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Interplay Between Personal Goals and Classroom Goal Structures in Predicting Student Outcomes: A Multilevel Analysis of Person–Context Interactions

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This study examined cross-level interactions between personal goals and classroom goal structures, as well as their additive contributions to predicting math achievement, engagement, interest, effort withdrawal, and avoidance coping, using a sample of 3,943 Grade 5 students from 130 classrooms. Results of hierarchical linear modeling showed that classroom performance goal structures exacerbated (a) the negative association between personal performance-avoidance goals and engagement and (b) the positive relations of personal performance-avoidance goals to effort withdrawal and avoidance coping. Moreover, both classroom performance goal structures and personal performance-avoidance goals had maladaptive patterns of relations to outcomes at their respective levels of analysis, whereas classroom mastery goal structures and personal mastery goals showed adaptive relations. Our findings underscore the importance of a multilevel interactionist perspective in understanding achievement motivation and making recommendations for educational practices.

Keywords: classroom goal structure, personal goal orientation, person–context interaction, achievement goal theory, elementary school

In the achievement goal literature, two lines of research have received considerable attention. The first line of research reflects the *person* perspective of motivation and focuses on investigating the motivational dynamics of individuals who adopt different types of personal goals (Dweck, 1986; Dweck & Leggett, 1988; Elliot, 2005). The second line of research reflects the *contextualist* perspective and focuses on how different types of contextual goal structures (salient goal-related messages conveyed by classroom practices or school policies) influence achievement-related behavior in educational settings (Ames, 1992; Ames & Archer, 1988; Maehr & Midgley, 1996). Although the two perspectives are complementary and mutually informative (Roeser, 2004), relatively little research has integrated the person and contextualist perspectives to study motivational phenomena in achievement contexts (Linnenbrink, 2004, 2005). In this study, we examined the joint (additive and interactive) contributions of classroom goal structures and personal goals to the prediction of students' achievement and motivational outcomes from a *multilevel interactionist* perspective. A specific emphasis of this article is a clear distinction between the personal and the contextual levels in our conceptualization and statistical analysis of person–context interactions (Chan, 2006; Glick, 1985; Raudenbush & Bryk, 2002).

Person Perspective

For researchers who are oriented toward the person perspective, one of their primary objectives is to build a science of achievement motivation with achievement goals as the central organizing constructs (Dweck, 1986; Dweck & Leggett, 1988; Elliot, 2005; Pintrich, 2000). In educational settings, students' achievement goals represent their reasons or purposes for engaging in academic tasks. A large body of empirical evidence has been accumulated in relation to three types of personal goals:[1] (a) personal mastery goals, which emphasize learning new knowledge and improving one's skills; (b) personal performance-approach goals, which emphasize demonstrating one's competence relative to others; and (c) personal performance-avoidance goals, which emphasize the avoidance of showing one's incompetence relative to others. The general findings are that personal mastery goals and performance-avoidance goals are consistently associated with adaptive and maladaptive outcomes, respectively. However, empirical evidence

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[1] In the latest formulation of achievement goal constructs, mastery goals were bifurcated into mastery-approach and mastery-avoidance goals (Elliot & McGregor, 2001; Pintrich, 2000). In this article, we focused on the approach dimension of the mastery goal and both the approach and avoidance dimensions of the performance goal because these three personal goals have produced the most solid empirical base.

for the role of performance-approach goals in achievement-related outcomes is mixed (see Elliot, 2005; Harackiewicz, Barron, Pintrich, Elliot, & Thrash, 2002; Midgley, Kaplan, & Middleton, 2001; Pintrich & Schunk, 2002, for recent reviews).

Contextualist Perspective

In a parallel development, practice-oriented and reform-minded researchers who are oriented toward the contextualist perspective have turned their attention to the influences of contextual (classroom or school) goal structures on students' achievement motivation (Ames, 1992; Ames & Archer, 1988; Anderman, Maehr, & Midgley, 1999; Maehr & Midgley, 1996; Roeser, 2004). One of their primary concerns is to identify contextual factors that are systematically related to key educational outcomes. Much research has focused on two types of classroom goal structures derived from the achievement goal theory: (a) the classroom mastery goal structure and (b) the classroom performance goal structure.[2] In mastery-oriented classrooms, instructional practices, task assignment, and evaluation procedure are structured to emphasize learning, task mastery, and trying hard to improve one's skills. In contrast, in performance-oriented classrooms, instructional practices, task assignment, and evaluation procedure are structured to emphasize demonstrating competence. The general findings are that classroom mastery goal structures are related to adaptive outcomes and classroom performance goal structures are related to maladaptive outcomes, although variations exist depending on the specific outcomes under investigation (see Kaplan, Middleton, Urdan, & Midgley, 2002; Meece, Anderman, & Anderman, 2006; Urdan, 2004, for recent reviews).

Level of Analysis Problem

Although research based on the person and contextualist perspectives has yielded different types of information (the former about motivational dynamics of individuals with different profiles of personal goals; the latter about what classroom or school environments would enhance or impede students' learning and motivation), considerable confusion has arisen from attempts to make substantive conclusions about influences of contextual goal structures by using evidence derived from the personal level of analysis (Roeser, 2004). Such confusion is exemplified by a recent debate that centered on the "unique positive potential of performance-approach goals, relative to mastery goals" (Harackiewicz, at el., 2002, p. 638; Midgley et al., 2001). Although the evidence that was marshaled to support each side of the debate was primarily based on the individual level of analysis, both Midgley et al. and Harackiewicz et al. discussed the broader educational implications of the evidence at the contextual level. For example, Midgley et al. were concerned about the unsettling implication that proving the adaptiveness of personal performance-approach goals might convey a message to teachers that they should emphasize performance goals in their classrooms—that "[t]he call for a reconceptualization of goal theory gives the message that it may be alright to emphasize the demonstration of ability and competition among students" (p. 83). In contrast, Harackiewicz et al. argued that emphasizing multiple goals in the classroom would provide students with multiple pathways to achieve the same valued outcomes—that "there may be multiple pathways to improve schools, not just one 'mastery road' that all must travel" (p. 643). Thus, there seems to be an implicit assumption that what is true at the individual level of analysis is also true at the contextual level of analysis (Roeser, 2004).

In this article, we argue that person-level findings cannot be directly translated into conclusions at the contextual level and that direct evidence derived from the contextual level of analysis is required to appropriately inform classroom practices or school policies. Although evidence has been reported to show either the direct relations between contextual goal structures and student outcomes or the indirect relations mediated by personal goals (e.g., Church, Elliot, & Gable, 2001; Kaplan & Midgley, 1999; Nolen & Haladyna, 1990; Roeser, Midgley, & Urdan, 1996), the reliance on single-level analyses in many of the reported studies has created interpretive difficulty.

Conceptually, a variable takes on different meanings at different levels of analysis (Chan, 2006; Glick, 1985; Raudenbush & Bryk, 2002). In relation to achievement goal research, if a researcher's objective is to study the contextual effects of classroom goal structures on student outcomes, the level of conceptualization is the classroom and not the individual. Accordingly, in statistical analysis, classroom goal structures should be treated as level-2 variables. In contrast, if a researcher's objective is to study the psychological correlates of personal goals, the level of conceptualization is the individual and not the classroom. Accordingly, in statistical analysis, personal goals should be treated as level-1 variables, and the conclusion drawn from this level of analysis should only be applicable to level 1. Statistically, ignoring the nested structure of the data and reliance on single-level analysis can lead to misleading estimates of parameters (Cronbach, 1976; Raudenbush & Bryk, 2002; Snijders & Bosker, 1999).

Are Person-Level Findings Consistent With Classroom-Level Findings?

Recent methodological advances in multilevel analysis or hierarchical linear modeling (HLM) have allowed researchers to analyze hierarchical data in a multilevel framework, thus resolving the level of analysis problem (Goldstein, 2003; Raudenbush & Bryk, 2002; Snijders & Bosker, 1999). The most relevant and informative studies are those that included both classroom goal structures and personal goals in the same HLM analysis. These studies have enabled direct comparisons between the role of classroom goal structures and personal goals with the same sample, measurement, and design characteristics. Moreover, they have provided evidence about the unique contribution of classroom goal structures after accounting for the predictive contribution of personal goals. This type of research, however, is limited in number and has yielded mixed findings. For example, Karabenick (2004) found that, in college introductory chemistry classrooms, level-1 (person-level) relations showed differential consistency with level-2 (classroom-level) relations, depending on the outcome variables used in the

[2] Some recent research has distinguished between the classroom performance-approach and classroom performance-avoidance goal structures (e.g., Kaplan, Gheen, & Midgley, 2002; Karabenick, 2004; Wolters, 2004), but the empirical support for such a distinction is not well established (see Discussion section for an elaboration of this point).

analysis. Specifically, at level 1, personal mastery and performance-approach goals were significant positive predictors of help-seeking approach, whereas personal performance-avoidance goals were significant negative predictors. At level 2, however, classroom mastery, performance-approach, and performance-avoidance goal structures were not significant predictors of help-seeking approach. When help-seeking avoidance was used as the outcome variable, level-1 relations were consistent with level-2 relations. Personal performance-avoidance goals were significant positive predictors at level 1 and classroom performance-avoidance goal structures were significant positive predictors at level 2. The other two personal goals and classroom goal structures were not significant predictors at level 1 and level 2, respectively. In another HLM study, Kaplan, Gheen, and Midgley (2002) found that level-1 and level-2 relations were quite consistent in a sample of Grade 9 students in math classrooms. Specifically, at level 1, personal mastery goals were negative predictors of disruptive behavior, whereas personal performance-approach and performance-avoidance goals were positive predictors. At level 2, classroom mastery goal structures were negative predictors of disruptive behavior, whereas classroom performance-approach goal structures were positive predictors.

Although these studies have significantly contributed to our understanding of multilevel relations, the paucity of research that included both classroom goal structures and personal goals in the same HLM analysis as well as the inconsistency of evidence has limited the generalizability of the findings to different outcomes and different age groups. Accordingly, one of the primary objectives of this study was to examine the predictive relations of classroom goal structures and personal goals to an expanded array of outcomes in Grade 5 math classrooms, including academic achievement, interest, engagement, effort withdrawal, and avoidance coping. The inclusion of both achievement and interest as outcomes is particularly pertinent in light of Harackiewicz et al.'s (2002) review of evidence in support of the differential relations that personal mastery goals were positively related to interest, but not achievement, whereas personal performance-approach goals were positively related to achievement, but not interest. Moreover, the inclusion of the three other outcome variables would allow us to examine the role of classroom goal structures and personal goals in both adaptive and maladaptive functioning of students. It is our aim that this study would capture the best features of the person and contextualist perspectives by advancing our knowledge of motivational dynamics at the student level as well as informing educational practices at the classroom level.

From Additive Models to Interactive Models

In the preceding sections, we have discussed the rationale and evidence in support of moving from single-level analysis to multilevel analysis. The HLM research we have reviewed employed additive multilevel models to explore the unique contributions of classroom goal structures and person goals to predicting outcomes at different levels. Additive multilevel models assume that relations between level-l variables (e.g., between personal goals and student-level outcomes) are homogenous across different contexts. This assumption needs to be tested explicitly in order to determine whether level-1 relations vary across classroom contexts and, if so, how classroom contexts may moderate (strengthen or weaken) the relations at level 1. The multilevel interactionist framework would be most suitable for addressing these questions.

Multilevel Interactionist Perspective

Consistent with the trend toward interactive models in developmental psychology (e.g., Bergman, Cairns, Nilsson, & Nystedt, 2000; Magnusson & Stattin, 1998), personality-social psychology (e.g., Mischel, 2003; Mischel & Shoda, 1995), educational psychology (e.g., Linnenbrink, 2004; Linnenbrink & Pintrich, 2001), and psychopathology (e.g., Ingram & Luxton, 2005; Rutter et al., 1997), we conceptualized students' achievement motivation in the classroom from an interactionist perspective. The specific kind of interaction we focus on in this article is termed multilevel (or cross-level) interaction, which is a form of statistical moderation (Baron & Kenny, 1986; Raudenbush & Bryk, 2002). A classroom context acts as a moderator if relations at the individual level vary as a function of the classroom context. In relation to achievement goal theory, a classroom goal structure acts as a moderator if it either strengthens or weakens the relations between personal goals and student outcomes. A theoretical significance of the interactionist perspective is that it provides a conceptual framework for researchers to investigate whether and how the motivational system of the individual may operate differently under varying contextual conditions, thus advancing our understanding of individuals' differential vulnerability to environmental stress and differential receptivity to environmental support (Wachs, 2000). An applied significance is that findings derived from interaction analyses not only provide teachers, policy makers, and educational reformers with important information about whether an intervention works in general, but also whether it works differentially for different types of students. Accordingly, another key objective of this study was to examine how classroom goal structures moderated the relations between personal goals and student outcomes.

Of particular relevance to our interest in studying person–context interaction are studies conducted by Newman (1998) and Linnenbrink (2005). In his experimental study, Newman (1998) manipulated the goal context and randomly assigned fifth and sixth graders to either a mastery or performance goal context. He found that in the performance goal context, personal performance-approach goals tended to be negatively related to help seeking, whereas in the mastery goal context, the relation tended to be positive.

Linnenbrink (2005) conducted a quasi-experimental study in which she measured Grade 6 students' entering personal goals (mastery and performance-approach goals) and manipulated classroom goal structures by providing participating teachers with specific suggestions for practice, primarily on the basis of the evaluation and recognition components of the TARGET system (Ames, 1992; Epstein, 1988). She included three classroom goal conditions in her analysis—mastery, performance-approach, and combined mastery/performance-approach. Using multivariate analysis of variance (MANCOVA), she found no significant interactions between classroom goal conditions and person goals, and therefore concluded that "students' entering personal goal orientations did not alter the way in which they responded to the classroom goal context" (p. 204). However, Linnenbrink (2005) did not include performance-avoidance goals in her study and neither did Newman (1998). It turns out, as we show in the

Analyses and Results section, that person–context interactions were especially salient between personal performance-avoidance goals and classroom performance goal structures. To provide a comprehensive account of the patterns of person–context interactions, this study extended previous work by including personal mastery, performance-approach, and performance-avoidance goals, and by using an alternative research design and analytic strategy to study person–context interactions.

Hypotheses

To examine whether and how classroom goal structures moderate the relations between personal goals and student outcomes, we used HLM to test three hypotheses. The first is termed the *additive hypothesis*. This is a main effect[3] hypothesis in which classroom goal structures and personal goals have additive contributions to the prediction of student outcomes. Under this hypothesis, for example, classroom mastery goal structures would predict outcomes at the classroom level and personal mastery goals would predict student-level outcomes, but classroom mastery goal structures do not moderate the relations between personal mastery goals and student-level outcomes.

The second hypothesis is termed the *reinforcing hypothesis*, which includes two types of interaction. In the first type of reinforcing interaction, classroom goal structures strengthen a desirable relation at the individual level (an enhancing pattern). An example consistent with this type of interaction is that classroom mastery goal structures strengthen the desirable relation between personal mastery goals and interest. Another example is that classroom performance goal structures strengthen the desirable relation between personal performance-approach goals and achievement. This type of interaction can be linked to the matching (Linnenbrink, 2004, 2005) or the person–environment fit hypothesis (Eccles et al., 1993; Hunt, 1975) proposed in prior research. The matching hypothesis suggests that a classroom goal structure that affords opportunities for the pursuit of a personal goal (i.e., a match between the person and the context) would lead to adaptive outcomes. The concept of person–environment fit or goal congruence is also central to research in organizational psychology (Edwards, Cable, Williamson, Lambert, & Shipp, 2006) and vocational choices (Holland, 1997). For example, Holland (1997) proposed that people would perceive an occupational environment to be reinforcing and satisfying when environmental features resemble their own personal characteristics. This person–environment fit would result in stability of behavior because people would receive a substantial amount of selective reinforcement of their behavior in such an environment.

Another type of reinforcing interaction is that classroom goal structures strengthen an undesirable relation at the individual level (an exacerbating pattern). An example consistent with this type of interaction is that classroom performance goal structures strengthen the undesirable relation between personal performance-avoidance goals and avoidance behavior. This pattern of interaction is consistent with the vulnerability-stress hypothesis in psychopathology (Ingram & Luxton, 2005). Vulnerability refers to a personal characteristic that predisposes an individual to a psychological disorder and stress refers to an environmental factor that disrupts the normal functioning of an individual. The hypothesis states that the probability of developing a given disorder depends on the interaction between the degree of personal vulnerability and the level of stress experienced by the individual (Ingram & Price, 2001; Monroe & Simons, 1991). Although the vulnerability-stress hypothesis is commonly used in the field of psychopathology, it provides insight into the understanding of the reinforcing exacerbating pattern in relation to personal performance-avoidance goals. The hypothesis suggests that students who strongly endorse performance-avoidance goals would be vulnerable to a goal context that emphasizes demonstrating competence and social comparison of ability. It is worth noting that despite the similarity (or "match") between classroom performance goal structures and personal performance-avoidance goals, this type of interaction is expected to lead to maladaptive outcomes, thus it could not be explained by the person–environment fit or matching hypothesis, which generally implies an enhancing effect.

The third hypothesis is termed the *counterbalancing hypothesis*, which also includes two types of interaction. In the first type of interaction, classroom goal structures weaken a desirable relation at the individual level (a dampening pattern). An example consistent with this type of interaction is that classroom performance goal structures weaken the desirable relation between personal mastery goals and interest. Another example is that classroom mastery goal structures weaken the desirable relation between personal performance-approach goals and achievement. In these examples, the positive potential of an individual is dampened (or not fully realized) due to goal incongruence. This pattern of interaction is consistent with the notion of "mismatch" or "misfit" in the matching (Linnenbrink, 2004, 2005) or person–environment fit hypothesis (Eccles et al., 1993; Hunt, 1975).

Another type of counterbalancing interaction is that classroom goal structures weaken an undesirable relation at the individual level (a buffering pattern). An example consistent with this type of interaction is that classroom mastery goal structures weaken the undesirable relation between personal performance-avoidance goals and avoidance behavior. This pattern of interaction is consistent with the buffering hypothesis proposed in prior research (Linnenbrink, 2004, 2005). The buffering hypothesis suggests that a supportive environment can buffer the negative impact of personal vulnerability on achievement-related outcomes.

Overall, the additive, reinforcing, and counterbalancing hypotheses proposed in this study are able to incorporate the various types of relation between classroom goal structures and personal goals. In addition to their generality and comprehensiveness, a strength of these hypotheses is that they can be tested systematically and unambiguously by specific patterns of results in HLM. An example illustrating the links between these hypotheses and specific patterns of HLM results is presented in the Analyses and Results section.

Objectives and Research Questions

In summary, a primary objective of this study was to examine the patterns of cross-level interactions between classroom goal

[3] To avoid awkward and cumbersome terminology, we used the term "effects" (e.g., main effects, interactive effects, additive effects, moderating effects) in a noncausal sense to refer to predictive relations in this article.

structures (mastery and performance) and personal goals (mastery, performance-approach, and performance-avoidance) in predicting multiple outcomes in a large sample of Grade 5 students in math classrooms. Another key objective was to examine the main (or additive) effects of classroom goal structures and personal goals on predicting student outcomes, if interactions were not significant or if the patterns of interactions were ordinal (Cohen, Cohen, West, & Aiken, 2003; Pedhazur, 1997).

We addressed the following research questions in this study: (a) Did classroom goal structures moderate the student-level relations between personal goals and outcomes? (b) If cross-level interactions (or moderating effects) were significant, would they show reinforcing or counterbalancing patterns? (c) If the interactions were not significant or displayed ordinal patterns of interactions, what would be the unique contributions of classroom goal structures and personal goals to predicting outcomes? (d) Were classroom-level relations between classroom goal structures and outcomes consistent with student-level relations between personal goals and outcomes?

Method

Participants

This study was part of a larger research project investigating the relations between learning environments and student outcomes. The participants in this study were 3,943 Grade 5 students from 130 classrooms in 38 elementary schools in Singapore. The sample included 2,754 Chinese (69.8%), 824 Malay (20.9%), 262 Indian (6.6%), and 103 students of other ethnic origins (2.6%). The gender distribution of the sample was 52.7% male and 47.3% female. The mean age of the participants was 11.4 years. English is the medium of instruction in Singapore, and all students formally start learning English in Grade 1.

Sampling Design and Procedure

Low statistical power to detect interaction effects, especially in the presence of measurement errors, has been an issue of great concern (Aiken & West, 1991; Cohen et al., 2003; McClelland & Judd, 1993). Therefore, consideration of sampling design is especially important in testing interaction hypotheses. In this study, we sampled a large number of students and classrooms using a stratified random sampling technique. Schools were divided into three strata based on their prior aggregate school achievement and 13 schools were randomly selected from each stratum. One school dropped out of the study, leaving a total of 38 schools in the sample. About half of the Grade 5 classrooms in each participating school were randomly selected to do the math survey and assessment. Our sampling design ensured that we tapped sufficient "natural variance" of classroom characteristics and student demography by selecting schools and classrooms that covered a broad spectrum of achievement levels.

The procedure consisted of two parts. Part 1 was an online survey conducted in the 8th month from the beginning of the school year. The online survey included two forms. Half of the students in each class were randomly selected to complete survey Form 1, in which students reported their motivational beliefs and achievement-related behaviors in their math classrooms. The other half of the students in the same class completed survey Form 2, in which students reported their perceived classroom goal structures. In other words, half of the students provided student-level (or level-1) data and the other half provided classroom-level (or level-2) data. In effect, half of the students served as independent raters of classroom goal structures. Because different groups of students provided data at different levels, potential inflation of cross-level interactions would be reduced. Such inflation could occur, for example, as a result of similar item wordings of the personal goal and classroom goal structure measures. The average numbers of students completing Forms 1 and 2 per class were 14.8 and 15.5, respectively. In Part 2 of the study, which was conducted about 1 month after the survey administration, a math achievement test was administered to all the students who had completed either Form 1 or Form 2 of the survey.

Measures

All of the items on the survey were rated on 5-point Likert scales (1 = *strongly disagree* to 5 = *strongly agree* or 1 = *never* to 5 = *always*). Sample items of self-report scales are provided in the Appendix.

Classroom goal structures. Two types of classroom goal structures were assessed—classroom mastery and classroom performance goal structures. The classroom mastery goal structure describes an environment in which the teacher emphasizes that learning, task mastery, and working hard are important. The classroom performance goal structure describes an environment in which the teacher emphasizes that demonstrating high ability and getting better grades than other students are important. It is worth noting that our measure of the classroom performance goal structure focuses on the approach dimension. The measures of classroom mastery and classroom performance goal structures were adapted from the Patterns of Adaptive Learning Survey (PALS; Midgley et al., 2000).

A confirmatory factor analysis was conducted to examine the factor structure of the constructs. A two-factor structure provided a good fit for the data, $\chi^2(26, N = 2017) = 239.61$, Tucker-Lewis index (TLI) = .92, comparative fit index (CFI) = .95, root-mean-square error of approximation (RMSEA) = .06. Each scale showed adequate internal consistency ($\alpha = .83$ for classroom mastery goal structure and $\alpha = .73$ for classroom performance goal structure).

Classroom-level measures of classroom goal structures were derived from aggregating (i.e., averaging within each classroom) individual students' perceptions of classroom goal structures (Karabenick, 2004; A. M. Ryan, Gheen, & Midgley, 1998). These aggregated measures were used as level-2 predictors in HLM. The total variability of perceived classroom goal structures consisted of the within-class and between-class components. The aggregated measures we used reflect the between-class component.

Personal goals. Three types of personal goals were measured: personal mastery, personal performance-approach, and personal performance-avoidance goals. The personal mastery goal scale assessed students' desire to learn new things and to master challenging concepts in math. The personal performance-approach goal scale assessed students' desire to demonstrate their superior ability relative to their peers and to obtain favorable judgment from teachers. The personal performance-avoidance goal scale

assessed students' desire to hide their weaknesses in math and to avoid being perceived as incompetent by their teachers and peers. The measures of personal goals were adapted from PALS (Midgley et al., 2000).

A confirmatory factor analysis was conducted to examine the factor structure of the constructs. A three-factor structure provided an adequate fit for the data, $\chi^2(62, N = 1926) = 707.91$, TLI = .91, CFI = .94, RMSEA = .07. Each scale showed adequate to high internal consistency ($\alpha = .85$ for personal mastery goal, $\alpha = .87$ for personal performance-approach goal, and $\alpha = .72$ for personal performance-avoidance goal).

Achievement. A multiple-choice math achievement test was developed for this study because a standardized test of math achievement at Grade 5 was not available in Singapore. The test was intended to assess students' knowledge and skills in math at the Grade 5 level. It included four types of questions, which required understanding basic math concepts, performing routine procedures, using complex procedures, and solving novel problems. A panel of researchers and school teachers who had experience teaching math constructed and reviewed the items to ensure the content validity, clarity, and grade-level appropriateness of the assessment instrument in the local context. A pilot study was conducted to select items from the item pool on the basis of their psychometric quality such as item difficulty, item discrimination, and functioning of distractors. A final set of 27 items was selected and administered in this (main) study. To select items for final scoring, we adopted the criterion used in the Trends in Mathematics and Science Study 1999 (TIMSS 1999; Mullis & Martin, 2000). Four items that had an item discrimination index less than 0.2 were dropped. The 23 items that were used for final scoring had high reliability ($\alpha = .87$). Standardized IRT (item response theory) scores were used in further analyses.

Adaptive and maladaptive motivational outcomes. Two adaptive and two maladaptive motivational outcomes were assessed in this study. The adaptive motivational outcomes included students' engagement and interest in math classes. Our measure of engagement was based on students' report of their attention, effort, and participation in their math classes (Steinberg, Lamborn, Dornbusch, & Darling, 1992; Wellborn & Connell, 1987). Our measure of interest was based on students' reports of their intrinsic motivation and enjoyment in their math classes (Elliot & Church, 1997). The maladaptive motivational outcomes included avoidance coping and effort withdrawal. The avoidance coping scale assessed students' tendency to give up when the work was difficult or boring. It was adapted from the Motivated Strategies for Learning Questionnaire (Pintrich, Smith, Garcia, & McKeachie, 1993). The effort withdrawal scale assessed students' tendency to hold back or minimize effort in their math work (Meece, Blumenfeld, & Hoyle, 1988; Nicholls, Patashnick, & Nolen, 1985).

A confirmatory factor analysis was conducted to examine the factor structure of the constructs. A second-order factor model, in which interest and engagement loaded onto the higher order factor of adaptive functioning and effort withdrawal and avoidance coping loaded onto the higher order factor of maladaptive functioning, provided a good fit for the data, $\chi^2(99, N = 1926) = 552.89$, TLI = .96, CFI = .97, RMSEA = .05. Each scale showed adequate to high internal consistency ($\alpha = .93$ for interest, $\alpha = .74$ for engagement, $\alpha = .80$ for effort withdrawal, and $\alpha = .79$ for avoidance coping).

Analyses and Results

Analytic Approach to Modeling Student Outcomes

All predictors and outcome variables were standardized before running hierarchical linear modeling (HLM). Outcome variables and level-1 predictors were standardized at level 1. Standardized level-2 predictors were derived from first aggregating level-1 scores to level 2 and then standardizing the level-2 scores at level 2. One-way analysis of variance (ANOVA) with random effects model (the unconditional model or Model 0) was used to estimate the proportion of within- and between-class variances in the outcome variables (Raudenbush & Bryk, 2002).

The intraclass correlation coefficient (ICC) measures the proportion of total variance in an outcome variable explained by between-class differences. ICC was 62.0% for math achievement, 7.6% for engagement, 4.1% for interest, 9.4% for effort withdrawal, and 5.8% for avoidance coping.[4] Chi-square tests were performed to examine the significance of between-class variances in the unconditional models. We found that between-class variances were significant for all of the five outcome variables, χ^2s (129, $N = 1926$) = 219.61 to 3016.18, $ps < .001$.

The next HLM analysis was performed to evaluate the predictive relations of personal goals to student outcomes. A student-level or level-1 model (Model 1) was run to examine the statistical significance of the three level-1 predictors: personal mastery, performance-approach, and performance-avoidance goals. To determine whether the three slopes were fixed or random, we performed a multivariate likelihood-ratio test for each of the outcome variables. The deviance statistic associated with the full random-coefficient regression model, in which all the three slopes were random, was compared with the corresponding statistic associated with the restricted model, in which all the three slopes were fixed. The purpose of the multivariate procedure is to test the omnibus null hypothesis and to protect against the inflation of Type I error rates. If the multivariate likelihood-ratio test was not significant, all the three slopes were fixed. If it was significant, univariate χ^2 tests would then be performed. The univariate test served as a post hoc procedure to identify which specific slopes were random. If univariate χ^2 tests were not significant, the slopes of the corresponding level-1 predictors were fixed (Raudenbush & Bryk, 2002). On the basis of the sequential procedures, slopes were either identified to be fixed or random. A fixed slope indicates that level-1 relations are homogeneous across classrooms, whereas a random slope indicates that level-1 relations vary across classrooms. The variation of slopes across classrooms represents a source of variance to be explained by classroom-level variables. Therefore, only random slopes were modeled in further analyses by adding level-2 predictors (see Table 2). In this study, the slopes relating personal mastery goals to avoidance coping, personal performance-approach goals to interest, personal performance-avoidance goals to engagement, personal performance-avoidance

[4] ICC was 8.3% for classroom mastery goal structures and 12.3% for classroom performance goal structures. ICC's for the predictors are reported for descriptive purposes only, because it is not our aim to explain the variance components associated with the predictors.

goals to effort withdrawal, and personal performance-avoidance goals to avoidance coping were found to be random.

Finally, classroom mastery and classroom performance goal structures (the level-2 predictors) were added to build the full model (Model 2). Model 2 was used to test cross-level interactions between classroom goal structures and personal goals as well as their unique main effects:

$$Y_{ij} = \beta_{0j} + \beta_{1j}(PMG) + \beta_{2j}(PPAP) + \beta_{3j}(PPAV) + r_{ij}$$

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(CMG) + \gamma_{02}(CPG) + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}(CMG) + \gamma_{12}(CPG) + u_{1j}$$

$$\beta_{2j} = \gamma_{20} + \gamma_{21}(CMG) + \gamma_{22}(CPG) + u_{2j}$$

$$\beta_{3j} = \gamma_{30} + \gamma_{31}(CMG) + \gamma_{32}(CPG) + u_{3j}.$$

Y_{ij} is the outcome variable, PMG is the personal mastery goal, PPAP is the personal performance-approach goal, PPAV is the personal performance-avoidance goal, CMG is the classroom mastery goal structure, and CPG is the classroom performance goal structure. The equation above represents the most elaborate form of Model 2. If a slope was fixed, the coefficients associated with CMG and CPG would be set to zero (i.e., no level-2 predictors would be added).

The cross-level interaction between classroom goal structures and personal goals can be interpreted as a statistical moderation effect (Baron & Kenny, 1986; Raudenbush & Bryk, 2002). The reinforcing hypothesis is supported if the interaction term is significant and its sign is the same as that of the main effect term for personal goals, the counterbalancing hypothesis is supported if the interaction term is significant and its sign is opposite to that of the main effect term for personal goals, and the additive hypothesis is supported if the interaction term is not significant. As an illustration, in Model 2, γ_{10} is the coefficient for the main effect of personal mastery goals on the outcome variable, γ_{11} is the coefficient for Classroom Mastery Goal Structure × Personal Mastery Goal interaction, and γ_{12} is the coefficient for Classroom Performance Goal Structure × Personal Mastery Goal interaction. In addition, γ_{01} and γ_{02} can be interpreted as the main effects of classroom mastery and classroom performance goal structures, respectively. A reinforcing effect of classroom mastery goal structures on the relation between personal mastery goals and the outcome variable is demonstrated if, for example, γ_{11} and γ_{10} are of the same sign, whereas a counterbalancing effect of classroom mastery goal structures is demonstrated if γ_{11} and γ_{10} are of opposite signs. Classroom mastery goal structures do not interact with personal mastery goals if γ_{11} is not significantly different from zero.

We also estimated the percentage of variance explained as a result of adding predictors in successive models. Besides conceptual considerations in relation to our research objectives, the sequence of model building is based on Raudenbush and Bryk's (2002) recommendation on the proper use of variance-explained statistics—"the variance explained in a level-2 parameter, such as β_{0j}, is conditional on a fixed level-1 specification" (p. 150). Thus, the comparison model (or reference model) we used to compute the variance explained statistic is always a nested model of the more complex model that follows (i.e., Model 2 vs. Model 1 or Model 1 vs. Model 0).

Descriptive Statistics and Zero-Order Correlations

Descriptive statistics and zero-order correlations among the student-level variables used in this study are presented in Table 1. The zero-order correlation between the two level-2 predictors, classroom mastery goal structures and classroom performance goal structures, was not significant ($r = -.053$, $p > .05$, $n = 130$).

Cross-Level Interactions Between Classroom Goal Structures and Personal Goals

Table 2 presents the parameter estimates of fixed effects and results of hypothesis tests for the full model (Model 2). The most notable cross-level interactions were found between classroom performance goal structures and personal performance-avoidance goals. Classroom performance goal structures had significant moderating effects on the relation between personal performance-avoidance goals and engagement ($\gamma = -.049$, $p < .05$), between performance-avoidance goals and effort withdrawal ($\gamma = .101$, $p < .01$), and between performance-avoidance goals and avoidance coping ($\gamma = .090$, $p < .01$).

The moderating effects of classroom performance goal structures on level-1 relations are shown in Figures 1–3. In classrooms with stronger emphasis on performance goals, personal performance-avoidance goals tended to be more negatively related to engagement,

Table 1
Descriptive Statistics and Zero-Order Correlations Among Student-Level Variables

	M	*SD*	1	2	3	4	5	6	7	8
					Student level (n = 1,926)					
1. Achievement	0.00	1.00	—							
2. Engagement	4.16	.66	.19	—						
3. Interest	4.00	.94	.19	.32	—					
4. Effort withdrawal	2.07	.97	−.29	−.25	−.22	—				
5. Avoidance coping	1.98	.98	−.24	−.24	−.31	.48	—			
6. Personal mastery goal	3.99	.75	.19	.43	.77	−.24	−.30	—		
7. Personal performance-approach goal	3.47	1.03	−.01†	.17	.25	.07	−.02†	.31	—	
8. Personal performance-avoidance goal	2.78	1.02	−.27	−.09	−.01†	.41	.25	.01†	.38	—

Note. All correlations are significant at the .01 level, except those marked with a dagger †, which are not significant at .05 level.

Table 2
Results From HLM Analyses Predicting Achievement and Motivational Outcomes

Variable	Achievement			Engagement			Interest			Effort withdrawal			Avoidance coping		
Fixed effect	γ	*SE*	*p*	γ	*SE*	*p*	γ	*SE*	*p*	γ	*SE*	*p*	γ	*SE*	*p*
β_0 Intercept															
γ_{00} Mean	**−.126**	.060	.038	−.008	.026	.757	.000	.017	.988	−.003	.023	.893	.005	.022	.814
γ_{01} Classroom mastery	**.129**	.060	.034	.052	.029	.078	.024	.018	.182	**−.066**	.027	.017	**−.097**	.024	<.001
γ_{02} Classroom performance	**−.385**	.055	<.001	**−.077**	.027	.005	.014	.019	.462	**.126**	.025	<.001	**.099**	.026	<.001
β_1 Personal mastery slope															
γ_{10} Mean	**.140**	.016	<.001	**.401**	.026	<.001	**.764**	.018	<.001	**−.259**	.022	<.001	**−.300**	.024	<.001
γ_{11} Classroom mastery	—[a]	—	—	—	—	—	—	—	—	—	—	—	−.038	.025	.133
γ_{12} Classroom performance	—	—	—	—	—	—	—	—	—	—	—	—	−.022	.026	.400
β_2 Personal performance-approach slope															
γ_{20} Mean	.001	.019	.971	**.085**	.023	<.001	.016	.019	.395	−.012	.023	.606	−.014	.024	.556
γ_{21} Classroom mastery	—	—	—	—	—	—	−.006	.016	.713	—	—	—	—	—	—
γ_{22} Classroom performance	—	—	—	—	—	—	.013	.016	.426	—	—	—	—	—	—
β_3 Personal performance-avoidance slope															
γ_{30} Mean	**−.094**	.018	<.001	**−.102**	.023	<.001	−.021	.016	.204	**.386**	.029	<.001	**.237**	.026	<.001
γ_{31} Classroom mastery	—	—	—	−.033	.024	.179	—	—	—	−.003	.025	.911	.000	.025	.990
γ_{32} Classroom performance	—	—	—	**−.049**	.024	.042	—	—	—	**.101**	.028	.001	**.090**	.024	<.001

Note. Coefficients significant at the .05 level are boldfaced. Number of level-1 units = 1,926; number of level-2 units = 130.
[a] Classroom mastery and classroom performance goal structures were not entered as level-2 predictors if the slopes of the corresponding personal goals were fixed.

more positively related to effort withdrawal, and more positively related to avoidance coping. The patterns can be characterized as ordinal interactions, in which nonparallel lines do not cross over within the range of interest (Cohen et al., 2003; Pedhazur, 1997).

Comparing Model 2 (the full model) with Model 1 (the student-level model), we found that classroom goal structures accounted for 20.2% of the between-class variance in the slope of performance-avoidance goals predicting engagement, 16.8% in the slope of performance-avoidance goals predicting effort withdrawal, and 25.91% in the slope of performance-avoidance goals predicting avoidance coping.

No interactions were found between classroom goal structures (either mastery or performance) and personal mastery goals and between classroom goal structures and personal performance-

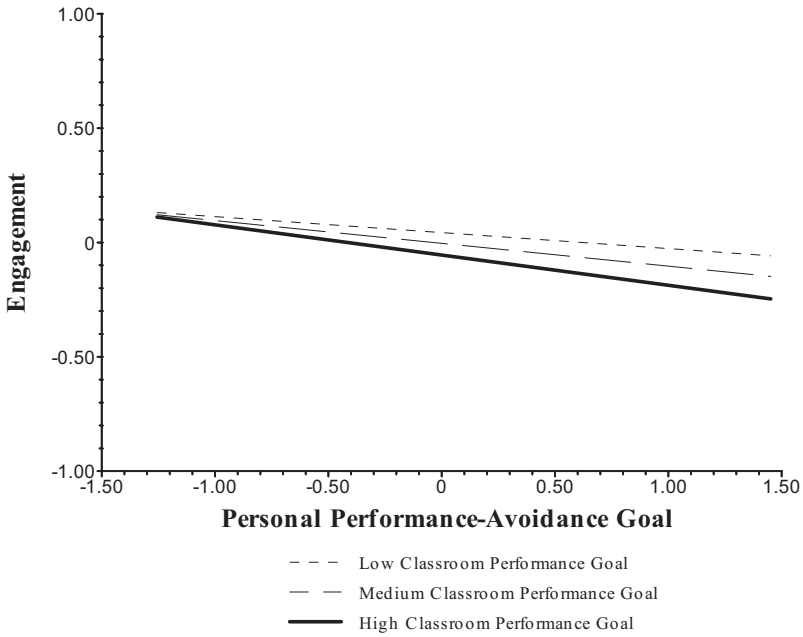

Figure 1. Interaction between classroom performance goal structure and personal performance-avoidance goal predicting engagement.

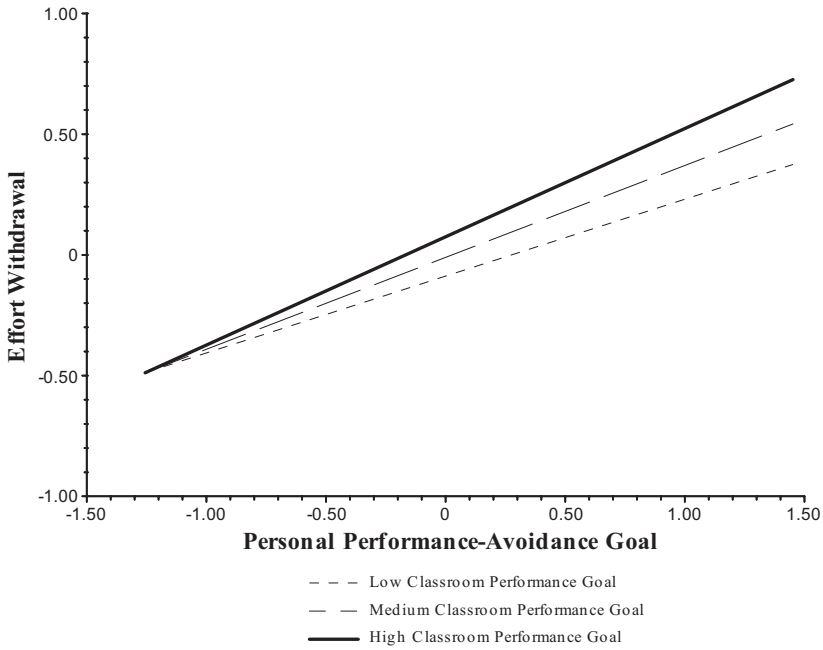

Figure 2. Interaction between classroom performance goal structure and personal performance-avoidance goal predicting effort withdrawal.

approach goals. For variables that produced interactions, the interaction pattern was of the ordinal type, suggesting that the main effects can be used to summarize the overall predictor-outcome relations. Therefore, we proceed to present results on the main effects of personal goals and classroom goal structures whether or not interactions were found.

Main Effects of Personal Goals

As shown in Table 2, personal mastery goals were positively related to math achievement ($\gamma = .140$, $p < .001$), engagement ($\gamma = .401$, $p < .001$), and interest ($\gamma = .764$, $p < .001$). Moreover, personal mastery goals were negatively related to effort with-

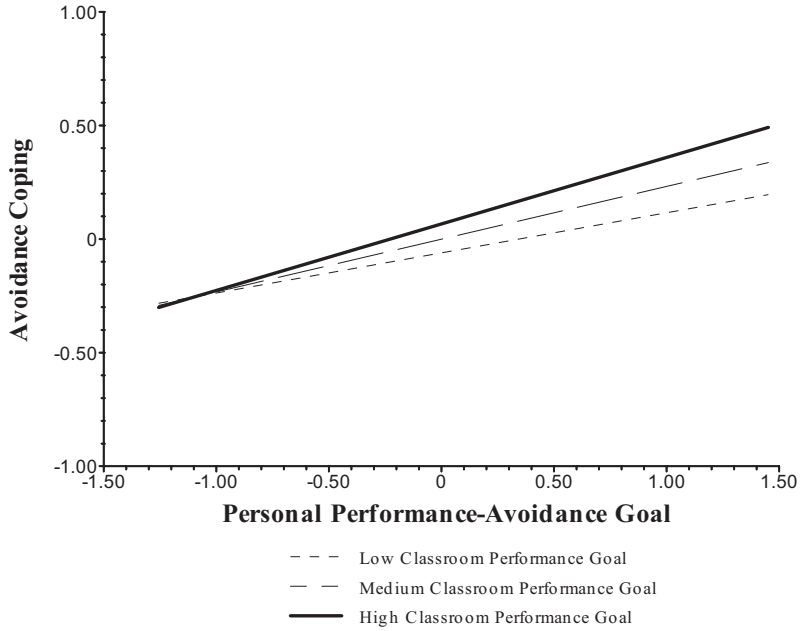

Figure 3. Interaction between classroom performance goal structure and personal performance-avoidance goal predicting avoidance coping.

drawal ($\gamma = -.259$, $p < .001$) and avoidance coping ($\gamma = -.300$, $p < .001$).

Personal performance-approach goals were positively related to engagement ($\gamma = .085$, $p < .001$). For other outcomes, personal performance-approach goals were not significant predictors at the .05 level.

Personal performance-avoidance goals were negatively related to math achievement ($\gamma = -.094$ $p < .001$) and engagement ($\gamma = -.102$, $p < .001$), but unrelated to interest ($\gamma = -.021$, $p > .05$). Moreover, personal performance-avoidance goals were positively related to effort withdrawal ($\gamma = .386$, $p < .001$) and avoidance coping ($\gamma = .237$, $p < .001$).

Comparing Model 1 (the student-level model) with Model 0 (the unconditional model), we found that personal goals accounted for 5.9% of the within-class (or level-1) variance for math achievement, 19.1% for engagement, 59.4% for interest, 25.7% for effort withdrawal, and 16.6% for avoidance coping.

Main Effects of Classroom Goal Structures

As shown in Table 2, classroom mastery goal structures were positively related to math achievement ($\gamma = .129$, $p < .05$), but negatively related to effort withdrawal ($\gamma = -.066$, $p < .05$) and avoidance coping ($\gamma = -.097$, $p < .001$). In contrast, classroom performance goal structures were negatively related to math achievement ($\gamma = -.385$, $p < .01$) and engagement ($\gamma = -.077$, $p < .01$) but positively related to effort withdrawal ($\gamma = .126$, $p < .001$) and avoidance coping ($\gamma = .099$, $p < .001$).

Comparing Model 2 (the full model) with Model 1 (the student-level model), we found that classroom goal structures accounted for 27.2% of the between-class (or level-2) variance for math achievement, 14.6% for engagement, 10.5% for interest, 40.3% for effort withdrawal, and 56.8% for avoidance coping, after controlling for personal goals at level 1.

Discussion

The main purposes of this study were to examine how classroom goal structures moderated the predictive relations between personal goals and student outcomes, as well as how these variables operated additively at the individual and classroom levels. Specifically, we used HLM to test three hypotheses: the reinforcing hypothesis, the counterbalancing hypothesis, and the additive hypothesis.

Cross-Level Interactions Between Classroom Goal Structures and Personal Goals

The reinforcing hypothesis has received empirical support from the findings of cross-level interactions between classroom performance goal structures and personal performance-avoidance goals in predicting engagement, effort withdrawal, and avoidance coping. We found that a strong focus on classroom performance goal structures tended to reinforce (or exacerbate) the negative association between personal performance-avoidance goals and student engagement. The reinforcing effects are also evident in predicting maladaptive motivational outcomes. High levels of classroom performance goal structures tended to reinforce (or exacerbate) the positive predictive relations of personal performance-avoidance goals to both effort withdrawal and avoidance coping. In other words, our finding suggests that in classrooms that emphasize demonstrating ability, social comparison of performance, and competition for good grades, students who are oriented toward performance-avoidance goals would be less likely to be engaged in their math classes, more likely to withdraw their effort in learning math, and more likely to give up when the work is difficult or boring.

The additive hypothesis was supported by the finding that classroom performance goal structures did not moderate the predictive relations of either personal mastery goals or performance-approach goals to any of the outcome variables. It was also supported by the finding that classroom mastery goal structures did not interact with any of the three personal goals in predicting any of the outcome variables, which indicated that classroom mastery goal structures operated in an additive way with personal goals to predict achievement and motivational outcomes.

Our findings are by and large consistent with Linnenbrink's (2005), despite differences between the two studies in numerous methodological and sample characteristics. In her quasi-experimental study, she found that classroom goal conditions did not interact with either personal mastery goals or personal performance-approach goals. Linnnenbrink, however, did not include personal-avoidance goals in her study, which turn out to be critical for testing the interaction hypotheses in this study.

This study extends previous research in two ways. First, our findings triangulate Linnenbrink's (2005) findings with respect to personal mastery and personal performance-approach goals by using an alternative research design and analytic approach. This approach allows us to associate specific HLM results with specific hypotheses in a systematic way. Second, including personal performance-avoidance goals in testing the interaction hypotheses provides a richer and more complete picture of person–context interactions by demonstrating the moderating effects of classroom performance goal structures on the maladaptive relations between personal performance-avoidance goals and motivational outcomes.

Overall, we obtained corroborative evidence for the additive and reinforcing hypotheses, but no evidence for the counterbalancing hypothesis. Whether and how classroom goal structures interact with personal goals depend on the specific combination of classroom goal structures and personal goals and the specific outcome variables used in the analysis. Before we elaborate on the implications of our findings for educational practices, we first discuss and interpret the main effect findings because it is important to take into account multiple levels of analysis in making recommendations for educational practices.

Main Effects of Personal Goals

We found that personal mastery goals were positively related to math achievement, engagement, and interest in math, but negatively related to effort withdrawal and avoidance coping. The patterns for performance-avoidance goals were quite consistent, but in the opposite direction—performance-avoidance goals were negatively related to math achievement and engagement, but positively related to effort withdrawal and avoidance coping. Performance-approach goals were positively related to engagement, but unrelated to the other outcome variables. Overall, the main effects of personal goals are consistent with the following

general conclusions derived from prior research: (a) personal mastery goals are adaptive, (b) performance-avoidance goals are maladaptive; and (c) evidence for the relations between performance-approach goals and outcomes is mixed and inconclusive (Elliot, 2005; Harackiewicz et al., 2002; Midgley et al., 2001). The demonstration of consistent results based on an Asian sample enhances the cross-cultural generalizability of the achievement goal theory.

Main Effects of Classroom Goal Structures

Classroom mastery goal structures were positive predictors of math achievement and negative predictors of effort withdrawal and avoidance coping. In other words, in classrooms where teachers were perceived to emphasize learning and improving, students tended to perform better in math tests, were less likely to withdraw effort in their math work, and were less likely to give up when the work was difficult or boring. In contrast, classroom performance goal structures were negative predictors of math achievement and engagement, but positive predictors of effort withdrawal and avoidance coping. That is, in classrooms with stronger emphasis on demonstrating one's competence, social comparison of ability, and competition for high grades, students tended to perform worse in math tests, were less likely to pay attention and participate in group work in class, were more likely to withdraw effort in their math work, and were more likely to give up when the work was difficult or boring.

Prior research that adopted a multilevel framework and used HLM procedures has documented similar patterns of results,[5] especially for maladaptive outcomes. For example, classroom mastery goal structures were found to be significant negative predictors of self-handicapping (Turner et al., 2002), avoidance of help-seeking (Karabenick, 2004; A. M. Ryan et al., 1998; Turner et al., 2002), and disruptive behaviors (Kaplan, Gheen, et al., 2002). In contrast, classroom performance goal structures were positively related to self-handicapping (Urdan, Midgley, & Anderman, 1998), avoidance of help-seeking (Karabenick, 2004; A. M. Ryan et al., 1998), and disruptive behavior (Kaplan, Gheen, et al., 2002). This study provides corroborative evidence for the role of classroom mastery goal structures and classroom performance goal structures in students' achievement and motivational outcomes in an Asian context. In addition, by including both adaptive and maladaptive outcomes in the same study, we provide a comprehensive set of findings to document differential relations for different types of classroom goal structure.

Comparisons of level-1 and level-2 relations reveal that personal mastery goals and classroom mastery goal structures had similar patterns of predictive relations to outcomes. Surprisingly, classroom performance goal structures, despite the focus on the approach dimension, were consistent with personal performance-avoidance goals (but not with personal performance-approach goals) in predicting outcomes at their respective levels of analysis. These findings have important implications for practice, which we elaborate in the next section.

Implications for Classroom Practices

Our study underscores the importance of studying achievement motivation in a multilevel framework. This point is particularly pertinent in light of recent debates about whether personal performance-approach goals are adaptive or not (Harackiewicz et al., 2002; Kaplan & Middleton, 2002; Midgley et al., 2001). In the current study, personal performance-approach goals were positively related to engagement and were unrelated to other outcome variables. From the individual level of analysis, it seems harmless or even beneficial to emphasize the approach dimension of performance goals. However, this finding alone cannot be directly translated into recommendations for educational practices because interventions that involve changing teachers' classroom practices are usually conducted at the classroom level. Classroom goal structures could have additive effects on student outcomes independent of their personal goals, as well as moderating effects on the relations between personal goals and student outcomes. We therefore caution against making recommendations for classroom practices on the basis of research conducted solely at the individual level of analysis (Roeser, 2004).

In line with the above argument, we take into account multilevel relations in drawing our conclusions. Both the interaction and main effect findings regarding the maladaptive role of classroom performance goal structures suggest that teachers should deemphasize performance goals in their classrooms, even if teachers' goal messages are meant to encourage students to demonstrate superior ability and to get higher grades than their peers. As our findings indicate, classroom performance goal structures are negatively related to math achievement and engagement, and positively related to effort withdrawal and avoidance coping. What is worrisome is that classroom performance goal structures appear to be especially detrimental to students who strongly endorse performance-avoidance goals, due to the reinforcing or exacerbating effects on the maladaptive relations between performance-avoidance goals and outcomes. Given the robust and consistent empirical generalization of the negative impact of personal performance-avoidance goals on student outcomes (see Elliot, 2005; Pintrich & Schunk, 2002; Urdan, Ryan, Anderman, & Gheen, 2002, for reviews), students who are oriented toward performance-avoidance goals are especially at-risk for maladaptive outcomes. Emphasizing performance goals in the classroom may further exacerbate the risk to this group of students, even if teachers focus on the approach dimension of classroom performance goal structures.

In addition, given the convergence of evidence from the current study and prior research (Kaplan, Gheen, et al., 2002; Karabenick, 2004; A. M. Ryan et al., 1998; Turner et al., 2002) regarding the adaptive role of both classroom mastery goal structures and personal mastery goals, it is advisable for teachers to place greater emphasis on mastery goals in their classrooms. Our findings show that classroom mastery goal structures and personal mastery goals operate in an additive way and the patterns of predictor-outcome relations are similar at both the classroom-level and student-level of analysis.

[5] A number of prior studies investigated the relations between classroom goal structures and outcomes at a single level (student-level) of analysis (e.g., Anderman & Midgley, 1997; Church et al., 2001; Kaplan & Maehr, 1999; Roeser et al., 1996). Because the within-class and between-class components of students' perceptions of classroom goal structures were not separated in these studies, it is difficult to compare their results with ours.

Limitations

Several limitations of this study should be noted. First, the use of correlational data does not permit us to infer causal flows from classroom goal structures and personal goals to student outcomes. Nevertheless, the evidence that supports the additive hypothesis (i.e., classroom mastery goal structures and classroom performance goal structures did not interact with either personal mastery goals or personal performance-approach goals) shows remarkable consistency with prior research using a quasi-experimental design (Linnenbrink, 2005). We believe that our findings and Linnenbrink's are complementary and mutually corroborative. Moreover, we extend previous research by demonstrating cross-level interactions between classroom performance goal structures and personal performance-avoidance goals. This finding, however, needs to be triangulated by quasi-experimental or experimental studies. It is hoped that our study will stimulate further research that uses alternative research designs to fully understand the complex interplay between personal goals and classroom goal structures.

Second, our measure of classroom performance goal structures primarily assessed the approach dimension. But it is important to note that, surprisingly, our "approach measure" had significant interactions with personal performance-avoidance goals, but not with personal performance-approach goals. Moreover, classroom performance goal structures were consistent with personal performance-avoidance goals (but not with personal performance-approach goals) in predicting outcomes at their respective levels of analysis. Thus, the fact that we focused on the approach dimension of classroom performance goal structures actually strengthens the case against emphasizing performance goals in the classroom. Students who strongly endorse performance-avoidance goals may not necessarily interpret the "approach" aspect of the performance goal messages despite the intentions of their teachers. It remains an empirical question whether students can distinguish between the approach and avoidance dimensions of classroom goal structures and, if they do, how they would interpret the goal messages conveyed to them. Karabenick (2004) reported a zero-order correlation of .91 between aggregated student perceptions of classroom performance-approach goals and classroom performance-avoidance goals, whereas Kaplan, Gheen, et al. (2002) reported the corresponding correlation to be .41. A comprehensive and systematic validity study would be needed to determine the empirical viability and utility of distinguishing between the approach and avoidance dimensions of classroom performance goal structures.

Third, our measures of classroom goal structures were based on students' self-reports, which were their subjective interpretations of goal messages conveyed by their teachers. There are disagreements in the literature about the merits of using student perceptions. A number of authors have argued that the subjective perceptions and interpretations of goal messages (or the functional significance of the goal context) are more important than the objective reality of classroom contexts in influencing students' achievement-related behaviors (Ames, 1992; Meece et al., 2006; A. M. Ryan et al., 1998; R. M. Ryan & Grolnick, 1986). When both teachers' reports and students' reports of classroom goal structures were used in the same study, aggregated student-report measures tended to be more strongly related to outcomes than did teacher-report measures (Kaplan, Gheen, et al., 2002; A. M. Ryan et al., 1998; Urdan et al., 1998). Moreover, there is evidence showing that students' self-reports of classroom goal structures were systematically related to teachers' practices based on classroom observations (Patrick, Anderman, Ryan, Edelin, & Midgley, 2001). Furthermore, from a measurement perspective, aggregation of student perceptions reduces measurement and other unsystematic errors and hence produces more reliable measures than teachers' reports or classroom observations based on a single observer.

However, a limitation of student perceptions is that it is difficult to make recommendations for classroom practices without understanding how objective classroom environments impact student outcomes (Linnenbrink, 2005; Urdan, 1997, 2004). Experimental and quasi-experimental studies of how manipulations of objective goal-related features in the classroom may alter students' personal goals and achievement-related outcomes would provide practitioners with concrete guidelines and specific practices for altering classroom goal structures. In addition, there is a need for more research that uses multiple methods such as classroom observations, interviews, simulated recalls, and experimental manipulations to triangulate and validate findings based on student perceptions (Urdan, 2004).

A fourth issue in relation to achievement goal research is the stability of personal goals. Experimental manipulations have been found to be effective in eliciting or changing particular personal goals in the laboratory setting, at least briefly, suggesting that personal goals could be responsive to situational demands and cues (Barron & Harackiewicz, 2001; Elliot & Harackiewicz, 1996; Elliott & Dweck, 1988). But evidence based on longitudinal survey research has shown that personal goals are relatively stable over time (Anderman & Midgley, 1997; Midgley et al., 1998; Wolters, Yu, & Pintrich, 1996). The mixed evidence base has led some authors to conclude that personal goals could display both dispositional and situational characteristics, depending on the research context (Elliot, 2005; Urdan, 1997, 2004). In experimental settings, goal messages are usually unambiguous and situational demands are strong, whereas in natural classroom environments, goal messages are usually mixed and the situational demands are weaker than those in experimental settings (Urdan, 1997). Although we expected personal goals to be relatively stable as this study was conducted in natural classroom settings, it is possible that classroom goal structures would have had time to influence personal goals as the data were collected in the 8th month from the beginning of the school year.

A limitation of this study is that a cross-sectional design does not allow us to empirically assess the stability of personal goals over time. This design could only capture the product of a series of potentially complex processes at a particular point in time, but the specific processes involved remain unclear. For example, although the current study demonstrates that, at the time of data collection, the relation between personal performance-avoidance goals and avoidance coping tended to be stronger in classrooms with higher levels of performance goal structures (a reinforcing-exacerbating pattern), the specific processes leading to this pattern of person–context interaction remain unclear. If classroom goal structures influenced personal goals, which in turn influenced achievement-related outcomes, the product of such mediating processes, together with those of any other processes, would be registered as the final product (statistical relations) at the point of data collection. Evidence on the stability (or instability) of personal goals would allow researchers to assess the plausibility of the mediation expla-

nation.[6] Future research that employs a longitudinal design to track students' personal goals over time would help to shed light on the processes involved (Anderman et al., 1999; Anderman & Midgley, 1997).

[6] It is important to note that mediation and moderation are not mutually exclusive phenomena. The validity of our statistical findings (e.g., the statistical moderating effects of classroom performance goal structures on the relations between personal performance-avoidance goals and student outcomes) does not rely on the assumption of the absence of mediation by personal goals. As explained by Muller, Judd, & Yzerbyt (2005), "the mediation question focuses on the intervening mechanism that produces the treatment effect. The moderation question focuses on factors that affect the magnitude of the treatment effect. It is important to note that these two processes may be combined in informative ways, such that moderation is mediated or mediation is moderated" (p. 852).

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Appendix

Sample Items for Self-Report Scales

Classroom Mastery Goal Structure (4 items)

My math teacher wants us to really understand the subject, not just to remember facts or rules.

Classroom Performance Goal Structure (5 items)

My math teacher thinks that it is more important to do well in math tests than to learn new things.

Personal Mastery Goal (5 items)

An important reason I do my math work is that I like to learn new things.

Personal Performance-Approach Goal (4 items)

I like to show my teacher that I am smarter than the other pupils in my math class.

Personal Performance-Avoidance Goal (4 items)

I do my math work because I do not want the teacher to think that I am stupid.

Interest (4 items)

I enjoy doing math.

Engagement (5 items)

I pay attention well in my math class.
I try my best to contribute during small group discussions.

Effort Withdrawal (4 items)

I do not work hard on my math homework.

Avoidance Coping (3 items)

When the work in math is difficult, I give up.

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