motivation: Historical background, methodological developments, and future prospects. *American Educational Research Journal, 45*(1), 166-183. doi:10.3102/0002831207312909

Zimmerman, B. J., Bandura, A., & Martinez-Pons, M. (1992). Self-motivation for academic attainment: The role of self-efficacy beliefs and personal goal setting. *American Educational Research Journal, 29*(3), 663-676. doi:10.2307/1163261

Zimmerman, B. J., & Martinez-Pons, M. (1990). Student differences in self-regulated learning: Relating grade, sex, and giftedness to self-efficacy and strategy

use. *Journal of Educational Psychology, 82*(1), 51-59. doi:http://dx.doi.org/10.1037/0022-0663.82.1.51

Zimmerman, B. J., & Moylan, A. R. (2009). Self-regulation: Where metacognition and motivation intersect. New York, NY: Routledge/Taylor & Francis.

Zimmerman, B. J., & Schunk, D. H. (2008). Motivation: An essential dimension of self-regulated learning. *Motivation and self-regulated learning: Theory, research, and applications.* (pp. 1-30). Mahwah, NJ: Erlbaum

Zusho, A., Pintrich, P. R., & Cortina, K. S. (2005). Motives, goals, and adaptive patterns of performance in asian american and anglo american students. *Learning and Individual Differences, 15*(2), 141-158. doi:http://dx.doi.org/10.1016/j.lindif.2004.11.003