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Comparison of Self-Beliefs for Predicting Student Motivation and Achievement

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ABSTRACT. The authors examined whether self-concept, self-efficacy, and self-esteem show differential predictive utility for academic achievement across age groups and domains. More specifically, the relationships of 3 self-constructs with achievement were examined in mathematics for elementary school students and mathematics and language arts for middle school students in Korea. Task value and test anxiety were hypothesized to mediate these relationships. Consistent with previous reports, domain-specific self-constructs such as self-efficacy and self-concept were better predictors of task value and achievement than was general self-esteem. Task value and test anxiety significantly mediated only the relationships of self-efficacy assessed by the Bandura-type scale to achievement. These domain-specific relationships tended to be stronger for middle school than elementary school students and in mathematics than language arts.

Keywords: domain specificity, self-concept, self-efficacy, self-esteem, task value, test anxiety

Educational theorists and researchers have long explored how perceived self-beliefs predict individuals' motivation and behavior by examining their effects on goal setting, task choice, strategy use, and achievement in academic settings (e.g., Bachman & O'Malley, 1977; Bandura & Schunk, 1981; Hansford & Hattie, 1982; Ludwig & Maehr, 1967; Marsh, Byrne, & Shavelson, 1988). Bandura's social cognitive theory (Bandura, 1977, 1986; Pajares, 1996), for instance, characterizes the relationship between perceived self-beliefs and personal behavior as reciprocal determinism because individuals' beliefs about themselves allow them to change their thoughts, emotions, and behaviors and these in turn change their beliefs.

Among different types of self-constructs, self-concept, self-efficacy, and self-esteem have perhaps been most actively studied in the field of education and motivation (Bandura, 1977; Bong & Skaalvik, 2003; Marsh, Walker, & Debus, 1991). Despite quite a few attempts to arrive at conceptual distinctions between these self-constructs (e.g., Bandura, 1997; Bong & Skaalvik, 2003; Pajares, 1996), many researchers still struggle when trying to separate them empirically (Shavelson & Bolus, 1982). This difficulty results in mixed reports in the literature regarding discriminability between these self-constructs and their roles in academic settings. No consensus has been reached regarding the relative predictive utility of self-concept and self-efficacy on academic achievement. The relative importance of different self-beliefs in affecting task value and anxiety in achievement situations is also unknown.

We tried to address these questions directly in the present investigation by comparing the utility of self-esteem, self-concept, and self-efficacy beliefs for predicting student achievement. On the basis of existing literature, we also tested the hypothesis that task value and anxiety would mediate the relationship between self-constructs and achievement. By including samples from two different school levels and assessing self-beliefs across two different subject matter areas, we aimed to help clarify the issue of relative predictive power of the three self-constructs for students’ achievement and motivation in school.

Conceptual Definitions of Self-Constructs

Self-concept refers to an individual’s perceptions of the self that are formed through experiences and evaluative feedback received from significant others (Shavelson, Hubner, & Stanton, 1976). It concerns self-descriptions and self-evaluations and hence is believed to consist of cognitive and affective components (Covington, 1984). Stated differently, self-concept represents an individual’s knowledge about him- or herself along with emotional reactions toward
the cognitively recognized competencies and attributes he or she possesses (Bong & Clark, 1999). Previous research indicates that affective responses are most likely when making comparisons of an individual's competencies and attributes to certain standards and norms (Ruble, Parsons, & Ross, 1976). Therefore, self-concept formation is heavily influenced by how individuals evaluate themselves in comparison with others and how they emotionally react to the results of these evaluations.

Self-efficacy refers to an individual's subjective convictions in his or her capability to organize and execute actions that are required to achieve a desired outcome in a given context (Bandura, 1977). Academic self-efficacy more specifically refers to the belief that an individual can successfully accomplish given academic tasks at designated levels (Schunk, 1991). Beliefs of self-efficacy are formed through an individual's own mastery experiences, vicarious experiences, social persuasion, and physiological reactions (Bandura, 1977, 1997). Whereas self-concept encompasses cognitive and affective components, self-efficacy primarily involves cognitive appraisals of one's personal capabilities (Bong & Skaalvik, 2003; Pajares, 1996). Pajares and Schunk (2002) suggested that the two self-beliefs develop through the processes of asking different questions. Self-efficacy develops by asking questions about capability (e.g., "Can I write a logical and persuasive piece on the causes of the Vietnam War?"). In contrast, self-concept is formed by asking questions about feelings and being (e.g., "How do I feel about myself as a writer?"). Answering self-efficacy questions reveals students' confidence toward successfully performing a task, whereas answering self-concept questions discloses their positive or negative views of themselves and their competencies.

Another marked distinction between self-concept and self-efficacy is the type of self-appraisal employed. Prior experience, whether it is an individual's own enactive experience or vicarious experience, is essential in establishing percepts of self-efficacy. Judgments of success or failure are made primarily against mastery criteria but social comparative information could be given more weight when the task is novel or the criteria for mastery are ambiguous. Also, observing others' performance provides important information for estimating an individual's probability of success on similar tasks. In such vicarious experiences, students develop efficacy beliefs by assessing the similarity of the model to themselves and gauging the perceived difficulty of the task (Schunk, 1991). In this sense, self-efficacy can be viewed as reflecting more or less a combination of results from criterion- and norm-referenced evaluations, with heavier weight assigned to the former. In comparison, self-concept is more concerned with an individual's relative standing in relation to others' performances (Zimmerman, 1995). It is thus more strongly influenced by social comparative information than is self-efficacy (Bong & Clark, 1999).

Compared to self-efficacy and self-concept, self-esteem has been rather loosely defined in the literature. It refers to how individuals feel about themselves and evaluate their global self-worth (Smelser, 1989). More precisely, Rosenberg, Schooler, Schoenbach, and Rosenberg (1995) defined self-esteem as "an individual's positive or negative attitude toward the self as a totality" (p. 141). On one hand, self-esteem is generally considered as a far less context-specific construct among the three. On the other hand, self-esteem appears more relevant to an individual's psychological well-being than self-concept or self-efficacy. A number of studies have reported that global self-esteem has shown strong relationships to levels of anxiety (Rosenberg, 1962) and psychological symptoms such as depression and juvenile delinquency (Rosenberg, Schooler, & Schoenbach, 1989).

Relationships with Academic Achievement

Self-concept, self-efficacy, and self-esteem all have displayed discernible and independent predictive power for students' scholastic attainments in past research, although it is difficult to locate studies that include all three constructs in the same investigation. Self-concept has been a critical component in most theoretical accounts of academic achievement, either as a presumed cause (e.g., Brookover, Thomas, & Paterson, 1964; Marsh, Byrne, & Yeung, 1999) or a byproduct of academic accomplishments (e.g., Calsyn & Kenny, 1977; Skaalvik & Hagtvet, 1990). Likewise, self-efficacy has repeatedly demonstrated itself as a significant predictor of students' academic performances. Its predictive power is even stronger than that of more objective indexes such as prior achievement levels (Zimmerman, Bandura, & Martinez-Pons, 1992). Self-concept and self-efficacy have also displayed significant relations with various indexes of academic persistence (Hansford & Hattie, 1982; Multon, Brown, & Lent, 1991).

Nonetheless, questions still remain as to which of the two self-constructs better represents the very belief that energizes students in learning and performance situations and hence should be the target of enhancement efforts. Whereas studies by Pajares and Miller (1994) and Pietsch, Walker, and Chapman (2003) demonstrated the stronger predictive utility of self-efficacy compared with that of self-concept within the same domain, Choi (2005) reported that academic self-concept was a better predictor of academic performance than self-efficacy among college students.

Regarding this issue, Bong and Clark (1999) and Bong and Skaalvik (2003) speculated that self-efficacy would better predict academic achievement than would self-concept. They reasoned that self-efficacy more truthfully mirrors an individual's achievement history because past mastery experiences are the most influential source of self-efficacy information. Moreover, competence judgments in self-efficacy rely largely on the prospect of successful task mastery as an absolute frame of reference. Self-efficacy also incorporates specific features of the performance context, which might affect the quality of performance (Bandura, 1997). Therefore, self-efficacy should be able to afford an accurate prediction of subsequent performance.
In contrast, self-concept appears to be more heavily swayed by various frames of reference and often does not exactly correspond to an individual's achievement history. For example, students' verbal and mathematics self-concepts demonstrate a nonsignificant or near-zero correlation with each other, even when their achievements in the two domains show a strong positive correlation (Marsh et al., 1988). Marsh (1986, 1990) explained this pattern to be a result of simultaneous operation of internal and external comparisons in his internal–external model of academic self-concept. When judging their academic self-concept in a given area, students compare their competence in that area to that of their peers. This process is called an external comparison, which leads to a positive correlation between the verbal and mathematics self-concepts. At the same time, students also compare their competence in a given area to their competence in other areas. Most typically, students compare their competence in verbal areas to their competence in mathematics-related areas and vice versa. This process is called an internal comparison, which yields a negative correlation between the verbal and mathematics self-concepts. Such concurrent utilization of the internal and external frames of reference nullifies the result obtained from each other, thereby making the correlation between the verbal and mathematics self-concepts to be nonsignificant and near zero.

Furthermore, academic self-concepts of equally able students differ greatly, depending on the ability of their peers in the reference group. The self-concept of a student attending a low-average school is higher than the self-concept of a student attending a high-average school, even when these two students are performing at the same level. This social comparison effect is called the big-fish-little-pond-effect by Marsh (1987, 1991). All these results point to the evaluative nature of self-concept (Bong & Clark, 1999; Bong & Skaalvik, 2003). Self-concept should thus be able to predict motivational constructs with strong evaluative and affective connotations better than self-efficacy.

Findings are even more inconsistent when it comes to the predictive utility of self-esteem for students' academic achievement. Self-esteem is significantly associated with achievement in some studies (Pullman & Allik, 2008) but shows negligible correlations with achievement in others (Byrne & Shavelson, 1986; Hansford & Hattie, 1982). Rosenberg et al. (1995) concluded that self-esteem appears to have little or no effect in enhancing academic performance among high school students. Still, some have argued that self-esteem plays a critical role in children's academic functioning (Pullman & Allik, 2008). According to these researchers, an individual's having positive regard toward him- or herself is particularly beneficial for young children because they have not yet developed stable perceptions of competence across domains.

This claim contradicts the recent trend in self research that mainly focuses on the role of domain-specific self-constructs in academic situations. Especially for adolescents, it is questionable whether nurturing global self-esteem would yield tangible benefits in academic attainments above and beyond what could be explained by a positive academic self-concept or a strong sense of academic self-efficacy. It is interesting to note, compared with the number of studies that have examined the relative power of self-concept and self-efficacy for predicting diverse achievement-related outcomes (e.g., Pajares & Miller, 1994; Pietsch et al., 2003; Skaalvik & Rankin, 1995), few studies have compared the predictive utility of self-esteem to that of other self-constructs. Results of the present research are expected to fill this void in the literature.

Relationships with Task Value and Anxiety

In addition to specifying predictive relationships between the three self-beliefs and academic achievement, we also anticipated task value and anxiety to mediate those relationships. The expectancy-value theory asserts that expectancies for success and task value are important predictors of motivation and achievement. Expectancy for success refers to the subjective estimation of the probability that an individual's performance leads to successful consequences, and task value refers to an incentive for engagement in particular tasks or activities (Eccles, Wigfield, Harold, & Blumenfeld, 1993; Wigfield et al., 1997). Many researchers operationally define task value as comprising dimensions of interest (i.e., intrinsic value), perceived importance (i.e., attainment value), and perceived usefulness (i.e., utility value; Berndt & Miller, 1990; Bong, 2001a, 2001b; Pokay & Blumenfeld, 1990). Task value is an important predictor of academic choices, self-reported effort in class, and intention to persist on a task (Hulleman, Durik, Schweigert, & Harackiewicz, 2008). Confidence increases students' interest in and task value for an activity, which, in turn, enables students to spend more time on the activity and perform better to meet higher standards (Eccles et al., 1993; Eccles & Wigfield, 1995). Therefore, we hypothesized that task value would be an important mediator linking self-perceived competence to achievement.

Previous research further suggests that emotions and affective responses are important correlates of various self-beliefs (Bandura, 1989; Scherer, Schorr, & Johnstone, 2001). According to Ruthig et al. (2008), distinct patterns of emotional experiences are associated with high personal control. As heightened senses of self-efficacy and positive self-concept denote greater perceived control, this suggests that certain academic emotions such as anxiety are associated with students' self-perceptions in learning contexts (Pekrun, Elliot, & Maier, 2006). Anxiety represents anticipatory fear accompanied by physiological arousal when ruminating over possible adversities (Bandura, 1988). It is known to be heavily influenced by how individuals conceive of specific situational contexts in which arousal occurs (Hunt, Cole, & Reis, 1958). Studies examining how self-perceptions affect anxiety indicate that positive self-concept and strong
self-efficacy help lower test anxiety (Bandalos, Yates, & Thorndike-Christ, 1995; Zeidner & Schleyer, 1999).

There is evidence that certain affective factors might be more strongly associated with self-concept than self-efficacy. For example, Skaalvik and Rankin (1995) observed that students' anxiety showed stronger correlation with self-concept than self-efficacy in mathematics and verbal domains. Pajares and Miller (1994) also reported that students' anxiety levels were more strongly related to self-concept than self-efficacy. These results make sense, considering self-concept includes affective components and self-efficacy does not. On the basis of these findings, we hypothesized that test anxiety would negatively mediate the relationship between the three self-constructs and achievement. We also predicted that self-concept would demonstrate stronger relationships with test anxiety compared with self-efficacy.

Domain and Age Differences

The self-constructs' relationships with other variables may also fluctuate depending on the domain characteristics and age of students. Academic self-concept is known to be clearly differentiated across mathematics and verbal areas, despite the strong positive correlation usually observed between mathematics and verbal achievements (Marsh et al., 1988). The frequently nonsignificant and near-zero correlation between mathematics and verbal self-concepts contrasts with significant positive correlation between mathematics and verbal self-efficacy (Bong, 1997, 2001a). This hints at the possibility that the degree of the self-constructs' relative predictive power may differ across academic domains. In fact, Bong (1998) reported that the relations of achievement indexes to domain-specific self-concept and self-efficacy were much stronger in mathematics-related subject areas than verbal subject areas. Because students develop unique understandings of not only themselves but also academic domains (Stodolski, Salk, & Glaessner, 1991), differential relations may exist among their self-perceptions and their motivation and achievement across different subject domains.

Age may be another factor that moderates the relationships of self-constructs with other constructs. It has been well established in the developmental literature that younger children evaluate themselves a lot more generously than do older students, to a degree that is not justified by their objective performance levels (e.g., Parsons & Ruble, 1977). This overestimation of competence by children is attributed to their lack of critical thinking and analytic reasoning ability and also their tendency to equate effort with ability (Harter, 1999). As children age, they begin to cognitively and more logically evaluate their achievement-related experiences and information and discriminate between their effort and ability. Hence, older students build more negative but accurate views of their academic capabilities (Eccles et al., 1993; Kun, Parsons, & Ruble, 1974; Parsons & Ruble, 1977). Reflecting these changes, students' ratings of their own academic competence reach the highest point in the early elementary school years and steadily decline afterward until early adolescence (Eccles, Midgley, & Adler, 1984; Marsh, Barnes, Cairns, & Tidman, 1984; Stipek & Tannatt, 1984). Further, this decline is most dramatic when students transition to middle school (Simmons et al., 1979; Stipek & Mac Iver, 1989).

By including elementary and middle school students in the present sample, we examined whether age or school-level difference moderated the relationships of self-constructs to other variables. Considering that older students' self-perceptions represent more realistic views of their own competencies, we hypothesized that self-constructs in general would demonstrate stronger predictive relationships with academic outcomes among the middle school students. We further hypothesized that this predictive gain would be more visible with domain-specific self-constructs such as self-concept and self-efficacy than global self-esteem.

Overview of the Present Hypotheses

In sum, we compared the utility of self-esteem, self-concept, and self-efficacy for predicting academic achievements of elementary and middle school students. We also tested whether task value and anxiety mediated the relationships between self-perceptions and achievement. In addition, domain- and age-related differences in predictive relations among the constructs were examined. Specifically, we generated and tested the following eight hypotheses:

**Hypothesis 1 (H1):** Domain-specific self-efficacy and domain-specific self-concept would predict academic achievement better than general self-esteem.

**H2:** Between self-concept and self-efficacy, self-efficacy would predict academic achievement better than self-concept.

**H3:** Between self-concept and self-efficacy, self-concept would predict academic achievement better than self-efficacy.

**H4:** Between self-concept and self-efficacy, self-concept would predict task value better than self-efficacy.

**H5:** Task value would mediate the relationships between self-constructs and academic achievement.

**H6:** Anxiety would mediate the relationships between self-constructs and academic achievement.

**H7:** The relationships between self-constructs and academic achievement would be stronger among middle school students than elementary school students.

**H8:** The relationships between self-constructs and academic achievement would be different across mathematics and language arts.

Figure 1 shows the structure of our theoretical model. Because the elementary school participants responded only to the mathematics surveys, Hypothesis 8 could not be tested among the elementary school students. Therefore, we decided to report our results in two studies to minimize potential confusion due to the difference in the types of data collected. In Study 1, we presented results regarding the
Seven students were excluded from the elementary school sample before analysis because they either did not have the achievement data or failed to answer a substantial portion of the survey. The final elementary school sample included 110 fifth-grade students and 117 sixth-grade students (125 boys, 102 girls). Their ages ranged between 10 and 12 years with an average age of 11.3 years (SD = .68). Five students were excluded from the middle school sample before analysis for the same reasons. The final breakdown of the middle school sample was 137 seventh-grade students, 244 eighth-grade students, and 126 ninth-grade students. The ages ranged between 12 and 15 years with an average age of 13.8 years (SD = .78).

Measures

Students were asked to rate each item on a 5-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). Except for self-esteem, all variables were assessed in reference to the domains of mathematics and language arts.

Self-esteem. General self-esteem was measured by eight items from the Academic Self-Description Questionnaire (ASDQ; e.g., “I have a lot to be proud of”; Marsh, 1992). Reliability of the scale was acceptable in the present study with Cronbach’s alpha values of .84 and .81 for the elementary and middle school samples, respectively.

Self-concept. Six items from the ASDQ (Marsh, 1992) were adopted (e.g., “Compared to others my age I am good at math”). Reliability coefficients (Cronbach’s α) were .88 in mathematics for the elementary school students, and .87 and .75 in mathematics and language arts, respectively, for the middle school students.

Self-efficacy. We assessed self-efficacy in two different ways because of their prevalent use in the literature. How self-efficacy is assessed is a critical issue in its own right (Pajares, 1996), yet empirical comparability of the scores obtained by different assessment methods has rarely been tested (Bong & Hocevar, 2002). One scale included four items adapted from Bandura’s (1986) Self-Efficacy scale (e.g., “I can get more than ’80’ in the math exam”) and the other consisted of five items from the Motivated Strategies for Learning Questionnaire (MSLQ; e.g., “I’m confident I can do an excellent job on the assignments and tests in this course”; Pintrich, Smith, Garcia, & McKeachie, 1993). For the Bandura-type Self-Efficacy Scale, Cronbach’s alphas were .91 in mathematics for the elementary school students, and .91 and .86 in mathematics and language arts, respectively, for the middle school students. For the MSLQ, Cronbach’s alphas were .91 in mathematics for the elementary school students, and .88 and .86 in mathematics and language arts, respectively, for the middle school students.

Task value. Task value consisted of three items, each asking about students’ perceptions of importance, utility, and

Relative predictive utility of self-constructs (i.e., Hypotheses 1–4), the mediating role of task value and anxiety in self-achievement relationships (i.e., Hypotheses 5 and 6), and age-related differences in construct relations (Hypothesis 7). In Study 2, we reported results regarding domain differences in construct relations across mathematics and language arts (i.e., Hypothesis 8) with only the middle school participants.

Method

Participants and Procedure

Participants were 234 elementary and 512 middle school students. Korean elementary schools offer 6 years of schooling before students enter middle schools. Therefore, fifth- and sixth-grade students are regarded as seniors in elementary schools. Middle and high schools each offer 3 years of schooling. All participants were attending public schools located in Seoul and its vicinity in Korea. The regions in which the schools were located were considered largely middle class in terms of socioeconomic status. The students participated in a larger research project on Korean students’ motivation and learning. There is another report based on the data from the same research project (Bong, 2009), but that article deals with different constructs (i.e., achievement goal orientations) and addresses a completely different set of research questions. Only the data relevant to the present research were analyzed in this study.

Surveys were administered during regular classroom hours in the middle of the semester, a little less than 2 months into the academic year. Students were told that participation was voluntary and no one outside the research team would have access to their individual responses. Elementary school students responded only to the surveys tapping into their motivation and learning in mathematics, whereas middle school students responded to the surveys for mathematics and language arts. Elementary school teachers’ ratings of their students’ mathematics competence were obtained with the survey data. Middle school students’ final examination scores in mathematics were obtained from the schools at the end of the semester.

FIGURE 1. Structure of the hypothesized theoretical model.
interest in the subject matter area (Bong, 2001a, 2001b). A sample item read, “I think math is a useful subject.” Reliability coefficients were a bit low with Cronbach’s alphas of .52 in mathematics for the elementary school sample, and .64 and .60 in mathematics and language arts, respectively, for the middle school sample.

Test anxiety. Three items were adapted from the MSLQ (e.g. “I worry a great deal about math tests”; Pintrich & De Groot, 1990). The reliability coefficients (Cronbach’s α) for test anxiety were .57 in mathematics for the elementary school sample, and .63 and .61 in mathematics and language arts, respectively, for the middle school sample.

Achievement indices. For the elementary school participants, their homeroom teachers rated each student’s level of mathematics performance on a 3-point Likert-type scale ranging from 1 (below average) to 3 (above average). We obtained indices of the elementary school students’ mathematics achievements this way because there was no official school-wide mathematics examination and the national education policy at the time of the survey dictated that grades not be assigned for elementary school students. For the middle school participants, their scores on the first-semester final exams in the subjects of mathematics and Korean, ranging between 0 and 100, were used as achievement indices. To prevent estimation problems associated with such a large discrepancy in the measurement units between the middle school achievement scores (i.e., 0–100) and other variables (i.e., 1–3 or 1–5), we transformed the middle school students’ achievement data into z scores before analysis.

Results

Study 1: Mediators and Age Differences

Table 1 shows descriptive statistics among the variables for the elementary and middle school participants. Several findings are noteworthy. The middle school students’ self-concept scores on the ASDQ and self-efficacy scores on the MSLQ (Ms = 3.06 and 3.36, SDs = .90 and .93) were significantly lower than those of the elementary school students (Ms = 3.30 and 3.57, SDs = .88 and .88), t(732) = 3.32 and 2.84, ps < .01. The general self-esteem scores were also significantly lower among the middle school students (M = 3.19, SD = .81) than the elementary school students (M = 3.39, SD = .84), t(732) = 2.96, p < .01. Test anxiety showed the opposite trend such that the middle school students expressed significantly higher levels of test anxiety (M = 3.04, SD = .98) compared with those of the elementary school students (M = 2.85, SD = .93), t(732) = −2.40, p < .05.

On the contrary, the middle school students’ self-efficacy scores on the Bandura-type scale (M = 3.59, SD = 1.10) did not differ from those of the elementary school counterparts (M = 3.51, SD = 1.09), t(731) = −0.88, p = ns. Moreover, the elementary and middle school students’ self-efficacy scores on the Bandura-type scale were associated with larger standard deviations (SDs = 1.09 and 1.10 for the elementary and middle school sample, respectively) compared with the standard deviations of the other scales.

Tests of measurement models. Because covariance structure modeling requires complete data on study variables, all missing values were replaced with the expected maximization (EM) method before analysis (Schreiber, Stage, King, Nora, & Barlow, 2006). The frequencies of missing values ranged from 1 (0.2%) to a maximum of 12 cases (2.4%) per variable, which is judged acceptable.

Before fitting our theoretical model to the empirical data, we tested the measurement models first by performing confirmatory factor analyses (CFAs) to check the factor structure. We used AMOS 7.0 for all our CFA and structural equation modeling (SEM; Arbuckle, 2006). Because chi-square statistics are known to be sensitive to sample size (Kline, 2005, p. 146), we applied the root mean square error of approximation (RMSEA) ≤ .06 (Hu & Bentler, 1999) and the

<table>
<thead>
<tr>
<th>Variable</th>
<th>Elementary</th>
<th>Middle</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ASDQ</td>
<td>3.30, 0.88</td>
<td>3.06b</td>
<td>0.90</td>
<td>—</td>
<td>.91</td>
<td>.84</td>
<td>.39</td>
<td>.74</td>
<td>−.57</td>
</tr>
<tr>
<td>2. MSLQ</td>
<td>3.57, 0.88</td>
<td>3.36b</td>
<td>0.93</td>
<td>.96</td>
<td>—</td>
<td>.78</td>
<td>.36</td>
<td>.62</td>
<td>−.45</td>
</tr>
<tr>
<td>3. BDR</td>
<td>3.51, 1.09</td>
<td>3.59</td>
<td>1.10</td>
<td>.78</td>
<td>.76</td>
<td>—</td>
<td>.36</td>
<td>.62</td>
<td>−.45</td>
</tr>
<tr>
<td>4. GSE</td>
<td>3.39, 0.84</td>
<td>3.19b</td>
<td>0.81</td>
<td>.53</td>
<td>.56</td>
<td>.43</td>
<td>—</td>
<td>.22</td>
<td>−.47</td>
</tr>
<tr>
<td>5. Task value</td>
<td>3.72, 0.80</td>
<td>3.60</td>
<td>0.89</td>
<td>.77</td>
<td>.81</td>
<td>.56</td>
<td>.36</td>
<td>—</td>
<td>−.35</td>
</tr>
<tr>
<td>6. Test anxiety</td>
<td>2.85, 0.93</td>
<td>3.04b</td>
<td>0.98</td>
<td>−.61</td>
<td>−.63</td>
<td>−.59</td>
<td>−.64</td>
<td>−.49</td>
<td>−.41</td>
</tr>
<tr>
<td>7. Achievement</td>
<td>2.24, 0.80</td>
<td>70.42</td>
<td>22.48</td>
<td>.61</td>
<td>.53</td>
<td>.56</td>
<td>.32</td>
<td>.45</td>
<td>−.51</td>
</tr>
</tbody>
</table>

Note. Correlation coefficients from elementary school in mathematics are below the diagonal; those from middle school in mathematics are above the diagonal. All coefficients are significant at p < .01. Different subscripts denote statistically significant difference at p < .05. ASDQ = self-concept assessed by the Academic Self-Description Questionnaire; MSLQ = self-efficacy assessed by the Motivated Strategies for Learning Questionnaire; BDR = self-efficacy assessed by the Bandura-type scale; GSE = general self-esteem.
Tucker-Lewis index (TLI) and comparative fit index (CFI) \( \geq .90 \) (Bentler, 1990; Tucker & Lewis, 1973) as the criteria for evaluating model fit.

The CFA models included general self-esteem, mathematics self-concept, MSLQ mathematics self-efficacy, Bandura-type mathematics self-efficacy, mathematics task value, mathematics test anxiety, and mathematics achievement. The model exhibited acceptable goodness-of-fit indices for the elementary, \( \chi^2(355, N = 227) = 678.602, p < .001, \text{CFI} = .916, \text{TLI} = .904, \text{RMSEA} = .064; \) and middle school samples, \( \chi^2(355, N = 507) = 1,027.119, p < .001, \text{CFI} = .916, \text{TLI} = .904, \text{RMSEA} = .061. \) All factor loadings were statistically significant at \( p < .001. \)

As can be seen in Table 1, there existed differences in variable correlation between the two age groups. When we examined the correlation coefficients among the four self-constructs, not much difference was observed in how the domain-specific self-constructs such as self-concept and self-efficacy correlated with each other across the two groups. However, general self-esteem, which was assessed globally, showed substantial drop in its correlation with other self-constructs in the middle school sample compared with the elementary school sample. The correlation coefficients of the general self-esteem factor reduced from phi values of .53 to .39 with self-concept, .56 to .44 with MSLQ self-efficacy, and .43 to .36 with Bandura-type self-efficacy for the middle school students, respectively.

The correlation coefficients between general self-esteem and other variables also decreased considerably (\( \text{phi} = .36 \) vs. .22 with task value, .64 vs. .47 with test anxiety, and .32 vs. .26 with achievement in the elementary and middle school samples, respectively). This was not the case for the domain-specific self-constructs such as self-concept and self-efficacy, as they demonstrated correlation coefficients of similar magnitude across the elementary and middle school samples with other variables, with the exception of test anxiety. The correlation coefficients between test anxiety and self-constructs uniformly dropped from the elementary to the middle school sample with self-concept (\( \phi = -.67 \) vs. -.57), MSLQ self-efficacy (\( \phi = -.63 \) vs. -.45), and Bandura-type self-efficacy (\( \phi = -.59 \) vs. -.45).

Some of the self-constructs were too highly correlated to ensure their discriminant validity. In particular, the self-concept and the MSLQ self-efficacy factors correlated too highly to each other in both samples (\( \phi = .96 \) and .91 in the elementary and middle school samples, respectively). This was surprising because these correlation coefficients were even stronger than those between the two self-efficacy factors assessed by different methods, the MSLQ and the Bandura-type scale (\( \phi = .76 \) in the elementary and .78 in the middle school sample). Therefore, to examine the empirical structure of our self-constructs, we conducted CFAs on two separate models. The first model was composed of four factors including MSLQ self-efficacy, Bandura-type self-efficacy, self-concept, and general self-esteem. In the second model, we merged the two self-efficacy factors together to have self-efficacy, self-concept, and general self-esteem.

In the elementary school sample, the first model revealed model fit of TLI = .924, CFI = .933, and RMSEA = .066, whereas the second model showed lower fit of TLI = .867, CFI = .882, and RMSEA = .087. Results from the middle school sample likewise revealed that in mathematics, the first model displayed a satisfactory model fit of TLI = .922, CFI = .931, and RMSEA = .064, whereas the second model displayed weaker fit of TLI = .874, CFI = .888, and RMSEA = .081. In language arts, the first model displayed fit of TLI = .900, CFI = .912, and RMSEA = .064, whereas the second model showed again decreased fit of TLI = .860, CFI = .876, and RMSEA = .076. Our CFA results, along with high correlations especially among the MSLQ self-efficacy, Bandura-type self-efficacy, and self-concept factors, suggest multicollinearity among the self-constructs. We thus examined each self-construct separately in all subsequent analyses to avoid empirical problems associated with multicollinearity.

SEM. The relative predictive utility of the self-constructs for achievement (Hypotheses 1 and 2), task value (Hypothesis 3), and anxiety (Hypothesis 4) were compared by SEM. The role of task value (Hypothesis 5) and anxiety (Hypothesis 6) as mediators of the self–achievement relationship was also examined. Figure 1 shows the theoretical model we specified for testing our hypotheses.

All models displayed satisfactory to marginally acceptable fit to the empirical data analyzed with AMOS 7.0 (Arbuckle, 2006), as reported in Table 2 (i.e., “original” models). Although there was some room for improvement for the general self-esteem models, we did not add any additional path to improve the overall fit because doing so might obstruct direct and more accurate comparison of the results. Figure 2 shows the results of structural equation modeling with the path coefficients separately estimated for each self-construct. All self-constructs except for general self-esteem and MSLQ self-efficacy for the elementary school sample proved to be significant positive predictors of students’ achievements in mathematics. General self-esteem was not a significant predictor of middle school students’ mathematics achievements either, providing support for Hypothesis 1 that domain-specific self-efficacy and domain-specific self-concept would predict academic achievement better than general self-esteem.

For the elementary school sample, self-concept demonstrated the strongest path to mathematics achievement with \( \gamma = .52 \), followed by Bandura-type self-efficacy with \( \gamma = .33 \). MSLQ self-efficacy and general self-esteem were not able to predict elementary school students’ mathematics achievements. For the middle school sample, self-concept again exhibited the strongest path with \( \gamma = .69 \), followed by MSLQ self-efficacy (\( \gamma = .61 \)) and Bandura-type self-efficacy (\( \gamma = .40 \)). Hypothesis 2, self-efficacy would predict academic achievement better than self-concept, was thus not supported.
TABLE 2. Goodness-of-Fit Indices for Elementary and Middle School Models in Study 1

<table>
<thead>
<tr>
<th>Model</th>
<th>CFI</th>
<th>TLI</th>
<th>RMSEA</th>
<th>χ²(df)</th>
<th>Δχ²(Δdf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASDQ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elementary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Original</td>
<td>.953</td>
<td>.938</td>
<td>.068</td>
<td>101.981(50)</td>
<td>0.026(1)</td>
</tr>
<tr>
<td>Alternative</td>
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<td>.936</td>
<td>.069</td>
<td>101.955(49)</td>
<td></td>
</tr>
<tr>
<td>Middle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Original</td>
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<td>.927</td>
<td>.073</td>
<td>185.988(50)</td>
<td>0.979(1)</td>
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<td>Alternative</td>
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<td>.925</td>
<td>.074</td>
<td>185.009(49)</td>
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<tr>
<td>MSLQ</td>
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<td></td>
</tr>
<tr>
<td>Original</td>
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<td>.917</td>
<td>.078</td>
<td>95.506(40)</td>
<td>0.014(1)</td>
</tr>
<tr>
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<td>.913</td>
<td>.080</td>
<td>95.492(39)</td>
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</tr>
<tr>
<td>Middle</td>
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<td>.936</td>
<td>.072</td>
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<td>25.379(0)</td>
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<td></td>
</tr>
<tr>
<td>BDR</td>
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<td></td>
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<td></td>
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<tr>
<td>Elementary</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Original</td>
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<td>.943</td>
<td>.077</td>
<td>70.149(30)</td>
<td>5.778(0)</td>
</tr>
<tr>
<td>Alternative</td>
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<td>.082</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Original</td>
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<td>.948</td>
<td>.072</td>
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<td>38.526(0)</td>
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<td>.922</td>
<td>.088</td>
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<tr>
<td>GSE</td>
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<td></td>
<td></td>
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<tr>
<td>Elementary</td>
<td></td>
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<td></td>
</tr>
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<td>.073</td>
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<td>10.447(0)</td>
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<td>.897</td>
<td>.068</td>
<td>148.232(72)</td>
<td></td>
</tr>
<tr>
<td>Middle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Original</td>
<td>.877</td>
<td>.844</td>
<td>.080</td>
<td>306.429(72)</td>
<td>18.426(0)</td>
</tr>
<tr>
<td>Alternative</td>
<td>.887</td>
<td>.857</td>
<td>.077</td>
<td>288.003(72)</td>
<td></td>
</tr>
</tbody>
</table>

Note. Ns = 227 (elementary students) and 507 (middle school students). CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; ASDQ = self-concept assessed by the Academic Self-Description Questionnaire; MSLQ = self-efficacy assessed by the Motivated Strategies for Learning Questionnaire; BDR = self-efficacy assessed by the Bandura-type scale; GSE = general self-esteem.

All domain-specific self-constructs as well as general self-esteem related significantly to task value and test anxiety in mathematics for the elementary and middle school samples. As hypothesized, self-constructs displayed positive relationships with task value and negative relationships with test anxiety. MSLQ self-efficacy demonstrated the strongest predictive paths to task value in both age groups, followed by self-concept, Bandura-type self-efficacy, and general self-esteem. The relationships of self-concept and MSLQ self-efficacy with task value were so strong as to suspect multicollinearity among the constructs. For example, the absence of significant paths from task value to achievement in these models likely has been due to the strong correlation between the self-construct and task value factors. We thus decided to exclude task value from Study 2.

Whereas the paths from MSLQ self-efficacy, self-concept, and general self-esteem to anxiety were of similar magnitude in the elementary school sample with gamma values of −.62, −.66, and −.66, respectively, the path from self-concept to anxiety was noticeably stronger in the middle school sample with a gamma value of −.57. Therefore, Hypothesis 3, self-concept would predict task value better than self-efficacy, and Hypothesis 4, self-concept would predict anxiety better than self-efficacy, received only partial support.

The hypothesized mediating roles of task value (Hypothesis 5) and test anxiety (Hypothesis 6) were supported with respect to general self-esteem and self-efficacy assessed by the Bandura-type scale for the middle school sample. Whereas Bandura-type mathematics self-efficacy showed direct predictive paths and indirect paths via task value and test anxiety on middle school students’ mathematics achievement, general self-esteem only demonstrated indirect predictive power on achievement through task value and test anxiety in both age groups. Therefore, the theoretical model with hypothesized mediators received clear support only with respect to Bandura-type self-efficacy in the middle school sample. Whereas task value significantly mediated the predictive relation of Bandura-type self-efficacy to mathematics achievement for the middle school students, it failed to do so for the elementary school students.
Tests of invariance across ages. In general, the relationships of self-constructs to task value and anxiety were either similar or slightly reduced in magnitude from the elementary to the middle school sample (see Figure 2). In particular, all self-constructs demonstrated much stronger relationships with anxiety for the elementary school students than the middle school students regardless of the type and the degree of domain specificity. The difference was relatively greater with regard to MSLQ self-efficacy ($\gamma = -0.62$ vs. $-0.45$) and general self-esteem ($\gamma = -0.66$ vs. $-0.49$ for the elementary and middle school samples, respectively). The predictive paths to achievements, in contrast, became stronger in the middle school sample with respect to all domain-specific self-constructs. All domain-specific self-constructs displayed stronger relationships with middle school students’ achievements than elementary school students’ achievements. The difference was more pronounced with MSLQ self-efficacy ($\gamma = 0.27$ [p = ns] vs. 0.61) compared with self-concept ($\gamma = 0.52$ vs. 0.69) or Bandura-type self-efficacy ($\gamma = 0.33$ vs. 0.40, for the elementary and the middle school samples, respectively).

To more systematically address age differences in construct relations, we performed multigroup analyses by imposing cross-group equality (i.e., invariance) constraints on the parameters between the two samples. Testing the structural invariance across groups should be performed in a two-step approach. First, when testing the metric invariance (i.e., equality of the measurement aspect of the model across groups), it should be tested that all paths in the model are invariant except for the structural path (MacCallum, Roznowski, & Reith, 1994). If the model fit in this stage is acceptable, the model satisfies cross-validation. The second stage, testing structural invariance across groups, is ensuring measurement and structural paths to be invariant across groups by testing the chi-square difference (Byrne, 2001). Whether there exist significant chi-square changes between the unconstrained (i.e., baseline) model and constrained model determines whether there is a group difference in the structural paths. That is, if there is no significant chi-square difference, the constrained model should be preferred because it is more parsimonious.

Results showed that the model fit for the constrained model showed only minimal changes from the model fit of the unconstrained model, revealing no significant differences in chi-square statistics (see Table 3) and indicating that the fit of the constrained model is superior to that of the unconstrained model. This suggests that the parameters of both samples within the population are equal (Kline, 2005, p. 290). In other words, the predictive power of latent
Test of alternative models. To determine whether the hypothesized model is the most reasonable representation of the empirical data (Bentler, 1990; Schreiber et al., 2006), we compared the hypothesized model with an alternative model by including an additional path linking task value with test anxiety (see Figure 3). Whereas the original model presumed task value and anxiety to be mediators of the self–achievement relationships, the alternative model specified anxiety to be a mediator in the relationships of both self-constructs and task value to achievement. This alternative model was based on the expectancy-value theory’s claim that expectancies for success, in the form of positive self-perceptions in this study, and task value are important predictors of motivation and achievement (Eccles et al., 1993; Eccles & Wigfield, 1995).

Statistical differences in chi squares between models demonstrate that our original model explains data better than the alternative models, with general self-esteem models as possible exceptions (see Table 2). Overall, the majority of the alternative models revealed that the added path from task value to test anxiety was statistically insignificant across grade levels. Because our main interest lied in how the different self-constructs project different patterns on achievement mediated by task value and anxiety and the results attested to empirical superiority of the original model, we decided to keep self-constructs as antecedents in each model.

Study 2: Domain Differences

Next, we analyzed the middle school data to examine if the predictive utility of self-constructs would differ, depending on the subject matter domain. Table 4 reports descriptive statistics and the latent variable correlations for the middle school participants in mathematics and language arts. Paired-samples t tests revealed statistically significant differences between the domains in self-concept, t(505) = –3.44, p < .001; test anxiety, t(505) = 3.48, p < .001; and achievement, t(506) = –2.82, p < .005. The middle school participants in this study expressed significantly lower levels of self-concept (M = 3.06, SD = .90 vs. M = 3.21, SD = .70) and achievement (M = 70.42, SD = 22.48 vs. M = 72.49, SD = 15.22) and significantly higher levels of test anxiety in mathematics (M = 3.04, SD = .98 vs. M = 2.86, SD = .88) compared with those in language arts. There was no other statistically significant difference in mean scores across the two domains.
Tests of measurement models. As was the case with the mathematics data in Study 1, the middle school data also yielded strong correlation coefficients between the self-concept and the MSLQ self-efficacy factors in the mathematics ($\phi = .91$) and language arts domains ($\phi = .97$). Also consistent with the findings in Study 1, these correlation coefficients were much stronger than those between the two self-efficacy scores, each assessed by the MSLQ and the Bandura-type scale ($\phi = .78$ and .77 in mathematics and language arts, respectively). The strong correlations of self-concept and MSLQ self-efficacy with task value observed in mathematics in Study 1 were also obtained in the domain of language arts ($\phi = .79$ with self-concept and .87 with MSLQ self-efficacy). Due to these high correlations, we excluded the task value factor from our model in Study 2 to avoid multicollinearity problems. The measurement models with all relevant variables in mathematics, $\chi^2(355, N = 507) = 1,027.119, p < .001$, CFI = .916, TLI = .904, RMSEA = .061; and language arts, $\chi^2(355, N = 507) = 1,108.472, p < .001$, CFI = .883; TLI = .866, RMSEA = .065, both yielded adequate fit to the data. All factor loadings were statistically significant at $p < .001$.

The correlation coefficients of self-constructs with other variables were, overall, noticeably stronger in the domain of mathematics than language arts. This trend was particularly conspicuous in their relationships with achievements. With the exception of general self-esteem, which showed similarly weak relationships with achievements in mathematics and language arts ($\phi = .26$ vs. .23, respectively), self-concept ($\phi = .67$ vs. .37), MSLQ self-efficacy ($\phi = .60$ vs. .28), and Bandura-type self-efficacy ($\phi = .57$ vs. .50) all displayed stronger correlations with achievement in the domain of mathematics.

Differences in the magnitude of construct correlations across domains were also evident in the self-constructs’ relationships with test anxiety. The self-concept, MSLQ self-efficacy, Bandura-type self-efficacy, and general self-esteem factors demonstrated correlation coefficients that ranged between $- .57 \leq \phi \leq - .45$ with test anxiety in mathematics. The corresponding correlations obtained from the language arts domain ranged between $- .41 \leq \phi \leq - .24$. General self-esteem also exhibited much stronger correlation with self-concept ($\phi = .39$ vs. 28) and MSLQ self-efficacy ($\phi = .44$ vs. .30) in mathematics than language arts. The correlation between task value and achievement ($\phi = .45$ vs. .11), test anxiety and task value ($\phi = -.35$ vs. -.20), and test anxiety and achievement ($\phi = -.41$ vs. -.17 in mathematics and language arts, respectively) were all considerably stronger in mathematics than language arts.

SEM. Table 5 (i.e., “independent” models) presents the goodness-of-fit indices of structural models, separately estimated for each self-construct in mathematics and language arts. All models exhibited acceptable fit indices, whereas the self-concept model in language arts and the general self-esteem models in mathematics and language arts demonstrated only marginally acceptable fit to the empirical data. As was the case in Study 1, we did not add any path for the purpose of improving the model fit as to allow more accurate comparison of the results. Figure 4 presents statistically significant paths at $p < .05$ and the standardized coefficients.

All self-constructs directly predicted achievement with varying power, with the exception of general self-esteem in mathematics. Further, all domain-specific self-constructs, with the exception of Bandura-type self-efficacy, displayed conspicuously stronger relationships to achievement in the domain of mathematics than language arts ($\gamma = .64$ vs. .37 for self-concept and .52 vs. .25 for MSLQ self-efficacy in mathematics vs. language arts, respectively). The utility of the self-efficacy beliefs assessed by the Bandura-type scale for predicting students’ achievements did not differ across the two domains with $\gamma = .47$ and .49 in mathematics.
TABLE 5. Goodness-of-Fit Indices for Mathematics and Language Arts Models in Study 2

<table>
<thead>
<tr>
<th>Model</th>
<th>CFI</th>
<th>TLI</th>
<th>RMSEA</th>
<th>$\chi^2$(df)</th>
<th>$\Delta\chi^2$(df)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASDQ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Independent</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>mathematics</td>
<td>.969</td>
<td>.957</td>
<td>.062</td>
<td>96.199(33)</td>
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</tr>
<tr>
<td>Language arts</td>
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<td>.831</td>
<td>.094</td>
<td>179.463(33)</td>
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<td>Invariance testing</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Unconstrained</td>
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<td>.894</td>
<td>.061</td>
<td>346.843(73)</td>
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<td>.063</td>
<td>380.766(76)</td>
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<td>MSLQ</td>
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<td>Independent</td>
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</tr>
<tr>
<td>mathematics</td>
<td>.952</td>
<td>.911</td>
<td>.082</td>
<td>109.961(25)</td>
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</tr>
<tr>
<td>Language arts</td>
<td>.969</td>
<td>.956</td>
<td>.057</td>
<td>66.115(25)</td>
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</tr>
<tr>
<td>Unconstrained</td>
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<td>.048</td>
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<td>56.100(3)***</td>
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<tr>
<td>BDR</td>
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<tr>
<td>Independent</td>
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<td>.086</td>
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<td>.051</td>
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<tr>
<td>Independent</td>
<td></td>
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<tr>
<td>mathematics</td>
<td>.889</td>
<td>.857</td>
<td>.084</td>
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<tr>
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<td>.055</td>
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<td>.868</td>
<td>.056</td>
<td>476.660(114)</td>
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</table>

Note. $N = 507$. CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; ASDQ = self-concept assessed by the Academic Self-Description Questionnaire; MSLQ = self-efficacy assessed by the Motivated Strategies for Learning Questionnaire; BDR = self-efficacy assessed by the Bandura-type scale; GSE = general self-esteem. 

*p < .05. **p < .01. ***p < .001.

and language arts, respectively. Test anxiety negatively mediated the relationships of general self-esteem and MSLQ self-efficacy to achievements in both domains and of Bandura-type self-efficacy to achievement in the domain of mathematics but not language arts.

Tests of invariance across domains. In principle, multigroup analysis is performed in order to test measurement or structural invariance across groups composed of independent samples. If multigroup analysis is conducted using a single sample, there is difficulty interpreting the results because comparing covariance and error covariance becomes implausible. Nonetheless, multigroup analysis may be performed when there are numerous parameters in the model and testing all possible interaction effects increases the occurrence of errors. For these reasons, we conducted multigroup analyses with the mathematics and language arts data.

As done in Study 1, we again imposed cross-group equality constraints to assess whether there were significant differences in the individual parameters between mathematics and language arts. According to the chi-square difference statistic, the fit of the constrained model was significantly worse than that of the unconstrained model (see Table 5), suggesting that the parameters in the population of the two domains were not equal (Kline, 2005, p. 290). Hence, we concluded that there were significant differences in path coefficients in mathematics and language arts. As Figure 4 shows, stronger paths were projected from MSLQ self-efficacy and self-concept to achievement in mathematics compared with language arts. Similarly, mathematics revealed stronger predictions from MSLQ self-efficacy and general self-esteem to test anxiety, and test anxiety to achievement in the Bandura-type self-efficacy and general self-esteem models.

Discussion

Self-Constructs as Predictors of Student Achievement

The present study confirmed once again that domain specificity is an important attribute of self-constructs to be able to function as significant predictors of tangible academic
outcomes. Academic self-concept and self-efficacy assessed in reference to particular subject matter areas were able to predict achievements in their respective domains, regardless of the assessment scales. The only domain-specific construct that failed to relate significantly to achievement was the elementary school students’ self-efficacy assessed by the MSLQ. However, interpretation of this result as a failure of MSLQ self-efficacy to predict achievement scores requires caution. There existed a strong and significant bivariate correlation between the elementary school students’ MSLQ self-efficacy and achievement ($\phi = .53$), which was quite commensurate in magnitude to that between academic self-concept and achievement ($\phi = .61$) or Bandura-type self-efficacy and achievement ($\phi = .56$). It thus seems more reasonable to view this finding as a result of collinearity between MSLQ self-efficacy and task value included in the same structural model, as will be discussed again later.

Global self-esteem that did not refer to any particular academic domain was not able to predict achievements in specific domains, except for achievement in language arts for the middle school students. Although general self-esteem correlated positively with achievement indexes for the elementary and middle school students, these correlations were considerably weaker than those demonstrated by the domain-specific self-constructs. In fact, they were even weaker than the correlations that task value and test anxiety, both measured in reference to specific subject matter areas, exhibited with achievements. This proves that domain specificity is an important prerequisite in construct assessment with regard to not only self-constructs but also other motivation variables, if the goal is to predict students’ achievements.

As our data further suggest, when asked domain-specifically without any reference to target outcomes, students do not distinguish between their self-efficacy and self-concept as clearly as theories would predict. Students’ academic self-concept assessed by the ASDQ (Marsh, 1992) and their academic self-efficacy assessed by the MSLQ (Pintrich et al., 1993) were almost identical, with correlation coefficients approaching unity. Academic self-efficacy assessed by the Bandura-type scale, which provided students with concrete referents against which to make ability judgments (e.g., “I can get more than ‘80’ in the math exam”), correlated substantially less strongly with the other two self-beliefs (correlations ranging between .76 and .84). Moreover, academic self-concept displayed the strongest predictive paths to achievements in mathematics for the elementary and middle school students in the present research. This finding was surprising because it is contrary to previous reports attesting to the superiority of self-efficacy beliefs in predicting students’ academic performances (Pajares & Miller, 1995; Pietsch et al., 2003).

One of the possible reasons for these results could be the normative grading system the participants were exposed to. Korean middle school students are evaluated against their peers when receiving grades. The elementary school teachers participating in the present research were also asked to rate each student in comparison to other students they were teaching. As Marsh, Trautwein, Lüdtke, and Koller (2008)
suggested, students may engage in habitual comparison of their performance levels with those of other students when they answer perceived competence items because that is the prevalent evaluation criteria they have been accustomed to. In addition, students become sensitive to and begin utilizing social comparison information by Grade 4 (Ruble et al., 1976). Therefore, even without explicit allusion to comparative information in the assessment scales, students may nonetheless use normative standards unless concrete performance targets are presented. This might explain the strong correlation between the academic self-concept and MSLQ self-efficacy scores observed in this study. As normative judgments of competence were explicitly called for only by the self-concept items (i.e., “Compared to others my age I am good at mathematics classes”), these judgments might also better predict performances appraised under a normative system.

In contrast, Bandura-type self-efficacy demonstrated the strongest predictive utility in the domain of language arts for the middle school students among the three domain-specific self-beliefs. This finding is intriguing because it was also the only domain-specific self-belief that displayed analogous predictive power across ages and domains. Whereas academic self-concept and MSLQ self-efficacy’s predictive paths to achievements were noticeably stronger for the middle than elementary school students and in the domain of mathematics than language arts, Bandura-type self-efficacy’s predictive relations to performances were comparable in magnitude across the two age groups and the two subject matter areas.

Considering that it may be easier to judge an individual’s relative ability compared with others in mathematics than language arts due to the nature of the subject matter and the fact that comparative judgments of ability become more salient as children grow older (Ruble et al., 1976), these results provide empirical support to the theoretical tenet that self-concept is more heavily affected by social comparison than is self-efficacy (Bong & Clark, 1999; Bong & Skaalvik, 2003). More importantly, our findings support the extant literature that domain-specific constructs, self-efficacy and self-concept, are better predictors of achievement compared with global self-esteem (Bandalos et al., 1995; Hansford & Hattie, 1982).

Task Value and Test Anxiety as Mediators of Self–Achievement Relations

The theoretical model linking self-constructs to achievements with task value and test anxiety as mediators received clear support only with respect to Bandura-type self-efficacy in the middle school sample. As hypothesized and consistent with previous research (e.g., Pajares & Kranzler, 1995), task value positively mediated and test anxiety negatively mediated the link between self-efficacy and achievement. Students with stronger self-efficacy are likely to experience lower anxiety, and those who are high in anxiety are likely to have low achievement (Meier, McCarthy, & Schmeck, 1984). The opposite pattern holds for task value. Students with stronger self-efficacy also express stronger task value, and those who perceive stronger value in the subject tend to attain higher achievement in it (Meier, McCarthy, & Schmeck, 1984).

The mediation hypothesis did not hold for self-concept. Students who reported higher levels of self-concept were likely to demonstrate higher achievement but this relationship was not necessarily mediated by anxiety. This is likely due to the strong prediction of achievement by self-concept. Because self-concept already encompasses affective responses to perceived competencies (Bong & Clark, 1999; Covington, 1984), as demonstrated by its strong correlation with test anxiety in this research as well, no further variance in student achievement might have been explained by test anxiety after the variance due to self-concept was accounted for.

Unfortunately, lack of differentiation among variables was not a problem confined only to self-constructs. Academic self-efficacy beliefs assessed by the MSLQ scale correlated too strongly with task value across ages and domains (with correlations ranging between .81 and .87). The correlations of academic self-concept with task value were also very high, although slightly lower than those of the MSLQ scale (ranging from .74 to .79). We thus warn researchers of the possibility of multicollinearity hindering attainment of proper solutions when other domain-specific constructs such as task value and test anxiety are included in the same model with self-constructs. We cautiously recommend use of self-efficacy beliefs assessed by the Bandura-type scale, if the goal is to examine the predictive utility of perceived self-competence in a complex nomological network. Use of Bandura-type self-efficacy ratings will be least affected by collinearity with other variables and hence enable delineation of all possible predictive and mediational paths to student achievement, as documented in this study.

Age and Academic Domain as Moderators of Self–Achievement Relations

Consistent with our hypothesis, the middle school sample in our study was associated with stronger predictive patterns between self-constructs and achievements. However, the differences were not as significant as we had anticipated. Given our sample of elementary school students consisting of fifth- and sixth-grade students, it is likely that they were already realistic and sensitive to normative information when judging their abilities (Nicholls, 1975, 1978; Ruble et al., 1976). Therefore, the predictive patterns for the elementary school students were not drastically different from those for the middle school students.

Regarding differences between domains, the predictive paths from domain-specific self-constructs to achievements were generally stronger in mathematics compared with language arts. We interpret this finding to indicate that students possess better knowledge about their own performance levels.
in mathematics because evaluation standards in mathematics tend to be more solidly established compared with those in language arts. Again, the predictive paths emanating from Bandura-type self-efficacy to achievements were exceptions to this trend because there was no noticeable difference in them across domains. It appears that self-efficacy beliefs assessed by items that present either specific target performances or concrete judgment standards afford the most robust prediction of achievements that is not compromised by age, domain, or collinearity with other constructs. Despite the differences in the magnitude of predictive relations, the pattern with which each self-construct links to achievement was consistent in both subjects and no unique pattern emerged domain-wise.

Interestingly, global self-esteem exhibited much stronger correlation with academic self-concept and academic self-efficacy assessed by the MSLQ scale in the domain of mathematics than language arts. Moreover, these mathematics-specific self-perceptions better predicted test anxiety and achievement in the domain than did domain-specific self-perceptions in language arts. Taken together, these results seem to suggest that self-perceived competence in mathematics is more psychologically salient than self-perceived competence in language arts for the middle school participants in this study.

Conclusions and Future Directions

We compared the predictive utility of multiple self-constructs with different degrees of domain specificity. We found domain-specific self-perceptions such as academic self-concept and self-efficacy to demonstrate superior predictive utility compared with global self-esteem. We also tested task value and test anxiety as potential mediators of the self-constructs’ effects on achievements. The complete model including all hypothesized mediators received clear empirical support only in the model with Bandura-type self-efficacy. We examined these hypothesized predictive paths in two age groups and two subject matter areas in an attempt to locate important possible moderators and establish generalizability of our findings. Age and academic domain proved to moderate the predictive relations to a certain degree, with domain creating a greater gap in the self-constructs’ predictive power than age.

Several limitations should be noted. First, due to multicollinearity problems, we were not able to include all relevant constructs in a single SEM. We suggest researchers examine ways to distinguish domain-specific constructs more clearly in future studies. At the same time, the possibility of cultural differences creating a different pattern of relationships cannot be completely ruled out. Our results showed that the model with three separate self-constructs, self-esteem, self-concept, and self-efficacy displayed satisfactory fit to the empirical data, consistent with the previous findings with Western samples. However, the correlation coefficients between the self-concept and self-efficacy factors were still too high in this study, which suggests a possibility of culture-specific finding. Second, although we included elementary and middle school samples in this study, the age difference between the two groups did not appear sufficiently large to capture developmental differences. It may be a worthwhile endeavor for investigators in this area to examine the point at which diverse self-constructs start to diverge and demonstrate disparate patterns of association with achievement-related motivation, emotion, and performance. Finally, we attributed the superior predictive utility of self-concept compared with self-efficacy in the present study to students’ increased awareness of social comparative information and the normative evaluation system they were exposed to. It will be interesting to see whether the present results replicate among students that are not functioning under such normative grading structures.

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REFERENCES


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