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ABSTRACT

Academic self-efficacy beliefs of 204 Korean high school freshmen were solicited in Korean, English, and math by using (a) specific problems, (b) task descriptions, and (c) general statements referring to each domain. Regardless of the assessment specificity, self-efficacy judgments demonstrated certain degrees of generality. Cross-domain correlations were stronger with problem- and task-specific self-efficacy beliefs than with domain-specific perceptions. Magnitude of within-domain correlations between any two self-efficacy measures decreased as the difference in their measurement levels increased. Problem- and task-specific assessments seemed to instigate fairly equivalent competence appraisals, whereas domain-level measures entailed somewhat idiosyncratic estimation. Though not definitive, some evidence of the need for specificity correspondence and temporal proximity between self-efficacy and performance evaluation was found. Task-specific efficacy beliefs proved more useful compared with the other two self-efficacy measures in predicting temporally distant performances. (Contains 39 references, 4 tables, 3 figures, and 2 appendixes.) (Author)

Comparison Between Domain-, Task-, and Problem-Specific Academic Self-Efficacy Judgments: Their Generality and Predictive Utility for Immediate and Delayed Academic Performances

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Abstract

Academic self-efficacy beliefs of 204 Korean high school freshmen were solicited in Korean, English, and math by using (a) specific problems, (b) task descriptions, and (c) general statements referring to each domain. Regardless of the assessment specificity, self-efficacy judgments demonstrated certain degrees of generality. Cross-domain correlations were stronger with problem- and task-specific self-efficacy beliefs than with domain-specific perceptions. Magnitude of within-domain correlations between any two self-efficacy measures decreased as the difference in their measurement levels increased. Problem- and task-specific assessments seemed to instigate fairly equivalent competence appraisals, whereas domain-level measures entailed somewhat idiosyncratic estimation. Though not definitive, some evidence of the need for specificity correspondence and temporal proximity between self-efficacy and performance evaluation was found. Task-specific efficacy beliefs proved more useful compared with the other two self-efficacy measures in predicting temporally distant performances.

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One of the thorniest problems facing the current academic self-efficacy research is the issue of measurement specificity. Researchers have been debating how specific is too specific to lose all practical relevance of findings and how general is too general to transform percepts of efficacy into something akin to personality traits, the notion of which is utterly incompatible with the self-efficacy theory (Bandura, 1997; Pajares, 1996). The present investigation examines part of this problem empirically by assessing self-efficacy judgments in multiple academic domains at three different levels of specificity. The generality and predictive utility for academic performance of these three self-efficacy beliefs are compared by a means of confirmatory factor analysis (CFA) and structural equation modeling (SEM).

Measurement Specificity and the Generality of Self-Efficacy Perceptions

Academic self-efficacy refers to one's convictions to successfully carry out given academic tasks at designated levels (Schunk, 1991). Bandura (1977, 1982) claimed that self-efficacy is a central construct in human agency because such subjective beliefs in one's own capability to realize desired outcomes wield critical influence on the person's subsequent functioning and attainments. In support of his view, ample evidence demonstrating the strong and positive influence of efficacy beliefs on various aspects of student motivation and achievement has accrued during the past two decades (e.g., Bandura & Schunk, 1981; Betz & Hackett, 1981; Pajares & Miller, 1994; Pintrich & De Groot, 1990; Schunk, 1982, 1983, 1984; Zimmerman & Bandura, 1994; Zimmerman, Bandura, & Martinez-Pons, 1992; see also Multon, Brown, & Lent, 1991).

The most salient attribute of academic self-efficacy research that distinguishes itself from other similar conceptualizations (e.g., academic self-concept) has been its strong emphasis on context- and task-specific assessment (Bong & Clark, in press; Pajares, 1996; Zimmerman, 1995). Efficacy researchers commonly solicit students' self-efficacy judgments toward a set of particularized problems or tasks and relate them to their performance on the same or similar tasks. Context-specificity is critical in self-efficacy assessment because accurate judgments of one's own capability toward tasks require all the affordances and constraints of the task-performing situation be taken into consideration. Recent advances made in the academic self-efficacy literature now stress both specificity <u>and</u> correspondence. Self-efficacy does not need to be too microscopically assessed but, rather, should be assessed in a way such that it reflects the scope and complexity of criterial tasks, performance on which it attempts to predict (Pajares, 1996). This recognition of variability in assessment specificity is consistent with Bandura's (1977, 1997) contention that one's self-efficacy beliefs can differ along the dimensions of strength, level, and <u>generality.</u>

A closely related issue to the "specificity and correspondence" of academic self-efficacy judgments is, therefore, the issue of generality. Establishing the generality of self-efficacy beliefs is important in at least two ways. First, assessing academic self-efficacy perceptions beyond a particularized task requires empirical evidence attesting to certain degrees of generality in those perceptions. General measures of self-efficacy should be "integrated multidomain measures" and not "indistinct omnibus measures" (Bandura, 1997, p. 49). If evidence shows that more specific, component self-efficacy beliefs are too widely distinct to be integrated, then we may lose the ground for creating more general self-efficacy measures. Second, compared with academic self-concept research, studies probing the internal structure of academic self-efficacy beliefs have been scarce. This has been primarily due to the self-efficacy researchers' heavy emphasis on task-specific assessment, coupled with their legitimate concern on the criterion-referenced validity of measures. Nevertheless, without considering the generality issue, pragmatic relevance of self-efficacy findings could be unjustly discounted. It is certainly good to know that students feel confident about their capability to solve 2-digit addition problems. Teachers and parents would be even happier if these students are also likely to feel reasonably confident toward other types of arithmetic problems. This is the kind of evidence that studies of generality can provide.

Compared with the generous number of self-efficacy studies tapping some form of strength or level of self-efficacy perceptions, only a handful number of studies to date have touched upon the issue of generality or generalization (e.g., Bong, 1997; Zimmerman & Ringle, 1981). Some have even struggled with the notion of general or generalized self-efficacy and its applicability to education research (e.g., Smith, 1989; Stanley & Murray, 1997). Unfortunately, these latter investigations often involved omnibus measures that informed respondents of neither the specific conditions under which they would be performing nor the specific performance criterion with which they would later be judged. For this reason, Stanley and Murray (1997) concluded that general self-efficacy ". . . as it is currently measured, seems to be the same construct as self-esteem" (p. 93) and that it ". . . is virtually useless in predicting specific task performance" (p. 95). However, limited usefulness of such omnibus measures in predicting specific performance has long been recognized by personality researchers in general (e.g., Mischel, 1977) and was the very impetus that catapulted the birth of self-efficacy theory (Bandura, 1977).

Part of the confusion and misconception regarding the generality issue seems to stem from a lack of relevant empirical evidence. As discussed earlier, when we assume that self-efficacy perception does possess a certain degree of generality, it becomes necessary to first determine the degree of such generality and then to come up with ways to correctly measure such general or generalized perceptions. Bong (1997) reported the first empirical evidence regarding the generality of self-efficacy perceptions in academic settings. She observed that students' problem-specific self-efficacy ratings were consistent within the boundary of each school subject and that they nicely defined their respective subject-specific factors. Correlation coefficients among these subject-specific self-efficacy factors were, in turn, best accounted for by two--verbal and quantitative--higher-order academic self-efficacy factors. These two self-efficacy factors were highly correlated, in contrast to findings from the academic self-concept research. The present investigation tests the replicability of her findings.

Because the present research uses three self-efficacy measures assessed at different levels, it is possible to compare the degree of generality by measurement specificity employed. Results are expected to shed some light on fundamental differences between self-concept and self-efficacy formation and their measurement. For example, relations between verbal and math self-concepts have been considerably weaker than those between verbal and math achievements (e.g., Byrne & Shavelson, 1986; Marsh, Byrne, & Shavelson, 1988; Marsh & Shavelson, 1985). Often nonsignificant and close to zero, they are also always weaker than relations between verbal and math self-efficacy.

Verbal and math self-efficacy factors are usually highly correlated (Bong, 1998b; Marsh, Walker, & Debus, 1991; Skaalvik & Rankin, 1990, 1995). A major reason for this phenomenon appears to be that different weight is assigned to personal mastery experiences and social comparison when assessing perceived competence (Bong & Clark, in press).

However, another plausibility is the difference in assessment specificity commonly associated with self-concept and self-efficacy research. Self-concept is customarily assessed at domain levels, whereas self-efficacy is more frequently measured at specific task levels (Bong & Clark, in press; Pajares, 1996). When self-efficacy perceptions in multiple academic domains were assessed with scales of different specificity, those tapped with a more general-level scale demonstrated clearer divergence across domains (Bong, 1998a). The current study investigates whether relations between self-efficacy beliefs are in fact weaker when assessed more generally at similar levels to self-concept (i.e., domain-specific), compared with when assessed at more specific levels.

Temporal Proximity on the Predictive Utility of Self-Efficacy Judgments

Bandura (1997) argued that "the relation between efficacy beliefs and action is revealed most accurately when they are measured in close temporal proximity. The closer in time, the better the test of causation" (p. 67). In addition to the specificity and correspondence required between self-efficacy beliefs and target of prediction, proximity of self-efficacy assessment to the performance of interest should also be secured. None of the studies to date has yet tested the effects of temporal disparity on causal relations between self-efficacy perceptions and performance. The present study affords testing Bandura's claim by comparing the predictive effects of self-efficacy beliefs on multiple achievement scores within a single domain. These achievement measures range from test performances that are simultaneously assessed with self-efficacy judgments to those that are more temporally distant. This allows exploring whether the relation between efficacy perception and performance is actually moderated by the temporal contiguity and whether there is difference across the three academic domains in the degree to which that relation is affected by such assessment interval.

The broad array of achievement indexes available in each academic domain is one of the strong points of the present research. Inclusion of multiple performance measures that varied in time and correspondence to self-efficacy measurement is distinctive in this study compared with prior research. Further, these achievement scores are based on real classroom and standardized tests rather than those devised solely for research purposes. This feature is believed to help strengthen the validity of self-efficacy ratings by making the criterial tasks more relevant and meaningful to students. By assessing self-efficacy beliefs in multiple academic domains by multiple scales and relating them with various actual test scores, findings of the current investigation are expected to yield results that are of both theoretical and practical import.

Method

Participants and Procedures

Two-hundred and four high school freshmen (i.e., roughly equivalent to US Grade 10) from a girls high school in Seoul, Korea, participated. Self-efficacy data collection took place in February 1998 in conjunction with placement tests developed by one of the educational testing services in Seoul. The school routinely administers these tests to their freshmen for the purposes of gauging students' achievement levels and of assigning them to appropriate achievement tracks in core school subjects.

Data were collected during three consecutive class hours. During the first class period, students responded to questionnaires asking about their domain- and task-specific self-efficacy perceptions in Korean, English, and mathematics. These subjects are normally considered the three most important school subjects. At the beginning of the second class period, teachers administered Korean and English problem-specific self-efficacy questionnaires in each classroom. Problems were presented through an overhead projector for a brief period and students rated their confidence for correctly solve each type of the problem. Problem-specific self-efficacy assessment took approximately 10 minutes. Students were then given another 50 minutes to complete the placement test (English only) consisted of the same problems. The same procedure was repeated for the third class period for math problem-specific self-efficacy questionnaire and math placement test. There was a 10-minute break between each class period.

Measures

Domain-specific self-efficacy. Five items from the Self-Efficacy scale of the Motivated Strategies for Learning Questionnaire (MSLQ) were used (Pintrich & De Groot, 1990). The MSLQ provides nine self-efficacy items, four of which concern comparative judgments of competence. Self-efficacy judgments are more heavily influenced by individual mastery experiences than by social comparative information (Bandura, 1977; Bong & Clark, in press; Zimmerman, 1995). Of course, there are times when social comparison critically influences efficacy appraisal, particularly with novel or ambiguous tasks (Bandura, 1997; France-Kaatrude & Smith, 1985; Marsh, Walker, & Debus, 1991). Being freshmen in high school, participants were believed to have had enough experiences with the three school subjects included in the current study. The four comparative items were thus excluded from the present investigation. Students responded to the following five statements: "I'm certain I can understand the ideas taught in the (specific subject) course, " "I expect to do very well in the (specific subject) class," "I am sure I can do an excellent job on the problems and tasks assigned for the (specific subject) class," "I think I will receive a good grade in the (specific subject) course," and "I know that I will be able to learn the material presented in the (specific subject) class." Students rated their agreement to each statement on a scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Task-specific self-efficacy. Items for task-specific self-efficacy assessment were initially developed from the placement test problems. To maximally differentiate task-specific self-efficacy items from the problem-specific efficacy items, all specifics (i.e., numbers, figures, vocabulary, reading passages, etc.) were deleted from task descriptions. Whenever possible, verbal descriptions of tasks were written to reflect essential skills or concepts generally required across problems of similar types. Ten representative task statements were constructed for each school subject. Although these were originally developed from specific test problems, results were fairly generic descriptions of tasks students would have to perform throughout the semester. Students read the task descriptions and rated their confidence for successfully performing each on a scale ranging from 0 to 100 in 10-unit intervals. Verbal descriptors were provided to help students understand more clearly what each number represented: 0 (not confident at all), 40 (maybe), 70 (somewhat confident), and 100 (real confident). See Appendix A for a list of task-specific self-efficacy items.

Problem-specific self-efficacy. At the beginning of each class period, teachers distributed self-efficacy response sheets to students and presented each placement test problem on a screen through an overhead projector. Students provided their judgments of confidence for successfully solving each type of the problem on a scale ranging from 0 to 100. Teachers administered the placement examinations after problem-specific self-efficacy responses were completed and collected. There were 15 problems in Korean and 25 problems in English and math. Appendix B presents sample problems for English and math.

Immediate Performance. Scores on the February placement tests administered simultaneously with the self-efficacy assessment constitute the most immediate performance indexes. In the case of math, teachers administered a second placement test in early March for more accurately assigning students to achievement tracks. Students took standardized achievement tests (for the purpose of comparing with other schools) in all three school subjects at the end of March. These scores comprise another immediate performance index. March test scores are not necessarily confined by the particulars of February placement tests. Yet, these tests are inevitably most similar in content with February tests because of their temporal proximity. It is of interest to see, therefore, whether problem-specific self-efficacy demonstrates different relations with the February and March achievement scores, assessed a month apart from each other.

Delayed Performance. The school provided students' midterm and final scores in the three school subjects. School marks are given in most Korean high schools on the basis of these two scores. Due to their temporal lag from the self-efficacy assessment, the midterm and final tests were expected to cover slightly different contents from the February or March achievement tests.

Results

Preliminary Analyses

There were a total of 112 variables included in the present study. Several variables had a small number of (i.e., 1 to 4) missing values. Only 10 variables had more than 7 (i.e., 7 to 10) missing values. Missing values were replaced with variable means for CFAs and SEMs. Among the 204 participants, 2 students failed to take one or more of the achievement tests. These students were excluded from SEMs. All self-efficacy scales demonstrated high reliability coefficients with standardized item αs ranging between .87 and .98. Because only total scores of each exam were provided by the school, reliability of achievement tests could not be estimated. Table 1 presents descriptive statistics.

Zero-order correlation coefficients among variables are reported in Table 2. The MSLQ self-efficacy ratings showed correlation coefficients of .51, .67, and .58 with task self-efficacy and of .56, .57, and .54 with problem self-efficacy in Korean, English, and math, respectively. These coefficients are substantially lower compared with those between task and problem self-efficacy. Task- and problem-specific self-efficacy ratings correlated .67, .79, and .71 in Korean, English, and math, respectively. This suggests that while task- and problem-specific self-efficacy tap more or less similar constructs, domain-level self-efficacy consists of something qualitatively different from the other two more specific measures. When we examine correlation coefficients of the same scale across school subjects, we find that the MSLQ scores correlated .39 between Korean and English, .32 between Korean and math, and .34 between English and math. Task- and problem-specific self-efficacy ratings correlated .72 and .63 between Korean and English, .55 and .50 between Korean and math, and .58 and .54 between English and math, respectively.

With regard to their relation with performance measures, self-efficacy ratings demonstrated lower-than-expected relations with various achievement test scores in Korean. Students did not take the February placement test in Korean because achievement track division is performed only in English and math and not in Korean. March achievement test scores are thus the most immediate performance index in Korean. Even correlation coefficients with this more immediate achievement index ranged from mere .17 to .23 (average $r = .18$). Coefficients between self-efficacy and performance ranged between .32 and .39 (average $r = .35$) in English and between .26 and .41 (average $r = .33$) in math. In general, no conspicuous trend was observed in verbal subjects either by the specificity of self-efficacy measures or by the immediacy of achievement measures in this zero-order correlation analysis. In math, however, task- and problem-specific self-efficacy measures showed stronger relations (average $rs = .37$ and .34, respectively) with various achievement indexes compared with a domain-level measure (average $r = .28$). As was the case with the two verbal subjects, temporal lag between self-efficacy and performance assessments did not result in any particular predictive difference in math, either. Achievement indexes in each school subject were highly correlated with each other (average $rs = .65$, .70, and .69 in Korean, English, and math, respectively).

Confirmatory Factor Analyses

A series of CFAs were conducted with the EQS program (Bentler, 1992) to test the generality of self-efficacy judgments. Covariance matrices were computed from input raw data and subsequently analyzed. The first set of analyses treated responses to each self-efficacy item as individual measured variables (MVs). Therefore, there were 5 MVs for MSLQ self-efficacy and 10 MVs for task-specific self-efficacy in each school subject. In the case of problem-specific self-efficacy, there were 25 MVs in English and math and 15 MVs in Korean. Three subject-specific latent factors were hypothesized: English, Korean, and math academic self-efficacy.

A CFA conducted with the MSLQ self-efficacy data with no correlated uniquenesses failed to produce an acceptable fit (both non-normed fit index [NNFI] and comparative fit index [CFI] less than .90; see Table 3). Modification indexes suggested correlated error paths be opened between items with the same wording across the three subjects. Halo effects of this type have been observed frequently in CFA research and can be dealt with effectively by correlating uniquenesses of MVs sharing the same wording. Adding 15 such covariances significantly improved the model fit, $\Delta\chi^2$ (15, $N = 202$) = 354.56, $p < .05$, and produced satisfactory goodness-of-fit indexes, χ^2 (72, $N = 202$) = 128.46, $p < .05$ (NNFI = .96, CFI = .97). Because the chi-square statistics is known to be biased against a large sample size, magnitude of residuals and ratio of chi-square values to their degrees of freedom were also considered in evaluating the model fit. As Table 3 shows, all goodness-of-fit indexes were of acceptable magnitude. Standardized factor loadings ranged from .65 to .87 ($Mdn = .80$) and were all statistically significant ($p < .05$), indicating that the three subject-specific factors were reasonably well defined.

The same factor structure was imposed on the task-specific self-efficacy data to examine whether the model with three subject-specific factors could demonstrate an acceptable fit with their factors being clearly defined. The goodness-of-fit indexes fell little short of acceptable magnitude when individual task items were used as MVs (see Table 3). Although it was not impossible to improve the model fit by specifying additional correlated error paths, creating composite MVs was deemed a more appropriate solution for the situation for the following two reasons. First, aggregating multiple items to create a single MV has advantages over using single-item MVs such as producing more valid and reliable indicators as well as making the multivariate normality assumption more likely to hold (Marsh, Craven, & Debus, 1991; Marsh, Roche, Pajares, & Miller, 1997). Second, it was preferable to use methods that were comparable to those used in Bong (1997) because one of the present investigation's purposes was to test the generalizability of her findings. Two task items were averaged to produce each of the 15 MVs (i.e., 5 MVs x 3 school subjects). The CFA model with three subject-specific factors generated acceptable goodness-of-fit indexes (see Table 3). Standardized factor loadings ranged between .71 and .93 (Mdn = .86) and all were statistically significant ($p < .05$). The three subject-specific factors were clearly defined using students' self-efficacy ratings toward a set of specific tasks.

CFAs with individual problem-specific self-efficacy ratings as MVs showed a similar pattern of results to those with task self-efficacy (see Table 3). For the same reasons discussed above, self-efficacy ratings toward 2 to 3 problems in each school subject were aggregated to generate 6 Korean MVs and 10 English and math MVs. The model with three subject-specific self-efficacy factors based on these 26 MVs was able to reproduce observed covariances reasonably well as indicated by its goodness-of-fit indexes reported in Table 3. All factor loadings were significant at $p < .05$, and ranged from .75 to .95 (Mdn = .88). Collectively, results suggest that students' self-efficacy perceptions are not necessarily confined to micro-level tasks or problems but can generalize to a certain degree beyond a single particularized task. However, task- and problem-specifically assessed self-efficacy beliefs appeared to contain more specific components that could not be explained entirely by subject-level factors. Compared with the MSLQ ratings that produced an acceptable fit using individual items as MVs, particularized task and problem self-efficacy ratings had to be aggregated to form a single MV before the subject-specific self-efficacy factors were able to represent their observed relationships to a sufficient degree.

Of particular interest was the correlation between the three subject-specific self-efficacy factors. As Table 4 reports, although the correlation coefficients were all statistically significant at $p < .05$ with the MSLQ, task-, and problem-specific data, their magnitude differed noticeably by the assessment specificity. Korean and English self-efficacy factors were more highly correlated with each other than with a math self-efficacy factor, regardless of assessment specificity. However, this pattern was more conspicuous in the task and problem data than in the MSLQ data. Furthermore, relationships among Korean, English, and math factors were stronger in general when self-efficacy was assessed with a set of specific tasks (average $r = .64$) or problems (average $r = .58$) than when it was measured with more general, subject-level statements (average $r = .35$) (see Table 4). These results are consistent with those from the zero-order correlation analyses reported above. Across three self-efficacy data sets, correlated factor structures were significantly better than uncorrelated factor structures at accounting for observed covariances, $\Delta\chi^2$ (3, N = 202) = 51.68, $p < .05$, for MSLQ self-efficacy, $\Delta\chi^2$ (3, N = 202) = 223.40, $p < .05$, for task self-efficacy, and, $\Delta\chi^2$ (3, N = 202) = 189.50, $p < .05$, for problem self-efficacy (see Table 3).

Structural Equation Modeling With Achievement Factors

To compare the predictive utility of subject-, task-, and problem-specific self-efficacy judgments, SEM was performed with multiple achievement factors in each domain. These achievement factors differed in temporal proximity from the self-efficacy assessment and, quite possibly, also in contents being covered. In Korean, there were three achievement scores available: March standardized achievement test, midterm, and final scores. Because students did not take the February placement test in Korean, March standardized achievement test scores constitute the most immediate performance index. In English, there were four achievement scores: February placement test, March standardized achievement test, midterm, and final scores. In math, there were five achievement scores available: February placement test (Placement Test 1), March placement test (Placement Test 2), March standardized achievement test, midterm, and final scores, in chronological order. Scores on the midterm and final exams were obtained two and five months after the self-efficacy assessment, respectively.

SEM corrects for measurement error when there are multiple indicators for a given latent construct. Because each of the test scores functioned as a separate achievement factor in the present investigation, their reliability was set to .90 in standardized metric (see, e.g., Marsh, 1990, for a similar procedure). Models for Korean and English demonstrated satisfactory goodness-of-fit indexes with no correlated error path, χ^2 (140, N = 202) = 298.09, $p < .05$ (NNFI = .93, CFI = .95), for Korean, and χ^2 (235, N = 202) = 506.33, $p < .05$ (NNFI = .93, CFI = .94), for English. The goodness-of-fit indexes of the math model fell slightly below the acceptable range (NNFI = .88, CFI = .90). Modification indexes suggested adding a correlated error path between two MVs, both made up of geometry problems. Adding this single correlated uniqueness improved the model fit to an acceptable level, χ^2 (251, N = 202) = 701.10, $p < .05$ (NNFI = .90, CFI = .91) without altering patterns of construct relations. All models converged in 5 iterations. Correlation coefficients among disturbance terms of achievement factors ranged from .76 to .84 in Korean (Mdn = .81), from .75 to .97 in English (Mdn = .80), and from .73 to .95 in math (Mdn = .82).

Figures 1, 2, and 3 presents SEM results for Korean, English, and math, respectively. Consistent with results from zero-order correlation analyses, self-efficacy factors inferred from task- and problem-specific MVs demonstrated the highest correlation with each other across the three subjects. These coefficients ranged from .71 to .81 (average $r = .76$), adding more weight to the present study's claim that the two assessment techniques invoke similar appraisal heuristics. There was little variation in the relations between MSLQ and task self-efficacy by the subject domain. The correlation coefficient between domain- and task-specific self-efficacy factors was the lowest in Korean (.56) and highest in English (.71) (average $r = .63$). Relations between the MSLQ- and problem-based self-efficacy factors were similarly low in all three school subjects (average $r = .59$). In general, the judgment gap widened as self-efficacy was tapped at increasingly more discrepant assessment levels.

Slightly different prediction patterns emerged across domains. Problem-specifically judged self-efficacy predicted none of the achievement indexes in Korean. This result is not too surprising because students did not take the placement test in Korean comprised of the same problems used in self-efficacy assessment. The MSLQ self-efficacy predicted students' March standardized achievement test scores, whereas task-specific self-efficacy predicted students' final scores in Korean. In the case of English, students' problem-specific self-efficacy ratings predicted their February placement test scores, both of which were assessed with the same problems. None of the other two types of efficacy judgments was able to predict various English achievement test scores. In math, a number of paths from self-efficacy to achievement proved significant. Among the three types of self-efficacy measures, task-specific self-efficacy turned out to be the most useful predictor of students' math performances, both immediate and delayed. Math self-efficacy assessed with a list of specific math tasks wielded comparable significant effects on students' performance on the February and March placement tests. However, its effect was the strongest on students' midterm performance. Although math problem-specific self-efficacy assessment used the same problems as the February math placement test, the path between the two was not statistically significant. Instead, problem-specifically assessed math efficacy judgments managed to predict students' March standardized achievement test scores, a math performance index assessed a month later.

Discussion

Generality of Self-Efficacy Beliefs

The present results replicated earlier reports of Bong (1997). Students' self-efficacy ratings were found to be more or less comparable within the boundary of each subject domain. Whereas Bong's earlier research only dealt with problem-specific self-efficacy ratings, this study extends her findings by including three self-efficacy measures tapped at different levels. Regardless of the measurement specificity used to assess self-efficacy beliefs, three subject-specific self-efficacy factors were significantly correlated with each other. In Bong's previous study, patterns of students' self-efficacy ratings were ultimately accounted for by two underlying higher-order factors, verbal and math self-efficacy. Because only three subject matters were included in the present research, relative superiority of general versus verbal and math higher-order factors for illustrating relations among lower-order subject-specific factors could not be tested. Nonetheless, intercorrelations among subject-specific self-efficacy factors revealed some interesting variance between measures.

When gauged against specific problems or tasks, relations among students' perceived self-efficacy in the three school subjects were pretty strong, analogous to relations found among their achievement scores in those subjects. However, when students responded to more general-level items regarding each domain of interest without referring to specific tasks, relations among subject-specific self-efficacy perceptions fell considerably. Similar findings have been reported by Bong (1998a) where domain-level measures of self-efficacy emerged as more distinctive across subject matters compared with problem-specific measures. These observations document that levels of measurement can make dramatic differences in construct relations and so lead to different answers to the same problems. In the beginning of this article, we noted that academic self-concepts in verbal and math areas typically show weaker relations than self-efficacy beliefs in those areas. We also noted that different assessment specificity has been associated with each of the two research traditions for theoretical and methodological reasons. One of the hypotheses tested in this research was that relations among diverse self perceptions would be affected by measurement specificity used to assess them. Present findings provide strong evidence for the claim. It thus becomes more convincing that one of the major factors contributing to the difference between self-concept and self-efficacy research is the difference in their measurement specificity.

When asked with domain-level questions, students differentiated their perceived competence between domains to the degree that is not warranted by either their task-specific self-efficacy, problem-specific self-efficacy, or achievement patterns. This suggests that these more global items might act to amplify differences in students' self-cognized competencies across domains. Although relations among self-efficacy factors were considerably weaker with the domain-level data than those with the task- or problem-level data, they were by no means close to the near-zero correlation frequently observed between verbal and math self-concepts. While measurement specificity is clearly one factor that contributes to the observed differences between self-concept and self-efficacy, other factors are also operating in differentiating the two constructs. The present investigation deliberately deleted explicit social comparative items from the MSLQ scale. Effects of social comparison are known to differ on self-concept and self-efficacy (Bong & Clark, in press; Marsh, Walker, & Debus, 1991; Zimmerman, 1995). Results might have been more similar to those from self-concept research had those comparative items been retained.

Generality of self-efficacy can be achieved through diverse processes. Bandura (1997) described five such processes (see also Pajares, 1996). Individuals face different tasks and activities with comparable confidence when they perceive those tasks as requiring similar subskills. Even when similar subskills do not underlie different activity domains, some generality is expected when skills required in these dissimilar domains are developed together. Possession of generalizable self-regulatory skills and considering effects of these self-regulatory capabilities in efficacy appraisal across varied domains can also produce a certain degree of generality. Generality can likewise be obtained by cognitively structuring commonalities across diverse areas and by powerful mastery experiences. The significant positive relationships among Korean, English, and math self-efficacy factors observed in the present investigation, especially when assessed with particularized problems and tasks, most likely reflect effects of codevelopment of relevant academic skills. Students' recognition of the important role played by self-regulatory learning capabilities in most academic functioning might also have played a role. Within the boundary of a single domain, generality of self-efficacy beliefs across varied tasks and problems might depend more on the perceived similarity of tasks, on top of the effects of codevelopment and generalizable self-regulatory skills (Bong, 1997). Future research should now look into factors and processes contributing to the generality of efficacy beliefs.

Predictive Utility of Self-Efficacy Judgments

The present study compared the utility of domain-, task-, and problem-specifically assessed self-efficacy ratings in predicting subsequent academic performance. Bandura (1997) wrote that "One can distinguish among three levels of generality of assessment. The most specific level measures perceived self-efficacy for a particular performance under a specific set of conditions. The intermediate level measures perceived self-efficacy for a class of performances within the same activity domain under a class of conditions sharing common properties. And finally, the most general and global level measures belief in personal efficacy without specifying the activities or the conditions under which they must be performed" (p. 49). The three self-efficacy measures used in this research roughly correspond to those that Bandura discussed as the three distinguishable levels of generality.

The three self-efficacy measures of different specificity were significantly and positively correlated in each domain. With little variation across domains, magnitude of relationships between any two self-efficacy measures tends to decrease as the gap in their measurement levels broadened. Bong (1999) recently obtained parallel results with Korean female college students. Students' self-efficacy perceptions were solicited at progressively more specific levels, providing general college learning, a specific course, representative topics in the course, and actual exam problems as referents. All measures significantly intercorrelated to a varying degree with each demonstrating the highest correlation with the one at an adjacent assessment level. On average, self-efficacy factors based on problem-specific confidence judgments and those inferred from task-specific judgments were most similar to each other, whereas the problem-based self-efficacy factors and the MSLQ factors were most dissimilar. These within-domain results are compatible with those on cross-domain generality of measures. Hence, it appears safe to assume that problem- and task-specific self-efficacy assessments instigate fairly equivalent competence perceptions. Domain-level measures seem to entail somewhat idiosyncratic appraisal processes.

Multiple achievement measures were available in each domain that were progressively more distant in time from self-efficacy assessment. Therefore, it was possible to examine the effects of temporal contiguity between self-efficacy and performance evaluation, in addition to testing the effects of specificity correspondence on their causal relations. Unfortunately, neither specificity correspondence nor temporal proximity hypothesis was fully supported by the current data. Effects of the specificity mismatch were examined in English and math with regard only to the placement test scores concurrently attained with the self-efficacy ratings. This avoided any possible confounding effects from temporal lag in assessment. The specificity correspondence hypothesis was not tested in Korean because performance scores on the test made up of isomorphic problems with the self-efficacy assessment were not available.

In English, the only significant positive predictive path was observed between problem-specific self-efficacy beliefs and achievement scores on the same problems. Task- and domain-specific English self-efficacy perceptions were not able to predict these scores after effects of problem-specific self-efficacy partialled out. This strongly supports the specificity hypothesis. In math, however, the identical path between math problem self-efficacy and test scores failed to reach statistical significance. Instead, task-specific self-efficacy predicted the performance. This finding is incongruous with many earlier reports of significant positive effects of math problem-specific self-efficacy on math problem-solving performance (e.g., Pajares & Miller, 1994, 1995). One explanation may be that math task and problem self-efficacy were so highly correlated, there was not enough variance left to explain once the effects of task-specific self-efficacy were controlled for. Problem-specific math self-efficacy was able to predict the second placement test scores in spite of the significant effect of task-specific efficacy beliefs.

No definitive support was found for the immediacy hypothesis from the correlation analyses. Across domains, the three self-efficacy measures showed similar relations with various achievement measures. However, different patterns emerged in structural equation models where effects of other predictors are taken into account. In Korean, the MSLQ self-efficacy ratings predicted students' March standardized achievement test performance. It was the only significant path exhibited by this domain-level measure across the three subject areas. Korean task self-efficacy assessed at the start of the semester successfully predicted students' end-of-semester performance. Task-specific self-efficacy beliefs in math were also able to predict students' second placement test scores as well as their midterm scores assessed two months after the self-efficacy assessment. The extended predictiveness of task-specific self-efficacy measures for delayed performances is concordant with Bandura's (1997) suggestion. He advised that self-efficacy assessment should aim at intermediate levels of generality when demand characteristics of tasks are not yet fully known. Although task-specific self-efficacy items in this study were developed out of specific problems, every effort was made to transform them into descriptions of essential skills in more generic form. Confidence judgments for the tasks so described were able to predict students' delayed future performances better than the other two, more specific and more general, self-efficacy measures.

Overall, results were not as unequivocal as expected, although some support existed for both the specificity correspondence and temporal proximity hypotheses. One thing the present investigation made clear, however, was that the absolute as well as relative predictive usefulness of self-efficacy beliefs vary depending on the scale and the academic domain under consideration. This finding is consistent with the observation that the manner with which questions are posed makes a difference in how one appraises and reports their perceived competence (Pajares & Miller, 1997; Pajares, Miller, & Johnson, in press). Another issue that needs to be resolved, therefore, is the issue of judgmental accuracy. Because only girls participated in the present study and item-level performance scores were not available, comparing the accuracy of self-efficacy judgments by assessment specificity, gender, or interaction between gender and specificity was not possible. These are all important questions to be addressed before researchers can decide on a single self-efficacy measure that most accurately represents the belief system with which one acts in the given academic pursuit.

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Appendix A

Items for Task-Specific Self-Efficacy Assessment

How confident are you that you can successfully solve or perform each of the following types of problems or tasks?

Korean

1. Read a given paragraph and infer correct meaning of underlined words.
2. Read a given paragraph and determine its main theme.
3. Change given sentences from active to passive voice.
4. List essential elements of each form of composition.
5. After reading multiple passages, correctly classify them into different types.
6. Correctly interpret underlined parts of a given poem.
7. After reading a given poem, identify poetic expressions with the same connotation.
8. Explain methods of writing different types of prose.
9. Comprehend a given sentence using a proverb or a Chinese idiom as an analogy.
10. Organize given sentences into a paragraph according to the main idea.

English

1. Correctly interpret underlined words in a given sentence.
2. Read a given paragraph and fill in parentheses with appropriate conjunctions.
3. Find parts that are grammatically incorrect from given sentences.
4. Provide appropriate responses for questions in a given conversation.
5. Read a given paragraph and determine its main theme.
6. Read a given paragraph and come up with appropriate title words.
7. Read given sentences and figure out contents that will appear next.

8. Select correct synonyms for given vocabulary.

9. Read a given paragraph and answer questions that are given in English.

10. Given multiple conversations, select inappropriate or inadequately combined pairs.

Math

1. Solve equations containing square roots.

2. Solve for x in a quadratic equation.

3. Given vertex and/or Cartesian coordinates, solve a function.

4. Compute a mean, standard deviation, and variance using a frequency table.

5. Given three sides of a triangle, determine whether it is an acute or obtuse triangle.

6. Given perimeter of a figure, compute its area.

7. Solve for a particular angle of a figure that is inscribed in a circle.

8. Given sides of a triangle, compute the area of a circle inscribed in it.

9. Compute the length of a line connecting a particular point on a circle and a tangent line.

10. Solve equations containing cos, sin, tan, $\cos^2$, $\sin^2$, $\tan^2$.

Appendix B

Sample Items for Problem-Specific Self-Efficacy Assessment

How confident are you that you can successfully solve the types of problems presented?

English

1. Which of the following is most appropriate to complete the conversation?

A: Do you have a car? B: No, I don't. But I wish _______ one. It's not easy to take a taxi these days.

① I had ② you can't buy

③ I didn't have ④ you don't have

⑤ I have to buy

2. Which of the following underlined parts is grammatically incorrect?

A: Hello, John. B: Hi, Tony. I ①haven't seen you for a long time. What ②have you been doing lately? A: I ③have been busy with my business. B: You ④must have had a hard time. Let's ⑤going fish together this Sunday. A: That's a good idea.

3.

Many people are beginning to watch less and less television. After they have been sitting at a desk all day, they don't want to sit on the sofa in the evening. They want to do something more active. So they often _______________ .

①watch TV ② read a book

③ play a sport ④ sit on the sofa

⑤ go to bed early

Math

1. If multiplying the two numbers that satisfy $x^2 - 4x - 3 = 2x + k$ produces 2, what is the value of k?

   ① -1

   ② -2

   ③ -3

   ④ -4

   ⑤ -5

2. Below are someone's scores on 5 achievement tests. What is the standard deviation of her score?

6, 5, 4, 8, 2

① $\sqrt{2}$

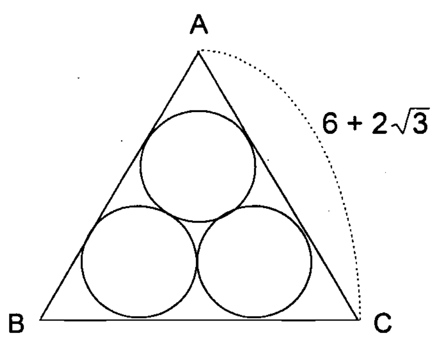
② $\sqrt{3}$

③ 2

④ $\sqrt{5}$

⑤ $\sqrt{6}$

3. The figure presented below describes three circles in a regular triangle ABC. Each circle touches two sides of a triangle and the other two circles. What is the sum of areas of these three circles?



① 3π

② 5π

③ 7π

④ 9π

⑤ 11π

Table 1

Descriptive Statistics of Self-Efficacy Scales and Achievement Tests

Scale	M	SD
Academic Self-Efficacy Scales		
Korean MSLQ Self-Efficacy	3.16	.63
English MSLQ Self-Efficacy	3.11	.68
Math MSLQ Self-Efficacy	3.17	.70
Korean Task-Specific Self-Efficacy	61.94	13.37
English Task-Specific Self-Efficacy	59.45	15.04
Math Task-Specific Self-Efficacy	61.48	13.48
Korean Problem-Specific Self-Efficacy	69.89	13.48
English Problem-Specific Self-Efficacy	65.81	13.48
Math Problem-Specific Self-Efficacy	53.27	18.05
Achievement Tests		
English Placement Test	56.77	17.29
Math Placement Test 1	48.63	19.17
Math Placement Test 2	62.62	22.01
March Korean Standardized Achievement Test	66.14	14.79
March English Standardized Achievement Test	46.87	12.62
March Math Standardized Achievement Test	47.10	14.25
Korean Midterm	71.79	10.13
English Midterm	66.07	17.74
Math Midterm	67.65	19.55

Table 1 (continued)

Scale	M	SD
Korean Final	64.00	11.06
English Final	69.16	18.55
Math Final	56.29	23.02

Table 2

Zero-Order Correlation Coefficients Among Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. MSLQK	--																				
2. TSKK	.51	--																			
3. PRBK	.56	.67	--																		
4. MO3K	.23	.20	.17	--																	
5. MIDK	.17	.18	.15	.63	--																
6. FINK	.13	.22	.14	.68	.65	--															
7. MSLQE	.39	.44	.30	.17	.21	.13	--														
8. TSKE	.28	.72	.51	.16	.21	.20	.67	--													
9. PRBE	.28	.58	.63	.18	.21	.15	.57	.79	--												
10. PLCE	-.01	.13	.06	.54	.50	.55	.32	.34	.38	--											
11. MO3E	.05	.18	.08	.60	.54	.54	.35	.39	.39	.72	--										

Table 2 (continued)

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
12. MIDE	.09	.19	.15	.51	.56	.60	.34	.33	.35	.65	.66	--									
13. FINE	.09	.20	.18	.54	.61	.67	.33	.36	.35	.69	.65	.80	--								
14. MSLQM	.32	.22	.22	.10	.07	.03	.34	.25	.22	.10	.08	.10	.07	--							
15. TSKM	.18	.55	.41	.05	.13	.13	.32	.58	.50	.16	.19	.22	.26	.58	--						
16. PRBM	.21	.43	.50	.06	.06	.10	.24	.48	.54	.15	.14	.14	.16	.54	.71	--					
17. PLCM1	-.01	.14	.07	.43	.38	.48	.26	.30	.32	.57	.56	.54	.50	.33	.39	.36	--				
18. PLCM2	-.06	.12	.07	.48	.43	.55	.18	.22	.25	.53	.54	.58	.56	.27	.41	.40	.73	--			
19. MO3M	-.07	.07	.06	.57	.43	.51	.06	.17	.19	.58	.56	.46	.47	.27	.29	.26	.63	.62	--		
20. MIDM	-.06	.07	.10	.46	.48	.54	.15	.21	.27	.54	.53	.61	.61	.26	.38	.33	.66	.76	.64	--	
21. FINM	-.11	.01	.01	.38	.42	.52	.12	.19	.20	.57	.50	.55	.56	.27	.37	.36	.73	.78	.63	.74	--

Note. Ns are 203 to 204 due to missing values. Correlation coefficients greater than .13 are significant at $p < .05$. MSLQ = Motivated Strategies for Learning Questionnaire (domain-specific self-efficacy); TSK = task-specific self-efficacy; PRB = problem-specific self-efficacy; PLC = placement test; MO3 = March achievement test; MID = midterm; FIN = final; E = English; K = Korean; M = math.

Table 3

Descriptions and Goodness-of-Fit Indexes of Confirmatory Factor Analysis Models

Model	Description	χ^2	df	χ^2: df	NNFI	CFI	Res.
1	Based on 15 MSLQ items with no CUs	483.03	87	5.55	.78	.82	.05
2	Based on 15 MSLQ items with 15 CUs	128.46	72	1.78	.96	.97	.05
2a	Model 2 with no factor correlation	180.14	75	2.40	.93	.95	.16
3	Based on 30 task items (10 items for each subject)	1072.00	402	2.67	.86	.87	.05
4	Based on 15 task MV (5 MVs for each subject)	247.07	87	2.84	.93	.94	.04
4a	Model 4 with no factor correlation	470.47	90	5.23	.83	.85	.29
5	Based on 65 problem items (15 Korean, 25 English, and 25 math items)	5098.39	2012	2.53	.79	.79	.05
6	Based on 26 problem MVs (6 Korean, 10 English, and 10 math MVs)	903.93	296	3.05	.90	.91	.03
6a	Model 6 with no factor correlation	1093.43	299	3.66	.87	.88	.29

Note. N = 202. MSLQ = Motivated Strategies for Learning Questionnaire. CU = correlated uniqueness; MV = measured variables; NNFI = Bentler-Bonnett nonnormed fit index; CFI = comparative fit index; Res. = average absolute standardized residuals.

Table 4

Correlation Coefficients Between Korean, English, and Math Self-Efficacy Factors

Factor	Korean	English	Math
Korean	--	.40	.31
English	.76 (.67)	--	.33
Math	.56 (.51)	.59 (.57)	--

Note. MSLQ self-efficacy above the diagonal; task- and problem-specific self-efficacy below the diagonal. Coefficients for problem-specific self-efficacy are reported in parentheses. All ps < .05.

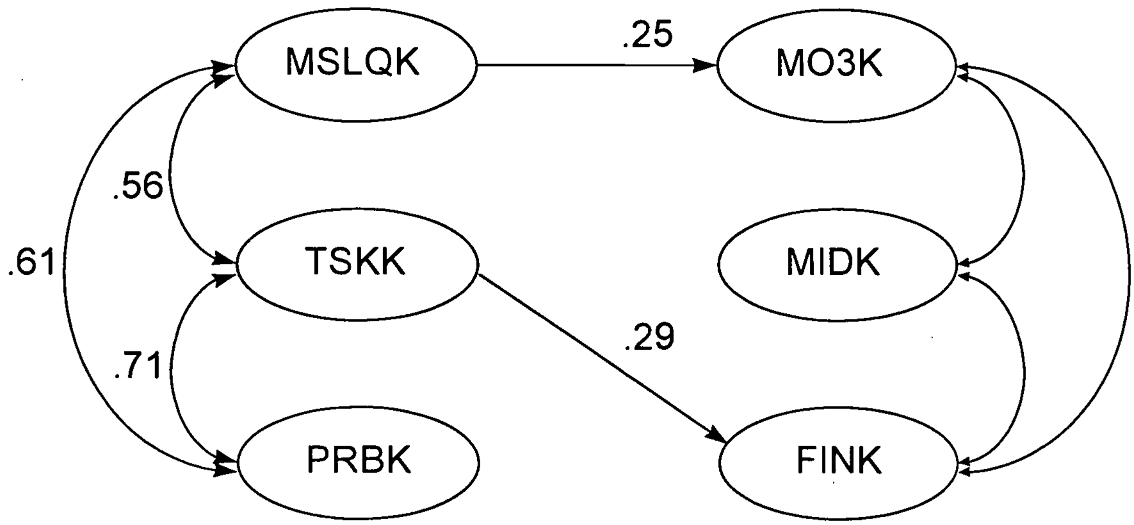


Figure 1. Structural equation modeling results in Korean. Only significant paths are presented ($p < .05$). Smaller arrows indicate correlated paths among disturbance terms. MSLQ = Motivated Strategies for Learning Questionnaire (domain-specific self-efficacy); TSK = task-specific self-efficacy; PRB = problem-specific self-efficacy; PLC = placement test; MO3 = March standardized achievement test; MID = midterm; FIN = final; K = Korean.

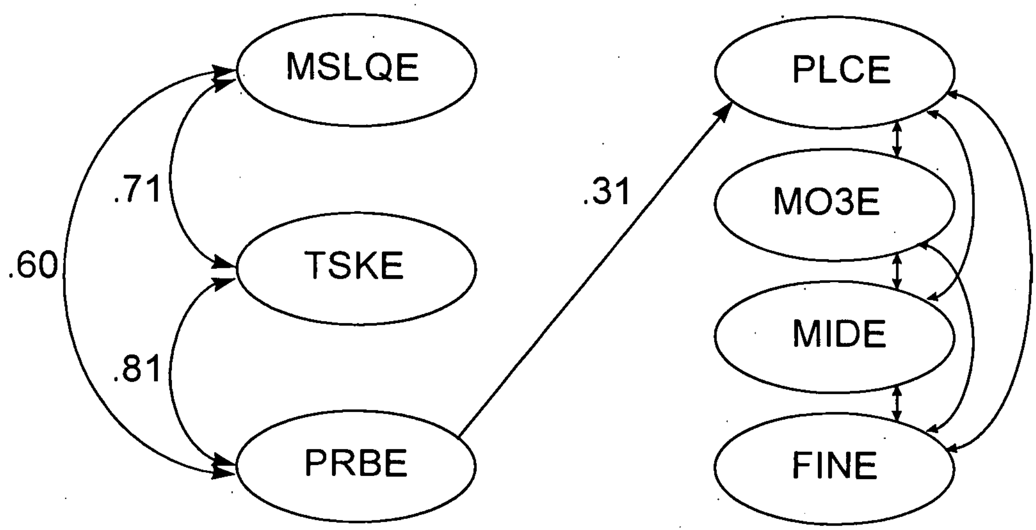


Figure 2. Structural equation modeling results in English. Only significant paths are presented ($p < .05$). Smaller arrows indicate correlated paths among disturbance terms. MSLQ = Motivated Strategies for Learning Questionnaire (domain-specific self-efficacy); TSK = task-specific self-efficacy; PRB = problem-specific self-efficacy; PLC = placement test; MO3 = March standardized achievement test; MID = midterm; FIN = final; E = English.

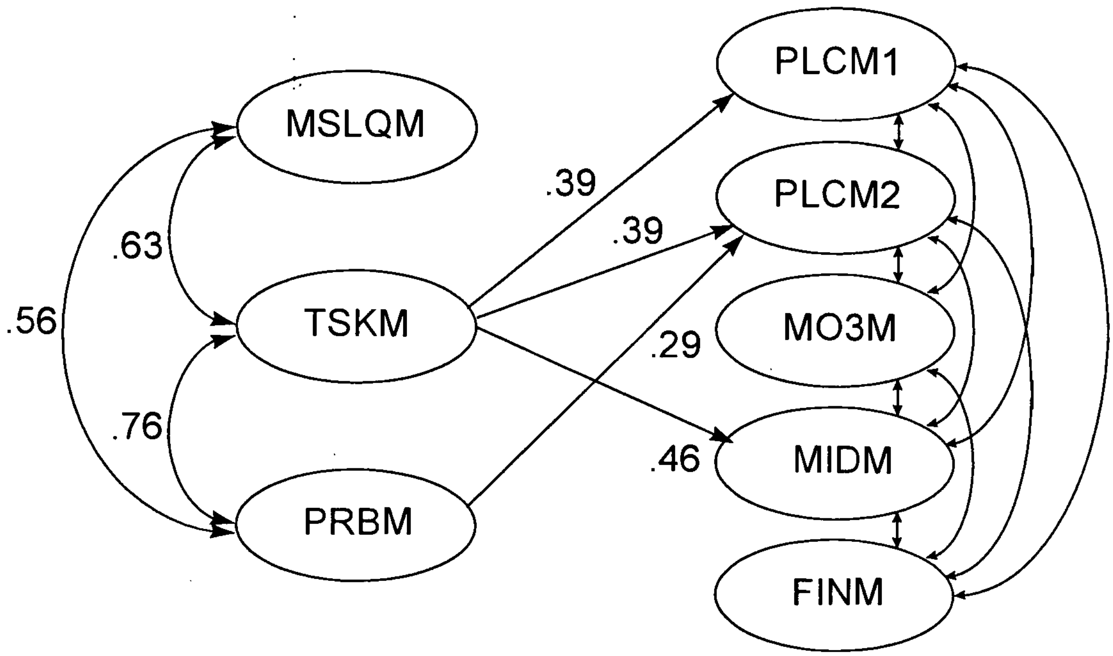


Figure 3. Structural equation modeling results in math. Only significant paths are presented ($p < .05$). Smaller arrows indicate correlated paths among disturbance terms. MSLQ = Motivated Strategies for Learning Questionnaire (domain-specific self-efficacy); TSK = task-specific self-efficacy; PRB = problem-specific self-efficacy; PLC = placement test; MO3 = March standardized achievement test; MID = midterm; FIN = final; M = math.

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