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Learning to Value Math and Reading: Relations to Mastery and Performance-Oriented
Instructional Practices

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Abstract

Changes in students' achievement values in math and reading were examined in a sample of children and early adolescents. Hierarchical linear modeling techniques were used to account for both classroom and student-level effects. At the student level, positive changes in students' achievement values were associated positively with self-concept of ability and the previous year's achievement values, in both reading and math. Measures of teachers' mastery and performance-oriented instructional practices were included in the full HLM model. Students experienced decrements in achievement values, after controlling for other student and classroom-level variables, in classrooms where performance-oriented instructional practices were used. In the full model, self-concept of ability was related positively to increases in achievement values, whereas gender was unrelated to changes in achievement values.

Learning to Value Math and Reading: Relations to Mastery and Performance-Oriented Instructional Practices

Why do some students come to value mathematics and reading, whereas others do not? By the time students reach high school, many are already self-declared “math phobics,” whereas other students embrace mathematics as an interesting and important topic. In addition, some students truly enjoy reading, whereas others find reading to be a dull and unimportant task.

The present study investigates the relations between mastery and performance-oriented instructional practices on changes in students’ achievement values in mathematics and reading. Multilevel regression techniques are used to examine the combined relations of student variables and teachers’ instructional practices to changes in achievement values over one school year. Two contemporary motivational theories (goal orientation theory and expectancy X value theory) are employed in this study.

Valuing Math and Reading: Important Educational Outcomes

Whether or not students develop a sense of valuing mathematics and reading during the elementary and middle school years can have profound effects on students’ future plans, and potential career trajectories. Developing a distaste for these subjects during childhood may lead the young adult to rule out math and reading-related career choices. In addition, students’ achievement values and motivation may vary by subject domain; thus a student who is highly motivated in reading may not be as highly motivated in mathematics (Stodolsky, Salk, & Glaessner, 1991; Young, Arbreton, & Midgley, 1992).

Consequently, the variables that motivate a student to try to achieve in reading may be somewhat different than the variables that are related to motivation in mathematics.

Goal Stresses in the Classroom

Goal orientation theorists argue that when students are engaged in academic tasks, they often are oriented to one of several different types of achievement goals. Specifically, students at times are oriented toward mastery goals (also referred to as learning or task goals). When students are mastery goal oriented, they are interested primarily in developing and improving their ability. In contrast, students who are performance goal oriented (also referred to as ego-involved or ability-goal oriented), primarily are interested in demonstrating and proving their ability relative to others (Ames & Archer, 1988; Dweck & Leggett, 1988; Nicholls, 1989; Maehr & Midgley, 1996). Recently, goal orientation researchers have distinguished between a performance-approach goal orientation, and a performance-avoid goal orientation. Students who are performance-approach oriented are interested in demonstrating their ability relative to others, whereas students who are performance-avoid oriented are interested in avoiding looking incompetent or “dumb” (Elliot & Harackiewicz, 1996; Middleton & Midgley, 1997).

Teachers who engage in mastery oriented instructional practices tend to create learning environments where all students can feel successful and feel a sense of task-mastery and improvement. Such classrooms emphasize effort, improvement, and challenges. In contrast, teachers who emphasize performance-oriented instructional practices tend to point out ability differences to show the work of the best students as examples for others, and to use competitive instructional methods (for a review, see Anderman & Maehr, 1994). Most research now assumes that mastery and performance

orientations among students, as well as goal orientations that are conceptualized as instructional practices among teachers, are orthogonal (e.g., Middleton & Midgley, 1997; Nicholls et al., 1990).

Research indicates that classroom-level instructional practices that emphasize mastery or performance-oriented goal stresses have an influence on a variety of student outcomes. Research results point in particular to the negative effects of the use of performance-oriented instructional strategies on motivational outcomes among children and adolescents. In one study, Anderman and Young (1994) found that the use of performance-oriented instructional strategies (e.g., pointing out the work of the best students as examples to others) was related to lower levels of student mastery goals in science classrooms. In addition, results of that study also indicated that the relation between self-concept of ability in science and mastery goals was diminished in classrooms where performance-oriented instructional strategies were emphasized. In a study using a large sample of fifth grade students, Urda, Midgley, and Anderman (1998) found that teachers' reported use of performance-oriented instructional strategies (their term was "ability goal oriented") and students' perceptions of an emphasis on performance-oriented instructional strategies were both related to greater use of self-handicapping strategies by students. In an observational study, Meece (1991) found that student motivational outcomes were related to a number of classroom-level practices that represented either mastery or performance-oriented instructional strategies. For example, in low mastery-oriented classrooms, students' grades mainly were determined by scores on tests; in contrast, in highly mastery-oriented classrooms, grading and testing were not used as often. To date, although researchers have distinguished between performance-approach

and avoid orientations at the individual (student) level (Elliot & Harackiewicz, 1996; Middleton & Midgley, 1997), researchers have not distinguished between performance-approach and performance-avoid classroom level practices.

Studies to date have not linked the use of mastery or performance-oriented instructional practices to the valuing of academic subjects. There is reason to suspect that children who learn in classrooms that emphasize mastery-oriented instructional practices will develop more positive achievement values than students who learn in performance-oriented classrooms. Whereas some research indicates that performance oriented environments are related to higher levels of intrinsic motivation (e.g., Harackiewicz & Elliot, 1993), such studies only have involved manipulations of conditions in laboratory settings or the use of samples of college students, and have not examined these processes in actual classrooms with school-aged children. Nicholls (1984) suggested that students who are task-involved (mastery-oriented) will choose moderately difficult tasks, whereas students who are ego-involved (performance-oriented) will choose moderately difficult tasks if they feel competent at completing the task. Consequently, the types of tasks that students associate with a particular academic domain may be shaped by the goal stresses in the classroom. In addition, Dweck and Elliott (1983) suggested that achievement goals are related to expectancies and values. When children learn in evaluative, comparative environments, students come to value performance goals, whereas students who learn in mastery-oriented environments come to value learning goals (see also Wigfield & Eccles, 1992, for a review).

Domain and Gender Differences in Student Motivation

Motivation researchers recently have acknowledged that motivation is subject-specific, and that students' attitudes, values, and goals may vary by subject area (e.g., Wigfield & Eccles, 1992; Wigfield et al., 1991). In particular, students' motivation toward verbal and mathematical tasks may vary considerably. In addition, some research indicates that there are gender differences in students' valuing of academic subjects.

Motivation and Literacy Activities. Some studies have examined classroom characteristics that are related to changes in students' valuing of literacy activities. Some research has examined changes in self-concept of ability in literacy, as opposed to self-efficacy, which often is conceptualized as being task-specific (Pajares, 1996). For example, Eccles and her colleagues (Eccles et al., 1989; Eccles & Midgley, 1989; Wigfield, Eccles, MacIver, Reuman, & Midgley, 1991) examined changes in students' self-concept of ability and valuing of English before and after the transition to junior high school. The students' self-concept of ability in English declined after the transition and remained low. Students' valuing of English declined after the transition, but then increased over the course of their seventh grade school year. They suggest that the instructional practices of the junior high school teachers may be responsible for some of these changes (Eccles et al., 1989; Eccles & Midgley, 1989; Wigfield et al., 1991).

In support of these findings, a few other research studies have found a link between the ways in which literacy is taught and students' valuing of reading-related activities. For example, Turner (1995) found that "open" literacy tasks (i.e., those involving student control and higher-order thinking) elicited stronger motivation than did other types of literacy tasks. However, there is still a dearth of studies specifically

examining the association of classroom-level practices with changes in the valuing of reading during middle childhood and early adolescence.

Motivation and math. Equally, few studies have examined the possible causes of changes in mathematics motivation during childhood and early adolescence. Nevertheless, some evidence of decrements in both perceptions of ability and valuing of mathematics exists. For example, Eccles, Wigfield, and their colleagues have documented declines in students' liking of math and math ability self-concept across the transition from elementary to junior high school (e.g., Eccles et al., 1989; Wigfield et al., 1991). Eccles, Wigfield, Harold and Blumenfeld found that although children's sense of competence in academic subjects declines during the elementary school years, there is no change in self-reported valuing of mathematics (e.g., Eccles, Wigfield, Harold, & Blumenfeld, 1993; Wigfield & Eccles, 1994; Wigfield et al., 1997). DiCintio and Stevens (1997) found that in sixth and seventh grade math classrooms, math work required fewer higher-order thinking skills than in fifth grade classrooms. In addition, they found that the sixth and seventh grade students reported lower levels of intrinsic motivation than did the fifth graders.

Meyer and her colleagues examined patterns of motivation in mathematics among fifth graders (Meyer, Turner, and Spencer, 1997). Specifically, Meyer et al. found that two motivational patterns emerged among students in mathematics. Some students exhibited a pattern of challenge-seeking in math; that pattern was characterized by high self-efficacy, a learning goal orientation, and being able to cope with failure. In contrast, challenge avoiders experienced negative affect after failures, reported lower self-efficacy, and reported being more performance-oriented in math.

Gender differences. Gender has emerged as an important moderating factor in students' values (e.g., interest and liking) and choices of whether or not to enroll in advanced mathematics courses (Eccles, Adler, & Meece, 1984). In general, studies have found that boys have more positive beliefs about their competence in math than do girls (Eccles et al., 1993). Other studies (e.g., Eccles et al., 1993; Frey & Ruble, 1987; Peterson & Fennema, 1985; Wigfield & Eccles, 1994) have found that gender differences in expectancies and values in mathematics emerge during the elementary grades, although with some samples, gender differences in achievement values do not appear until the junior high school years (e.g., Wigfield & Eccles, 1994). In contrast, females have higher task values and higher self-perceptions of ability in English than do males throughout elementary and secondary school (e.g., Eccles, 1983; Eccles et al., 1989; Marsh, 1989; Wigfield et al., 1991). Together, these differences begin to suggest why females are less likely to take advanced math and physical science courses than males (Eccles et al., 1989).

Summary. In the present study, relations between mastery- and performance-oriented instructional practices, and changes in students' reported valuing of math and reading over the course of a school year, are examined. We control for a number of additional variables that are related to student motivation, including self-concept of ability and gender. We hypothesize that students who learn math and reading under mastery-oriented instructional practices will experience gains in the valuing of math and reading over the course of the year, and that students who learn math and reading in environments that emphasize performance-oriented instructional strategies will experience declines in the valuing of math and reading over the school year.

Hierarchical linear modeling [HLM] (Bryk & Raudenbush, 1992) is used to examine the unique relations between student characteristics and instructional practices on changes in students' reported valuing of mathematics and reading. The fact that students are nested in classrooms implies that relations between and among variables may differ according to both student and classroom characteristics. In the present study, both student and teacher data are used. The models that are presented incorporate individual measures of student characteristics, as well as teacher reports of classroom-level practices.

Method

Sample

Data come from the third and fourth years from the "Childhood and Beyond" study (Eccles, Wigfield, & Blumenfeld, 1984; see Eccles et al., 1993, for an overview of the study). The data used in the present study were collected in the spring of 1989 and the spring of 1990. This study was designed to investigate the development of children's self- and task-perceptions and values during middle childhood and early adolescence. The student sample consisted of 570 students (105 third graders, 154 fourth graders, and 311 sixth graders) from 12 schools. Over 95% of the participants were of European American descent, and most came from lower middle to middle-class socioeconomic backgrounds. Average family income in the districts that participated in this study is \$50,000. All of the schools are elementary schools, except for one middle school that contained only fifth and sixth graders. The sample is nearly evenly divided by gender (49% male, 51% female).¹

Teachers were included in the study if they had a minimum of five participants in their classes, since the HLM program used for the analyses requires a minimum of about five cases per group (Bryk & Raudenbush, 1992). For the analyses involving reading,

data were available for 54 teachers (43 female and 11 male), whereas 48 teachers were available for the math analyses (38 female and 10 male). The average number of years of teaching experience was 17 years ($SD = 9.08$) for mathematics, and 16 years for reading ($SD = 9.72$). For all HLM analyses, students were matched with their specific math and reading teachers.

Procedures

During the spring of each school year, participants completed questionnaires measuring their subjective task values and competence beliefs in a variety of subject domains, including math, reading, sports, and instrumental music. Questionnaires were completed in the students' classrooms, in their regular schools, in three 20-minute sessions. Most of the items used 7-point Likert-style anchors. The items were pilot-tested on 100 children, to insure that the younger children would be able to answer the questions (see Wigfield et al., 1997).

Measures

All scales are based on extensive exploratory factor analyses followed by subsequent confirmatory factor analyses and construct validation (for details, see Eccles et al., 1993). The items making up the student scales are presented in Table 1 with standardized alpha coefficients.

All of the teachers completed a questionnaire examining their beliefs and classroom practices. This measure was administered during the spring of the fourth year of this study; consequently, the teacher data were collected at the same time as the student-level data that were used as the dependent variables in this study. The teacher scales were part of a longer instrument that all teachers participating in the study were asked to complete.

Teachers were asked to complete teacher surveys only if they had students in their classrooms who were participating in the research. In the present study, the following two measures were used: teachers' self-reported use of mastery-oriented and performance-oriented instructional practices. The measure of performance-oriented practices asked teachers to indicate how often they emphasized a number of instructional strategies in their classrooms. Some of these practices included working for the top grades in class, knowing who is doing the best and striving to do as well, and achieving higher test scores. The measure of mastery-oriented practices asked teachers to indicate how often they emphasized instructional routines such as paying attention to one's own improvement, choosing or initiating independent projects, and attempting challenging assignments or projects even when faced with difficulty. The items were anchored with a seven point scale, where 1 = "not at all," and 7 = "a great deal." Items and standardized alphas for the teacher measures are presented in Table 2.

Analysis Strategy

Although it is possible in studies involving students in multiple classrooms to consider classroom-level factors as individual characteristics of students, this is statistically inappropriate, since in actuality there are two different units of analysis involved in such studies (the student and the classroom). In addition, Bryk & Raudenbush (1992) note that aggregation bias can occur when variables take on different meanings at different organizational levels. When one assigns grouped or aggregated data directly to individuals nested within those groups, standard errors are often smaller than they should be, and therefore, confidence intervals may be quite small (Patterson, 1991).

The use of multilevel regression techniques such as hierarchical linear modeling [HLM] (Bryk & Raudenbush, 1992) allows for the development of equations to examine relations within and between classrooms. Specifically, after developing a student level model to explain individual differences between students, a series of equations can be developed representing the math and reading classrooms within the present study. In this way, it is possible to examine differences between the classrooms by comparing the slopes and intercepts for the different groups of students nested in the various classrooms (Bryk & Raudenbush, 1992). Consequently, in such analyses, researchers can examine the additive effects of classroom level practices (e.g., use of mastery-oriented and performance-oriented instructional strategies) on individual student outcomes within those classrooms.

The student-level hierarchical linear model. The dependent variables in the student-level modeling (which only used student-level data) were the measures of valuing of reading and math from the current school year. In addition, we also included the measure of valuing of reading/math from the prior year as a covariate in the analysis. At the student (individual) level, we used gender and self-concept of ability in reading/math as student-level controls.

The within-classroom or student-level model is represented by the equation:

$$\text{Valuing Reading[Math]} = B_{0j} + B_{1j} (\text{Self-Concept of Ability in Reading[Math]}) + B_{2j}(\text{Valuing Reading[Math] From Previous Year}) + B_{3j} (\text{Gender}) + \varepsilon_{ij}$$

where

B_{0j} = mean valuing of the change in valuing reading [math] for students in classroom j

B_{1j} = relation of change in valuing reading [math] during current year to self-concept of ability in reading[math] in classroom j

B_{2j} = relation of change in valuing reading[math] to valuing of reading[math] from the previous year in classroom j

B_{3j} = relation of change in valuing reading[math] to gender in classroom j.

The full hierarchical-linear model. The full model included both student and teacher-level variables. Teachers' reports of their mastery- and performance-oriented instructional strategies were used as classroom-level predictors for the intercept. All analyses were performed separately for reading and for math.

The between-classroom models examining between-classroom differences in valuing of reading/math are represented by the equation:

$$B_{0j} = \theta_{00} + \theta_{01} (\text{Performance Oriented Instructional Practices}) + \theta_{02} (\text{Mastery Oriented Instructional Practices}) + u_{0j}$$

where θ_{00} = the intercept for valuing reading/math, and θ_{01} = the relation of performance oriented instructional strategies within a particular classroom to changes in students' valuing of reading/math, and θ_{02} = the relation of mastery oriented instructional strategies within a particular classroom to changes in students' valuing of reading/math.

Results

Descriptive statistics and bivariate correlations for the student-level measures are presented first, followed by the results of hierarchical linear modeling analyses, separately for mathematics and English.

Relations Between Variables

Descriptive statistics and zero order correlations for the math and reading measures are presented in Table 3. Valuing of reading is more strongly correlated with the prior year's measure of reading value than is the correlation between the current year's valuing of math with the measure from the prior year. Self-concept of ability is related to valuing of both reading and math.

Correlations also were run between the teacher mastery and performance-oriented strategy scales. The reported use of mastery-oriented instructional strategies was uncorrelated with the reported use of performance-oriented instructional strategies ($r = .004$, N.S.).² These results are similar to the findings of other researchers. For example, in assessing mastery and performance goals in students, Middleton and Midgley (1997) reported low correlations between mastery and performance-approach goals ($r = .04$). Nicholls and his colleagues reported low correlations between task and ego goals in student populations, concluding that the two goals were probably orthogonal (Nicholls et al., 1990). Anderman and Midgley (1997) reported moderate negative correlations between students' perceptions of teachers' mastery and ability-oriented instructional practices. For example, they reported correlations between students' perceptions of mastery and performance oriented instructional practices of $r = -.36$ for reading, and $r = -.34$ for mathematics. In the present study, the use of performance oriented instructional strategies was correlated positively with grade level ($r = .25$, $p < .05$). Teachers of students in higher grade levels reported using performance-oriented instructional practices more than did teachers of students in the lower grades. This is similar to findings reported by Midgley and her colleagues (e.g., Anderman & Midgley, 1997; Midgley et al., 1995), who

found that teachers of older students were more likely to emphasize and be perceived by students as emphasizing performance oriented instructional strategies.

How Much Does Valuing of Mathematics and Reading Vary Between Classrooms?

We determined that the intraclass correlation (the percentage of variance between classrooms) was 13.78% for mathematics, and 14.44% for reading.² Consequently, variation in classroom characteristics may help explain these between classroom differences in the valuing of mathematics and reading.

Student Level HLM Model

For the HLM models, we standardized all continuous predictor variables to z-scores. We first ran this model using dummy variables representing grade level as predictors, but they were eliminated from the analyses since they were not significant. Results of the student level HLM are presented in Table 4.

The residual parameter variance for gender and for the previous year's measure of valuing math/reading were set to zero (i.e., they were not allowed to vary between classrooms). However, the parameter variance for the intercept and the self-concept of ability reading [math] slope was allowed to vary between classrooms, because it is possible that differences in teachers' instructional practices might be related to the relation between self-perceptions of ability and changes in the valuing of math/reading. Thus although this was not a major hypothesis in the present study, that residual parameter variance was allowed to vary between classrooms to allow for potential between-classroom variation. The residual parameter variance was set to zero for gender because we had no theoretically based reason to hypothesize that the relations between gender and the valuing of reading [math] would vary by classroom. In addition, the residual

parameter variance for the previous years' measure of valuing of reading [math] was fixed because there was no reason for the covariate, which was measured during the previous academic year, to vary according to the students' current classroom assignment.

The student-level HLM model is interpreted in a similar manner to a more traditional ordinary least squares regression. However, a major difference is that in the HLM model, classroom level differences were controlled. Although no classroom-level variables were modeled in the student-level model, the analysis took into account the fact that the students were nested in multiple classrooms. Results indicated that in both math and reading, the valuing of reading and math was predicted positively by self-concept of ability and by the previous year's measure of the valuing of the subject (see table 4). Gender was unrelated to the valuing of either math or reading.

The Full HLM Model

Multilevel models were developed to assess between-classroom differences in valuing of mathematics and reading. Teachers' self-reported use of performance and mastery oriented strategies were used as classroom level predictors. In the final models, we allowed the intercept (valuing of reading/math) and the slope of self-concept of ability to vary randomly between classrooms. The intercept was allowed to vary because it was the outcome, and because the initial intraclass correlation revealed that a significant proportion of the variance in valuing reading/math lied between classrooms. Self-concept of ability again was allowed to vary, since it is possible that the relations between self-concept of ability and valuing of a subject might vary by classroom. As in the student level model, the residual parameter variances for gender and for the previous year's measure of valuing reading [math] were fixed.

Results of the full HLM models for reading and math, including both student and teacher-level data, are presented in table 5. The fixed effects in table 5 represent student-level variables (where the residual parameter variance for each predictor was set to zero). The random effects represent the variables that were modeled as varying between classrooms (the intercept and the self-concept of ability slope).

Once student level variables and the previous year's measure of valuing of reading/math have been controlled, the valuing of reading/math is lower in classrooms where teachers use performance-oriented instructional strategies ($\gamma = -.12$, $p < .05$ for math, $\gamma = -.12$, $p < .01$ for reading). This means that the students in classrooms where teachers report using performance-oriented instructional strategies on average decrease in their valuing of reading and math more than do students in classrooms where performance-oriented instructional strategies are used to a lesser extent, after controlling for other variables. The reported use of mastery-oriented instructional strategies was unrelated to changes in the valuing of math ($\gamma = -.03$, NS) and to changes in the valuing of reading ($\gamma = .02$, NS). Gender remained unrelated to changes in the valuing of reading or math.

The purpose of the present study was not to explain all of the variance in the valuing of reading and math. Nevertheless, it is possible to examine the amount of explained variance in HLM models. Although the model did not fully explain all of the significant between-classroom variance in either the valuing of mathematics ($\chi^2(42) = 71.72$, $p < .01$) or the valuing of reading ($\chi^2(50) = 95.38$, $p < .001$), we were able to explain substantial portions of the between-classroom variance in each subject domain. Specifically, the model explained 45% of the between-classroom variance in valuing

reading (of the original 14.44% between-classroom variance reported for the valuing of reading), and 33 % of the between-classroom variance in valuing math (of the original 13.78% between-classroom variance reported for the valuing of math). We determined this by subtracting σ^2 values from the full HLM model ($\underline{\sigma}^2 = .588$ for reading, $\underline{\sigma}^2 = .756$ for math) from the $\underline{\sigma}^2$ value for the unconditional model ($\underline{\sigma}^2 = 1.07$ for reading, $\underline{\sigma}^2 = 1.129$ for math), and then dividing by $\underline{\sigma}^2$ from the unconditional model¹ (see Bryk & Raudenbush, 1992).

Discussion

Results of the present study suggest that after controlling for prior valuing of math/reading and individual difference variables, classroom practices do predict changes in students' overall valuing of mathematics and reading. Although research suggests that performance oriented instructional strategies sometimes have deleterious effects on student motivation (see Anderman & Maehr, 1994, for a review), results of the present study specifically link the negative impact of these practices to changes in the valuing of both reading and math.

Limitations of the Present Study

The present study has a number of limitations. First, it was limited to a two-level hierarchical linear modeling analysis, using student and classroom-level data. Additional studies with larger samples surely will benefit from three-level hierarchical designs that also make use of school or district-level data. Such designs can examine individual, classroom, and school or district-level variables simultaneously (Bryk & Raudenbush, 1992). In this project, one of the schools was a middle school containing fifth and sixth grade students. Whereas data were collected separately from the reading and math

teachers of those students, it is possible that the unique environment of the middle school may have had effects that a two-level HLM analysis was unable to detect. Indeed, research indicates that the middle school environment often is related to negative shifts in student motivation and achievement (Anderman & Midgley, 1997; Eccles & Midgley, 1989; Simmons & Blyth, 1987). Consequently, future three-level HLM studies could reveal additional information about the interplay between the individual, the classroom, and the school as a whole.

Second, longitudinal studies utilizing more than two points of data are needed. For example, the use of growth curve modeling with such samples may reveal more complex intra-individual changes than were possible in this study (Willett, 1994).

Third, the sample of teachers used in this study all had considerable teaching experience. The mean number of years of teaching experience was 16 for reading and 17 for math. Consequently, it is possible that the experiences of this veteran group of teachers may have resulted in different types of practices than might be used by a group of teachers with less experience.

Fourth, we were unable to corroborate the teachers' self-reports of their instructional practices with either students' perceptions of those practices, or third-party observations of those practices. Although teachers may have reported using many performance or mastery-oriented instructional strategies, it would be important to ascertain whether or not the students or outside observers perceived high usage of those strategies.

Finally, these data were collected in 1989 and 1990. Although there is no obvious reason to assume that historical influences would alter the nature of these relations if the

data were collected today, the results of future studies should be compared with the present data to examine possible historical influences.

Student-Level Factors Related to Changes in Achievement Values

Gender. Gender was unrelated to changes in the reported valuing of reading and mathematics. Other research has indicated that female students value literacy activities more than do males (e.g., Eccles et al., 1993). In addition, research has indicated that males often are more highly motivated in mathematics than are females (Eccles et al., 1989; Wigfield et al., 1991). However, the findings that gender was unrelated to changes in the valuing of math and reading, after controlling for classroom level variables, is intriguing. These results suggest that in mathematics and reading, classroom level factors, such as the use of performance oriented instructional strategies, may play more of a role in determining changes in students' achievement values than do gender, during middle childhood and early adolescence.

The non-significant findings for gender also may be related to the ages of the students. For example, strong differences in the valuing of math often do not emerge until the junior high school years (Wigfield & Eccles, 1994). Most of the participants in this study were elementary school students (recall that age was not significantly related to changes in achievement values). Therefore, the fact that gender was not predictive of changes in math achievement values is consistent with the findings of other research using pre-adolescent and early-adolescent samples (e.g., Wigfield & Eccles, 1994).

Self-concept of ability. In the present research, self-concept of ability was found to be related positively to gains in the valuing of both math and reading. A number of studies indicate that students' self-perceptions of ability are related to of a variety of

educational variables, including both grades and interest in math and reading (e.g., Eccles, 1983; Wigfield & Eccles, 1992). Students who perceive themselves as being good, competent students generally experience positive changes in achievement values toward various subject domains (see Eccles, 1984). When students are able to maintain a positive self-image, this seems to translate into positive attitudes and beliefs about the subject area.

Classroom-Level Variables

Using HLM, we were able to separate the within and between-classroom variance to examine the unique influence of classroom practices, after controlling for student-level variables. As predicted, after controlling for student-level characteristics and for prior valuing of mathematics and reading, we found that students who had math and reading teachers who reported using performance-oriented instructional practices (e.g., emphasizing high test scores and knowing who is doing the “best” in class) experienced declines in valuing of mathematics and reading. These results are consistent with the findings of Anderman & Young (1994), who found that teachers who reported using performance-oriented instructional strategies in junior high science classes had students who were less learning (mastery) focused. Interestingly, contrary to our predictions, the use of mastery-oriented instructional practices was found to be unrelated to changes in achievement values in both reading and math

The fact that mastery-oriented instructional practices did not significantly predict valuing of mathematics is a surprising and important finding. Ames (1990) suggests that teachers who use goal orientation theory to guide their classroom practices should concentrate more on the development of mastery-oriented instructional strategies than on the elimination of performance-oriented strategies. However, results of the present study

suggest that the deleterious effects of performance oriented instructional strategies should not be ignored and may be more critical. For example, other research (e.g., Anderman, Griesinger, & Westerfield, 1998) indicates that perceptions of emphases on performance, ability, and extrinsic incentives are related to increased occurrences of student cheating, whereas perceptions of emphases mastery and improvement are unrelated to cheating.

It is important to note that researchers define a mastery goal orientation in a number of different ways (e.g., Ames & Archer, 1988; Dweck & Leggett, 1988; Midgley, Anderman, & Hicks, 1995; Nicholls, Cobb, Wood, Yackel, & Patashnick, 1990). Whereas the fact that our measure of teachers' mastery-oriented instructional practices did not emerge as a significant predictor, this may be due to a number of factors. First, some research from a goal orientation perspective suggests that students' perceptions of teachers' instructional practices are predictors of students outcomes (e.g., Ames & Archer, 1988). Consequently, although teachers may be reporting truthfully their instructional practices, students may respond to and interpret these practices in differing ways. Second, our operational definition of mastery oriented instructional practices may differ from those used by other researchers. Indeed, few studies to date have asked teachers to specify the types of practices that they use, in goal-orientation terms. In the present study, our measure focused on teachers emphasizing that students should pay attention to their own improvement, choose challenging projects, and have fun doing their work. Other studies have operationalized these constructs somewhat differently. For example, Midgley and colleagues (Midgley et al., 1995) developed scales assessing teachers' mastery (task) goals for students (e.g., how much the teachers encourage students to attempt very challenging tasks or projects), teachers' mastery (task) - oriented

practices (e.g., encouraging students to take risks academically), and teachers' mastery (task) - related pedagogical beliefs (e.g., beliefs in whether or not students should be encouraged to take academic risks).

Implications for Instructional Practice

Results of the present study have several implications for instructional practice. These results suggest that performance-oriented instructional practices, such as emphasizing test scores and getting the highest grades, are related to negative shifts in achievement values in reading and math during childhood and early adolescence. Although performance-oriented environments may have some positive effects in some situations (e.g., Harackiewicz & Elliot, 1993), they also may undermine interest and valuing.

Results of the present study do indicate that classroom-level variables can have important relations with changes in students' valuing of mathematics and reading (see Bergin, 1999, for a review). Indeed, teachers' instructional practices do make a difference, in terms of students' achievement values. Although much has been written about the potential negative effects of competition and grading practices on various outcomes (e.g., Kohn, 1986), the present study provides empirical support for this claim. After controlling for students' prior reported valuing of mathematics and reading, teachers' use of performance oriented instructional strategies can have a possible deleterious effect on changes in the valuing of these subjects.

The development of positive achievement values during childhood and early adolescence is particularly important, as children begin to develop their identities and to start to examine various life and career trajectories (Brophy, 1999; Eccles, 1984; Wigfield, Eccles, & Pintrich, 1996). Research clearly indicates that students' achievement values

are significant predictors of academic performance, as well as their intentions to take future courses, and subsequent enrollment in those courses (Eccles, 1983, 1984; Meece, Wigfield, & Eccles, 1990; Schiefele et al., 1992; Updegraff, Eccles, Barber, & O'Brien, in press; Wigfield & Eccles, 1992; Yoon, 1996). Results of the present study suggest that when teachers emphasize performance-oriented instructional strategies, students' reported valuing of math and reading decline. Whereas this decline may not be serious if it occurs in one school year, for some students it may lead to a strong distaste for either math or reading after exposure to many years of such practices. Numerous suggestions have been made in recent years to lessen performance-oriented instructional practices, while simultaneously increasing mastery-oriented practices (Ames, 1990; Anderman & Maehr, 1994; Anderman, Maehr, & Midgley, 1999; Maehr & Midgley, 1991, 1996). Results of the present research suggest that at least in terms of students' reported valuing of math and reading, the negative effects of performance-oriented practices may have particularly deleterious effects on achievement values. This is not to say that mastery-oriented instructional practices are unimportant; indeed, the instrument used to measure teachers' mastery-oriented practices may not have captured the intricacies of these practices. Future studies incorporating classroom observations may help to clarify these findings. However, results of the present study extend prior research demonstrating the negative effects of performance oriented practices on certain important aspects of student motivation.

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Endnotes

1. For the analyses involving reading, $N = 520$ (48% male, 52% female), due to missing data.
2. Correlations between teacher measures were run using a larger sample of teachers ($n = 72$). Those 72 teachers included all of the teachers that participated in the present study, as well as additional teachers. Correlations for the larger sample are reported in order to provide a larger sample size for the establishment of the validity of the teacher instruments.
3. This is similar to findings reported by Anderman and Young (1994) in a study of achievement goals in which 14.5% of students' learning focused goal orientations in science varied between classrooms.
4. The unconditional HLM model is the initial model, without any student or classroom-level predictors.

Table 1:Items and Alpha Coefficients for Student Scales

	Alpha Math	Alpha Reading
<u>Valuing Math/Reading</u>	.77	.76
In general, how useful is what you learn in math?		
Compared to most of your other activities, how useful is what you learn in math?		
For me being good at math is ... (not at all important..... very important).		
Compared to most of your other activities, how important is it to you to be good at math?		
In general, I find working on math assignments... (very boring... very interesting).		
How much do you like doing math?		
<u>Self-Concept of Ability</u>	.71	.80
How good at math are you?		
Compared to most of your other school subjects, how good are you at math?		
If you were to list all the students in your class from the worst to the best in math, where would you put yourself?		
How well do you expect to do in math this year?		
How good would you be at learning something new in math?		
How upset would you be if you got a low mark in math?		

Note. The word reading is substituted for math for the reading measures.

Table 2:Items and Alpha Coefficients for Teacher Scales

	Alpha
<u>Performance Strategies</u> - How much do you emphasize each of the following goals to your students? Working for top grades in the class. Spending a lot of time studying facts or basic skills. Achieving higher test scores. Knowing who is doing the best and striving to do as well.	.62
<u>Mastery Strategies</u> - How much do you emphasize each of the following goals to your students? Paying attention to their own improvement. Attempting challenging assignments or projects even when faced with difficulty. Pursuing their own ideas and interests. Having fun doing projects or assignments, even if it takes more class time than expected. Choosing or initiating projects on their own.	.83

Table 3:

Means, Standard Deviations, and Correlations for Student-Level Variables

Variable	Read	Read	Math	Math	1	2	3
	Mean	SD	Mean	SD			
1. Value	5.12	1.07	5.07	1.11	--	.27**	.15**
2. Prior Year Value	5.24	1.13	5.31	0.95	.49**	--	.46**
3. Self-Concept of Ability	5.31	1.04	5.25	0.97	.58**	.39**	--

Note. All continuous measures are standardized into z-scores. Correlations for math are above the diagonal, and correlations for reading are below the diagonal. ** $p < .01$

Table 4.

Gamma Coefficients For Student Level Hierarchical Linear Models Predicting Changes in Valuing of Math and Reading

Variable	Math	Reading
Intercept	5.08***	5.10***
Self-Concept of Ability	.42***	.50***
Valuing From Previous Year	.36***	.33***
Gender	.05	.08

Note. *** $p < .001$; gender is coded 1 = female, 0 = male.

Table 5

Full HLM Models Predicting Changes in Valuing of Math and Reading

Variable	Math	Reading
<u>Random Effects</u>		
Intercept	5.07***	5.09***
Performance-Oriented Strategies Modeled on Intercept	-.12*	-.12**
Mastery-Oriented Strategies Modeled on Intercept	-.03	.02
Self-Concept of Ability	.44***	.50***
<u>Fixed Effects</u>		
Valuing Math/Reading From Prior Year	.35***	.32***
Gender	.06	.09

Note. * $p < .05$ ** $p < .01$ *** $p < .001$; gender is coded 1 = female, 0 = male.