Classroom Experience and Change in Upper Elementary Students' Self and Task Beliefs in Reading and Math

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Paper presented at the annual conference of the American Psychological Association, Toronto, 1993. The research reported in this paper was supported by grant HD17553 from NICHD to Jacquelynne Eccles, and is part of the Michigan Childhood Development Study at the University of Michigan. Address all correspondence to the first author at 5201 Institute for Social Research, Box 1248, Ann Arbor, Michigan, 48106-1248.

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Abstract

The present study extends research in expectancy-value theory into the socialization of self and task beliefs during the upper elementary school years. We examined the determinants of change in students' math and reading motivation from fifth to sixth grade. Three hundred and sixty students completed questionnaires assessing their perceptions of their math and reading classrooms, as well as their self-perceptions of competence and values in math and reading at the end of their fifth and sixth grade years. Students were broken into achievement groups by grades and standardized test scores. Path analyses indicated that perceived classroom characteristics affected student motivation above and beyond previous motivation, and that substantial amounts of variance were explained in students' competence and value beliefs. In general, the patterns of relationship were similar across low and high achievers, as well as the domains of math and reading. Perceived teacher expectations had strong, positive effects on competence and value beliefs, while perceived interest of classroom activities and class climate positively impacted value-related beliefs such as importance/utility and subject matter interest in math.

Introduction

Cognitive approaches to understanding students' achievement motivation theorize that particular self and task beliefs play an important role in the determination of achievement behavior. These beliefs, such as self-perceptions of ability and task valuing, have consistently been shown to be an important part of student motivation, achievement, and academic choice (cf: Eccles, 1983). By the later elementary years, there is evidence of a general decline in children's rating of their own competence and values across different subject matters, including reading and math (Eccles, Wigfield, Harold & Blumenfeld, 1993; Haladyna & Thomas, 1979, Nicholls, 1979). This is particularly true of young adolescents' beliefs about mathematics, which become progressively more negative (Eccles, 1983; Eccles, Adler, & Meece, 1984a; Heller, Futterman, Kaczala, Karabenich and Parsons, 1978; Wigfield, Eccles, Mac Iver, Reuman, & Midgley, 1991). While declines in competence beliefs have been attributed to increasing pessimism with age (e.g. Parsons & Ruble, 1977), as well as the increasing correspondence of these self-beliefs with the child's actual ability (Nicholls, 1978; 1979), Eccles and her colleagues (1993) have suggested that aspects of the home and school environment also play an important role in the declines in competence and value beliefs evidenced during this time.

Because the upper elementary years seem to characterize a time when students' motivational beliefs undergo significant change (e.g. Ames, 1990; Aiken, 1976), we focus on aspects of students' classroom experience in the sixth grade that may impact these changes in this study. Much work has been done to assess classroom characteristics that may affect motivational beliefs during this period (for reviews see: Eccles & Midgley, 1989; Eccles, Midgley & Adler, 1984b). This work has highlighted the importance of considering how feedback practices, tasks, instructional methods and teacher interpersonal characteristics influence student beliefs (Brophy, 1983; Mac Iver, 1986; Marshall & Weinstein, 1984; Rosenholtz & Simpson, 1981). Studies using a student-mediating paradigm (Shulman, 1986) assign central importance to a child's perception of the classroom environment in the determination of motivational beliefs (see Schunk & Meece, 1992; Weinstein, 1989). Within this tradition, work has focused on variables such as children's perceptions of classroom goal orientations, classroom climate, differential treatment, and the quality of the teacher-student relationship (Ames, 1992; Midgley, Feldlaufer & Eccles, 1989; Trickett & Moos, 1974; Weinstein, 1989).

The present work is part of a larger study at the University of Michigan (the Michigan Childhood Development Study) aimed at understanding the ontogeny and development of achievement-related beliefs and values in elementary school-aged children. This particular study examines how self-concepts of ability and values in reading and

mathematics change from the fifth to sixth grade, and what influences these changes. Specifically, we examine how the child's perception of various classroom practices influences change in these beliefs. Below, we briefly review work that has highlighted the importance of self-concepts of ability and task value in determining achievement behavior, gender and age-related differences in these beliefs, and studies that have looked at the relationships between students' perceptions of their classroom environments and these motivational beliefs.

Influences of Perceptions of Ability and Task Value on Student Achievement and Activity Choice

Self-Perceptions of Ability

Several theoretical perspectives on achievement motivation have stressed the mediational role of self-perceptions of ability on student achievement. These theoretical approaches include attribution theory (Weiner, 1985), self-efficacy theory (Bandura, 1986) and expectancy-value theory (Eccles, 1983). Research using these perspectives has shown that an individual's concept of being able to perform tasks in a particular subject area is related to positive performance and learning (Bandura, 1986; Eccles, 1983; Pintrich & De Groot, 1990; Schunk, 1985).

It appears that from a very early age children develop and differentiate self-perceptions of ability, including expectations for success, in various general areas such as the academic, social and physical domains (Harter, 1982), as well as in discrete academic subjects (Eccles et al., 1993; Marsh, Craven & Debus, 1991). Furthermore, by the upper elementary school grades there is evidence that boys and girls begin to differ in the strength of their self-concepts in different activity domains For instance, boys report feeling more able in math and sports than girls, while girls report feeling more able in English and social pursuits (Eccles et al., 1989; Eccles et al., 1993; Wigfield et al., 1991b). There is some evidence to suggest that students' perceptions of the classroom are related to their expectations for success (Brattesani, Weinstein, & Marshall, 1984). Most research, however, has examined how classroom practices directly affect self-concepts of ability, rather than examining the mediational role that student perceptions of the classroom may play in change in these beliefs over time.

Task Value

In addition to work on self-perceptions of ability, task valuing has also been shown to be an important component of students' choice, motivation and learning (Deci & Ryan, 1985; Eccles, 1983; Pintrich, 1989; Schiefele, 1991). Eccles (1983) conceptualized task-

value as comprised of three inter-related constructs: attainment value, utility value and intrinsic value. Attainment value, or importance of a task, is related to how well the task interacts with an individual's needs and goals. Utility refers to a student's perception of how useful a particular subject area is, whereas intrinsic value or interest is related to a student's personal feelings of interest and liking of the subject area (Eccles, 1983; Pintrich, 1989), and is conceptualized as developing slowly and having long lasting effects on a person's preferences and knowledge (Hidi, 1990).

Although young elementary school children do differentiate self-concepts of ability from value-related beliefs, there is some evidence that they do not make these fine distinctions among the separate components of task value until they are older (see Eccles, 1983; Eccles & Wigfield, 1991; Eccles et al., 1993). Eccles and Wigfield (1991) do find, using confirmatory factor analysis, that the different components of value are differentiated in students in fifth grade and older. Findings also indicate that the different components of task value impact upon achievement intentions across a student's development (Wigfield & Eccles, 1992).

In terms of the relationships between task value and achievement behavior, studies show that one's self-concept of ability is more important in determining performance, while task value is more important for one's decision to engage in a particular activity (Eccles, 1983; 1984; Eccles, Adler & Meece, 1984b; Wigfield & Eccles, 1992). Additionally, Pintrich and his colleagues (1990; in press) find intrinsic value related to the use of both self-regulatory and learning strategies, while Schiefele (1991) finds individual interest to be related to text comprehension, use of learning strategies, and the quality of emotional experience during learning. It appears that aspects of task value are linked to both broad achievement outcomes such as academic choice, as well as students' discrete cognitive and affective experiences during the learning process. Less is known about how specific features of classrooms and children's perceptions of the classroom environment affect the different components of task value over time. Several researchers have highlighted this need to better understand the determinants of both general and achievement-related values, as well as the specific components of achievement values across development (Eccles, 1983; Feather, 1982; Wigfield & Eccles, 1992).

Academic Worry

Affective components of classroom learning include students feelings about themselves or about academic tasks and their ability to perform them (e.g. Pintrich, 1989). Test anxiety, which has received the most attention in the educational literature on the affective components of learning, seems to be comprised of both a worry component, and

an emotionality component (Liebert & Morris, 1967). The worry component, which is more cognitive in nature, is related to students' cognitions about their performance and concern about the consequences of performing poorly. In synthesizing the literature on test anxiety over the past thirty years, Covington (1992) has suggested that academic anxiety represents a student's reaction to a perceived threat to her personal sense of competence and worth in an achievement setting.

Gender and Age Differences in Self-Perceptions of Ability and Task Value

Research on the development of self-perceptions of ability and task value has proceeded in two main ways: (1) with studies that examine changes in mean level of beliefs over time, and (2) with studies that look at how the structure of the beliefs change over time. Here we will only review work that deals with mean level changes over time.

In general, evidence suggests that as children grow older, their self-perceptions of ability decline, and task values change in different directions depending on the domain (Eccles, Midgley & Adler, 1984b; Eccles et al., 1989; Marsh, 1989; Stipek, 1984; Wigfield et al., 1991). In reading, competence beliefs and values grow more negative by the upper elementary grades (Eccles et al., 1993; Nicholls, 1979). In math, competence beliefs decline uniformly across the elementary years, while math-related value beliefs remain stable until the late elementary and early middle school years, after which time they also begin to grow more negative (Eccles et al. 1993; Wigfield et al., 1991).

Significant differences in self-perceptions of ability and task value also exist between girls and boys during the elementary school years. Boys tend to perceive themselves as more able in the physical and mathematics domains, while girls perceive themselves as more able in the reading, music and social domains. The same patterns hold for boys' and girls' values: boys value physical activities and mathematics more, while girls value reading, music and social activities more, although the developmental period in which these differences manifest varies (Eccles, 1983; Eccles et al., 1989; Eccles et al., 1993; Marsh, 1989).

Actual Performance, Self-Perceptions of Ability, Task Value and Academic Worry

Several theorists have discussed the relations between self-perceptions of ability and achievement-related behaviors such as performance and persistence (Covington & Beery, 1976; Eccles, 1983; Schunk, 1985). Studies have revealed a consistent positive effect of self-perceptions of ability and efficacy on academic performance (Eccles, 1983; Multon, Brown, & Lent, 1991). These studies did not, however, test the causal direction of these relationships. For instance, Calsyn and Kenny (1977) found that academic

achievement determines self-perceptions of ability rather than the reverse in a sample of middle school students, while Eccles and her colleagues (1984) found a small impact of self-concept of ability in math on subsequent math grades (see Eccles & Wigfield, 1985). Because grades are hypothesized to convey important information about ability to the student, especially in the upper elementary grades (e.g. Nicholls, 1984), we plan to look at both relations in this study. Research also has documented the detrimental impact of cognitions reflecting academic worry on academic performance as measured by achievement tests (e.g. Hill & Wigfield, 1984). We included year end reading and math grades in our analyses and hypothesize that children who feel more able in a subject matter at time one will perform better at time two, which will in turn increase a student's self-perception of ability at the end of the year. Conversely, we will examine whether or not reported academic worry in a subject area has any effect on subsequent performance as measured by classroom grades.

Unlike self-perceptions of ability and academic worry that are linked to actual performance, research has suggested that values are more related to academic intentions and choice (Eccles, 1983). However, some work suggests that children will value those activities that allow them to exhibit competence (see Wigfield & Eccles, 1992 for review). For this study, we hypothesize that grades will be positively related to perceived task importance at time one and two. In addition, some work suggests that interest may be related to test comprehension and knowledge (Hidi, 1991; Schiefele, 1991). If comprehension and knowledge are indicative of performance as measured by grades, then we might expect to find positive relations between interest and grades at time one and two. We will test each of these predictions in the current study.

Classroom Effects on Motivational Beliefs

Classroom Effects on Perceptions of Ability

Many studies have focused on how specific aspects of the classroom may influence children's self-perceptions of ability (Blumenfeld, Pintrich, Meece & Wessels, 1982; Mac Iver, 1986; Marshall & Weinstein, 1984; Parsons, Kaczala, and Meece, 1982; Rosenholtz and Simpson, 1984). In general, work on self-perceptions of ability and classroom practices has shown that those practices that increase social comparison and the salience of ability-related information tend have the strongest impact on students' self-concepts of ability. Furthermore, the influence of these practices may be more powerful in the upper elementary grades when ability information is more readily utilized by the student to form impressions of their ability (Nicholls, 1990).

Research on expectancy effects in the classroom has also shown the impact that teacher beliefs can have on students' own self-perceptions of competence and expectations for success (see Brophy, 1983; Eccles & Wigfield, 1985; Wigfield & Harold, 1991 for reviews). Briefly, Brophy and Good (1974) suggested that the manner in which teacher beliefs about student achievement affect student's own beliefs is through differential treatment of low and high achievers, which students in turn interpret and use to form their own ability beliefs. Most research has focused on the linkages between teacher expectancies and students' competence-related beliefs (e.g. Weinstein, 1989). Although Brophy (1983) hypothesized that expectancy effects may be stronger in the early elementary years when there is a lot of teacher-student one on one contact, recent work suggests that expectancy effects actually become more potent in their influence on student beliefs as the elementary years progress. For instance, Wigfield and Harold (1992), looking at first, second and fourth graders, found that the relations between teachers assessments of students' abilities in reading and math and students' own competence beliefs actually increase in magnitude with grade level (Wigfield & Harold, 1992). Although correlational in nature, these data, like Weinstein's (1987), suggest that the upper elementary years are an important period to consider the impact of teacher expectations on students' ability beliefs.

Classroom Effects on Task Attitudes and Values

In contrast to the work done on the socialization of competence beliefs, few studies have been done on the socialization of task values as conceptualized by Eccles and her colleagues (e.g. Eccles, 1983). Instead, studies have mainly described the characteristics of classrooms, teachers and instruction that influence children's attitudes such as liking and interest toward the subject matter. In math, a variety of teacher beliefs related to the subject area, such as personal efficacy (Midgley, Feldlaufer & Eccles, 1988; 1989b), interest or enthusiasm in teaching math (Aiken, 1976, Haladyna, Shaughnessy & Shaughnessy, 1980), and the quality of the teacher-student relationship have been shown to have positive effects on student attitudes (Mergendoller & Packer, 1985; Midgley et al.; 1989). Other general classroom factors, such as reward practices, the design and appropriateness of tasks, and the use of value-oriented teacher information have been suggested as potentially important determinants of students' value -related motivational beliefs (e.g. Brophy, 1987; Lepper & Hodell, 1989).

Studies on student attitudes tend to tap only one value-related measure of motivation, mainly liking or interest in the subject matter. More information is needed in understanding how children's experience of their classrooms is related to different

components of task value beyond interest, such as usefulness and importance. To this end, we will look at how classrooms where instruction is perceived as interesting in mathematics and reading, and where there is teacher support affect changes in different aspects of students' value beliefs.

Student Perceptions and Motivational Beliefs

In addition to this work on the relationships between teacher and classroom factors and student motivation, other studies have used a general student mediating paradigm (Shulman, 1986) to understand how students' perceptions of their classroom experience mediate the relations between classroom practices and achievement-related outcomes. Research has highlighted the importance of considering student perceptions of important social aspects of learning environments that influence motivation (e.g. Goodenow, 1993). This work has focused on classroom climate (Trickett & Moos, 1974; Fraser & Fisher, 1982), the teacher-student relationship (Midgley, Feldlaufer & Eccles, 1989), and differential treatment (Weinstein, 1989) as perceived by the students. For this study, we were interested in looking simultaneously at how perceptions of climate, differential treatment and teacher expectancies, and the classroom as interesting influenced students' self and task beliefs across time.

Classroom Climate

Research has indicated that the quality of the teacher-student relationship as perceived by the student is associated with academic motivation and positive attitudes towards school (Fraser & Fisher, 1982; Moos, 1979; Trickett & Moos, 1974). Strong correlations have been found between teacher support and academic interest and satisfaction in high school students (Trickett and Moos, 1974), and liking of science and math in junior high school students (Fraser & Fisher, 1982; Midgley et al., 1989). These studies suggest that students' perceptions of the teacher and the classroom environment generally as warm and friendly might mediate motivational beliefs associated with particular subject areas, especially liking of and satisfaction with the subject matter. Despite this, little research on classroom climate and domain specific self and task beliefs such as self-concept, usefulness and importance, has been done with elementary-aged children. We hypothesize that a positive classroom climate will be associated with positive changes in students' interest and liking of math, as well as changes in students' beliefs about the importance and usefulness of mathematics.

Perceptions of Academic Tasks and Teacher Quality

Student interest and liking of a particular subject are also positively influenced by a teachers' ability to present the subject matter in a clear and interesting manner. Several studies suggest that the overall quality of teaching, including teacher enthusiasm, fairness and commitment to helping students is related to positive attitudes towards math (Aiken, 1976; Haladyna et al., 1980). Callahan (1971) and Dutton (1954, 1956) find junior high school and college students cite teachers who explain math well as a reason for liking math, as well as teachers who do not explain math well are a reason for disliking mathematics.

Academic tasks are also thought to influence students' learning and motivation by focusing them on particular aspects of content, stimulating interest, and promoting the use of different information processing strategies (e.g. Doyle, 1983). For instance, a recent study shows that middle school-aged students' perceptions of teacher effectiveness (e.g. clear presentation) and engaging tasks is positively related to task value, self-efficacy, and strategy use (Pintrich et al., in press). For this study, we asked children about how interesting they found their reading and math lessons. We hypothesize that the classrooms rated as interesting will have positive effects on change in students' math and reading interest and attainment values.

Differential Treatment and Perceived Teacher Expectations

Weinstein and her colleagues (1989) have shown that children in fourth to sixth grade, regardless of gender or ability level, perceive systematic differences in the way teachers treat high and low achievers. In brief, this work suggests that expectations are conveyed through differential teacher practices with children of different ability levels, that children perceive these expectations from their teacher's behavior, and that these expectations influence students' own expectations, perceptions of academic standing, and achievement (Brophy, 1983; Brattesani et al., 1984; Brophy & Good, 1974; Mitman & Lash, 1988). For this study, we were interested in two questions related to this work. First, does the perception of differential treatment of high and low achievers impact on student motivation, especially low achievers. For instance, Weinstein and Middlestadt (1979) reported that the perception of differential treatment in the upper grades, compared to in the lower grades, indicated that students thought low achievers were treated worse. In this study, we will examine whether or not a student views her classroom as a place where high and low achievers are treated differently. We will then look at how students' perceptions of differential teacher treatment by ability may relate to change in both low and high achieving students' self-perceptions of ability in math and reading, which are closely related to the expectancy beliefs studied by Weinstein and her colleagues (see Eccles & Wigfield, 1991).

A second central issue concerns how students' perceptions of teacher expectations impact their own motivational beliefs. Few if any studies have looked at the effects of teacher expectancies on diverse aspects of student motivation such as levels of interest or perceived task utility and importance, however. We expect that students who believe their teachers expect them to do well in math or reading will report higher competence beliefs, and also feel that the subject is more important, while no predictions are made for teacher expectancies and interest.

Method

Participants

The participants for this study came from a larger sample of students involved in a four year longitudinal project aimed at understanding the ontogeny and development of children's self and task-related beliefs (the Michigan Childhood Development Study). Data were collected from four school districts in semi-urban areas surrounding a large mid-western city. The children were drawn from twenty-five classrooms in ten school districts, are from lower middle class to middle class family backgrounds, and are 95% Caucasian. Children, parents and teachers were asked to participate through their school districts, and 79% of the children solicited agreed, with parental permission.

The larger study consisted of four waves of data collection, beginning in 1987. For this study, the data came from the third and fourth years of data collection (Wave 3-1989, Wave 4-1990). Each student in this study was in fifth grade in Wave 3, and progressed to sixth grade in the following year. Participants in sixth grade in Wave 4 included 360 students originally. In this paper, due to data that span multiple years and missing data, as well as the use of listwise deletion of cases in many of the analyses, there are 277 and 280 students for the reading and mathematics analyses, respectively. In reading this includes 144 girls (52%) and 133 boys, while in math there are 147 girls (53%). Students in the sample were either in one of nine K-6 elementary schools (N=110, 39%), or a 5-6 elementary school (N=170; 61%)[1] . Although not the focus of this study, children in these different school settings differed on some of the motivation and class perception measures, so school type was controlled for in the regression analyses. For the sake of clarity, sample sizes are noted under each set of analyses.

[1] Students in this district attend K-4 schools, move into the 5-6 school in this study, then transition into a 7-8 middle school and finally a high school. The 5-6, 7-8, and 9-12 schools are all located on the same academic "campus," however.

Measures

Children in this study filled out a series of questionnaires at the end of each school year. Questionnaires tapped beliefs across different activity domains, including academic, artistic, athletic and social pursuits (see Eccles et al, 1993 for measures description). Within the academic domain, we focused primarily on beliefs about mathematics and reading. In addition, children were asked about their perceptions of different aspects of their classrooms in mathematics and reading. All questions were measured on seven point Likert scales, and only questions related to math and reading were used for this study. Questions were modified from earlier items developed by Eccles and her colleagues, and all were pilot tested before use with the general sample (for psychometric properties see Eccles 1983; 1984, 1984b, 1993). Record data measures were also collected during the fourth year of the study for all students who had participated. For this study, we utilized both first and second semester grades, as well as California Test of Basic Skills (CTBS) test scores for math and reading.

Motivation Measures

Three motivation scales were constructed for each wave of data (Time1, Time 2), and each subject (Reading, Math). All items and scale alphas are presented in Appendix A. The time one measures in this study were collected at the end of the student's fifth grade year. The time two measures of motivation were collected one year later at the end of the student's sixth grade year. Scales included self-concept of ability scales (SCA), constructed from the average of five items concerning perceptions of ability in the subject area, expectancies for current and future success in the subject area, and ratings of the difficulty of the subjects. Two task value scales were also constructed for each subject. These included task importance and task interest in both mathematics and reading. Four items assessed a child's belief that the subject was important and useful , while the interest scales were averages of two items assessing liking and interest. Although Eccles and her colleagues (1991) have shown that importance and usefulness form independent aspects of task valuing by the upper elementary years, we chose to leave the importance and utility items together in the same scale for purposes of this study.

Classroom Perception Measures

In addition to the motivation scales, five measures of classroom perceptions were collected at the end of the student's sixth grade year. These included a differential treatment by ability item, class climate scales, an item assessing whether the class was interesting or not, and a single item assessing the students' perceptions of teacher expectations for them

in a particular subject area. The measures for math asked specifically about the student's math teacher, while the items used in the reading analyses were worded more generally . Scales and items are presented in Appendix B[2].

Performance Measures and Achievement Covariates

Measures of performance were created for both math and reading by averaging of students' final Fall and Spring semester grades. Comparable grade measures for children attending schools in different districts had to be constructed because the four different school districts used different grading systems. One district used letter grades that ranged from A=superior, C=average, and E=not making progress, although very few B's or D's were given. The other districts used a three category system that indicated whether the child was performing below, at or above grade level. New grade measures were constructed by creating z-scores within district by grade level and then combining all districts.

In order to create different groups by overall achievement level in a subject area, composite achievement scores were created. First, overall percentile scores for the math and reading sections of the CTBS were averaged across the fourth, fifth and sixth grades for each student. Next, an average of students' achievement test scores and yearly grade in each subject was created. Finally, students' scoring in the bottom third of these new measures of achievement for math and reading were categorized as low achieving, while the upper two-thirds of the distributions were designated as high-achieving. The low achieving group include 96 students in math and 106 in reading, while the high achieving groups include 184 and 171 for math and reading, respectively.

Analyses

Three main analysis strategies were used to assess (1) the differences in mean scores of motivation by gender, school type, achievement level, and time; (2) the correlations among the motivation variables at time one and time two, and (3) the independent contribution of students' initial motivation and students' perceptions of classrooms on time two motivational beliefs. Repeated measures analyses of variance were used to assess both gender differences, K-6 vs. 5-6 school environment, low vs. high

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[2] Two of the items used to assess classroom experience in this study were multiple items scales the previous year. This including items assessing the class instruction as interesting,clear and useful, and those related to perceptions of differential treatment by ability. Reliable multiple item scales in the previous year of data collection were formed with alphas $\geq .60$ for both subject areas. In this study, these are single item scales because items were dropped on the survey used in the current analyses. We will, however, present this study and a replication of it across the fourth and fifth grades using the previous year's data in the near future.

achievement, and fifth to sixth grade variation in math and reading beliefs. Means tables are provided for both the motivation measures at time one and two, and for the classroom perception measures. Path analysis was used to assess the predictive effects of motivation and class perceptions on cross-time change.

Results

Descriptive Statistics of Math Beliefs

Repeated measures analyses of variance techniques were used to assess the within student variation across the two years, the between students variation by school type, gender and achievement level, and the interactions of time by gender, achievement level and school type. Table 1 displays the results of the MANOVA analyses for each of the dependent motivation measures. This includes the relevant F-values and eta-square effect sizes for each predictor and interaction. Table 2 presents means of self-concept, importance, interest and worry in reading in math broken out by time (grade 5 and 6), gender and achievement level.

Results of the repeated measures analyses for motivational beliefs indicated several significant effects. Low achievers reported lower self-concepts of ability and higher levels of worry in both reading and math than high achievers, and also showed less interest and attached less importance to mathematics. In looking at the effects for gender, girls rated their self-concepts of ability in math lower, and their interest in reading higher than boys. Finally, the only significant effects for time were that students' reported worry in reading decreased from fifth to sixth grade, as did their interest in mathematics.

Descriptive Statistics of Classroom Perception Measures

Analysis of variance techniques were used to assess differences in students' classroom perceptions and grades by gender and achievement level. Analysis of variance statistics and means are presented in Table 3. In summary, low achieving children by definition evidenced lower grades and reported lower perceived teacher expectations for success in both reading and math, and also reported more differential treatment in their reading classrooms in comparison to the high achievers. No gender differences were found on any of these variables.

Correlational Analyses - Relations Among Motivational Constructs Across Time and Classroom Perceptions During Sixth Grade

The next series of analyses examined the relations among the time one and time two motivational beliefs in reading and math, and the relations among the classroom perception

variables. Correlational results are presented in Table 4 with correlations on the upper half of the table referring to reading, and the lower half reflecting the relationships for math. The auto-correlations of the expectancy-value beliefs from fifth to sixth grade indicate that these beliefs are moderately stable during this period. This is especially true for self-concepts of ability and interest in reading and math (R_{sca}=.59/.51; $R_{Interest}$=.54/.51; read/math), while importance and worry beliefs are less stable. In addition, these analyses show, as has previous work with this sample (Eccles & Wigfield, 1991), that the self-concept and value components were all positively correlated with one another for both subject areas. Finally, students who felt reading and/or math was an important and useful subject also reported more worry in that domain. One domain difference in the relationships among the motivational beliefs was that in math, but not in reading, students who reported feeling more competent also reported less worry about doing poorly.

Next, we looked at how student's perceptions of the various aspects of their classrooms were related. In both reading and math, students' perceptions of teacher expectations, class climate, and the class as interesting were all positively related to one another. Perceived differential treatment, on the other hand, was related to more negative perceptions of the class climate and the class as interesting. Domain differences included two relationships. In reading, teacher expectations were significantly negatively related to student perceptions of differential treatment at the .05 probability level, whereas in math this relationship was in the same direction but did not attain significance. Also, in reading only, perceived class climate shared a small, positive relationship with academic performance as measured by grades.

Correlational Analyses - Relations Between Motivational Constructs Across Time and Classroom Perceptions During Sixth Grade

In order to assess how student entry characteristics (e.g. motivational beliefs at the end of fifth grade) were related to how they perceived their sixth grade classrooms, as well as how these experiences impacted on subsequent motivational beliefs, we correlated motivational beliefs at time 1 and time 2 with the classroom perception measures. These results are presented in the upper right and lower left quadrants of Table 4.

In looking at the relations between measures of reading and math beliefs from the end of the fifth grade and class perceptions and performance from the end of the sixth grade, several significant correlations emerged. Students who had positive values and competence beliefs in reading and math upon entry to the sixth grade also perceived that teachers had high expectations for their success in these classes. In addition, students with positive value beliefs about math reported that their sixth grade classrooms were interesting

and the class climate was positive. This was not true in reading. Finally, those with higher self-concepts of ability in fifth grade received higher grades in reading and math at the end of sixth grade.

As one might expect, time two measures of motivation showed more significant relations with the class perception and performance variables. The positive correlations between perceived teacher expectations and self-concept, importance and interest all increased in magnitude by the end of sixth grade. Greater positive correlations were also evident between perceptions of the class climate and the class as interesting and students' values in math and reading. Finally, by the end of sixth grade, students self-reported worry in reading and math was negatively related to perceived teacher expectations and academic achievement, and was positively related to perceived differential treatment in reading class.

Path Analysis: Overview

The final series of analyses consisted of four path models to assess the independent predictive contributions of time one motivational beliefs and time two classroom experience on end of the year motivational beliefs. The results of the path analysis are presented in Tables 5-8 and in Figures 1-4. Because main effects for achievement level, gender, and school type were found on some of the motivational and class perceptions measures (see Tables 1-3), these measures were incorporated into the path analyses. Also, because there is good reason to believe that low achieving students have different classroom experiences than their high achieving peers (e.g. Weinstein, 1989), separate regression analyses for high and low achievers were run to see if the pattern of relationships differed by achievement status.

Path Analysis: Individual Entry Characteristics, School Type and Classroom Perceptions

The first step of each path analysis assessed the predictive contribution of school type, (0=K-6, 1=5-6), gender (0=girls, 1=boys) and time one motivation belief on the classroom perception and performance variables. These results are presented in tables 5 and 7 for reading and math, respectively. In general, small amounts of variance in class perceptions and performance were accounted for by these measures. Several results are noteworthy, however.

In mathematics, initial beliefs about competence and interest in math were positively related to perceptions of teacher expectations in math, while initial level of interest also positively predicted to perceptions of the class as interesting. In reading, these same relationships were only significant among the high achieving students. School type also

had significant effects on the class perception measures.. First, low achievers in the 5-6 school environment achieved significantly higher grades in reading and math than their counterparts in the K-6 schools. This was not true for the high achievers. Finally, both low and high achievers in the 5-6 school perceived their classrooms in reading and math as less interesting and less positive in terms of classroom climate, though the effects only attained significance for the high achievers in reading.

Path Analysis: Individual Entry Characteristics, School Type, Classroom Perceptions and Time Two Measures of Motivation

The second series of regressions in the path analysis investigated the independent contributions of school type, gender, time one motivation variables, and time two classroom experiences on reading and math beliefs at the end of the sixth grade year. Substantial amounts of variance in reading and math self-concepts, feelings of subject importance for low achievers, and interest were accounted for by these variables (r-squares between .30 and .56). Less variance could be explained in students' worry beliefs, high achievers' feelings that reading and math are important, and low achievers' interest in reading. These relationships are depicted in Figures 1-4.

In general, the strongest predictive effects on motivation at the end of the sixth grade year was the same belief a year before. In addition, perceived teacher expectations had a positive impact on students' self-concepts of ability in both subjects, interest in math, and feelings of subject importance for low achievers in reading and high achievers in math. Students' perceptions of the classroom as interesting and positive in terms of the social-emotional climate also had a positive impact on math-related value beliefs, while this was not true for reading. Finally, differential treatment by ability level and class climate both showed positive effects on the level of academic worry low achievers reported in reading . These results are elaborated on below.

Discussion

Overall, the results of this study suggest that classroom perceptions affect change in motivation beliefs in math and reading in the upper elementary years. Specifically, teacher expectations as perceived by the student seem to impact both competence and value-related beliefs, especially in mathematics. Classroom climate and the amount of interest generated in a classroom seem to impact more on value-related beliefs. In mathematics in particular, the effects of these classroom perceptions were as strong if not stronger than those for entering levels of motivational beliefs. Few effects of classroom experience on change in worry beliefs were found. Finally, the results of this study and its design display the

importance of accounting for how student's initial characteristics influence their perceptions of the classroom environment, which may in turn influence student beliefs. Below, we discuss how self-concept, interest and importance for reading and math changed over time, and how classroom perceptions influenced change in these beliefs.

Changes in Self and Task Beliefs Over Time

The present study supplements previous work done on the developmental patterns of reading and math-related beliefs. For instance, we found that self-concepts of ability in reading and mathematics did not decline from fourth to fifth grade for this sample. Eccles et al. (1993) reported that reading and math competence beliefs decline across the elementary years using a cross-sectional sample of first, second and fourth graders. Other research has also found that as children grow older and less optimistic, their self-concepts of ability decline (Nicholls, 1990), especially around the transition to junior high school (Eccles et al. 1983; 1984; 1989; Brush, 1980). This study suggests that although differences persist between boys' and girls' self-concepts in math, mean levels may be more stable in the upper elementary school years. This sex difference pattern in math is consistent with previous research (Eccles, 1984) that shows by the upper elementary school years boys perceive themselves as more able in math. The gender difference between boys' and girls' ratings of competence in the language arts domain (e.g. reading, English) found in other studies (e.g. Wigfield et al., 1991) seems not to become pronounced until the late elementary or early middle school years. This may be the result of measures that assessed competence in reading as opposed to "English."

In contrast to competence beliefs in reading and math, we did find some change in values from the fifth to sixth grade. For example, Eccles et al. (1993) report that mean levels of students' values in math, but not reading, remained fairly stable across a cross-sectional sample of first, second and fourth graders. Reading values declined across these grades. Other studies suggest that in upper elementary and early middle school grades, math values in particular begin to decline (Eccles, Midgley & Adler, 1984b; Wigfield et al. 1991). In this study, we found that mean levels of interest in both reading and math decline across the upper elementary school years. During this time, however, ratings of subject importance remained stable. Taken together, these studies suggest that the decline in math-related beliefs may begin with interest around the fourth to fifth grade years and continue into middle school, while for reading, there appears to be a steady decline in interest across the span of the elementary years, that eventuates in English as being one of the these least liked domains among middle school children (Wigfield et al., 1991).

Other studies have also revealed gender differences in value-related beliefs. For instance, Eccles (1984a) found that between fifth to seventh grade, girls start to lose interest in math and increase their interest in English, while boys remain fairly stable in these beliefs. Although we did not find gender differences in value beliefs related to mathematics in this study, girls did report significantly higher levels of interest in reading. This suggests that these gender differences for math values may only appear after the beginning of middle school, while girls' increased interest in the language arts develops or is socialized across the span of the elementary school years (Eccles et al. 1993).

Determinants of Change in Self-Concepts Over Time

In looking at the determinants of change in self-concept beliefs from fifth to sixth grade, our results suggest that in math, perceived teacher expectations exert the strongest effects on competence beliefs at the end of the year, while in reading, entry beliefs concerning competence are most influential. While previous research has shown the effect teachers can have on students' self-concepts of ability in math around this age (e.g. Parson et al., 1982), our results suggest that students are relying on their interpretations of teachers' beliefs about their abilities as a basis for their own competence beliefs more in math than in reading in the upper elementary years. It could that be elementary students' classroom experiences early on emphasize ability differences in the reading domain, but that only in the upper elementary grades are practices that serve to convey information about ability and teacher expectations extended to include mathematics (see Eccles et al., 1984).

This work extends that of Weinstein and her colleagues, which looked at how perceived teacher expectancies for student success in reading influenced students' own expectancies. First, we looked at how perceived expectancies influenced students' self-concept beliefs in both reading and mathematics. Our measure of self-concept actually incorporates expectancies for success with other items concerning perceived competence because of their close relationship (Eccles & Wigfield, 1985). We found that low achieving students believed that teachers had lower expectations for them to succeed. This supports both the view that teachers may be accurate in their expectancies concerning student achievement (Brophy, 1983), and that these beliefs are communicated to students through low-ability cues from the teacher and other aspects of the classroom context (Blumenfeld et al., 1982; Weinstein, Marshall, Sharp, & Botkin, 1987).

We found a significant predictive effect of perceived teacher expectations on competence related-beliefs in both reading and math, with the magnitude of effect being stronger in the mathematics domain at this grade. These findings extend the chain of

relationships documented previously on this sample by Wigfield and Harold (1992) who examined how teacher beliefs related to students' own self-concepts. In that study, Wigfield and Harold found modest correlations ranging from .11 to .36 for teacher and student beliefs about student abilities in reading and math. In this study, using student perceptions of teacher beliefs, we find correlations ranging from .30 to .71, with the correlations strongest in math. Assuming students' accurately perceived the expectations of their teachers (e.g. Weinstein et al., 1987), our results support the importance of using student perceptions to assess the impact of expectations (Weinstein, 1989). Additionally, our results suggest the importance of controlling for prior levels of competence beliefs in assessing the impact of teacher expectations on these beliefs. Finally, these results support the contention of Brophy and Good (1970) that students' interpretations of teacher behaviors could impact on achievement and motivation. In math especially, we find that teacher expectations influence beliefs about personal competence and task value. Presumably, students' interpretations of teacher behaviors such as opportunity provision, choice, and feedback form the basis of their assessments of how well the teacher thinks they will do (Weinstein, 1989). This in turn affects students' own competence beliefs.

It is interesting to note that, although low and high achieving students perceived different teacher expectations for success, only in reading do they also report differences in the treatment of high and low achievers. Despite this, we found no significant effects for differential treatment in reading on self-concepts. This lack of results is subject to several interpretations. First, we only used a single item to tap student perceptions of differential treatment, and this item did not specifically refer to the reading teacher but one's teacher in general. This may not have adequately captured the construct. Second, other research has suggested that it is not the perception of differential treatment per se, but perceived high differential treatment coupled with perceived low teacher expectations that produces effects on student achievement and expectancies (Brattesani et al., 1984). Thirdly, previous research has looked at the effects of differential treatment on a single measure of motivation (expectancies) in reading (e.g. Brattesani et al., 1984; Weinstein, 1989), while expectancies reflect only one item in our self-concept measure for math. Finally, our work looked at classroom perceptions and outcomes at the individual level of analysis, while other work has examined class level effects (Weinstein, 1989).

Contrary to several of our hypotheses, we found no effects of time one beliefs of competence on subsequent achievement as measured by grades, or any effect of grades on time two competence beliefs. This may have been due to a lack of variance in our grade measures, and our splitting the sample into groups by achievement level. We also found no relationships of worry with grades in either subject.

Overall, our model contributes moderate amounts of explanatory power to self-concepts of ability in reading and math at the end of the year, but leaves a substantial amount of the variance unexplained. Given the continued existence of sex differences in self-perceptions of ability in math at this age, it is likely that factors such as sex-role related constructs (e.g. the appropriateness of math for girls) are also operating to influence the development of these beliefs (Eccles, 1984; Parsons et al., 1976).

Determinants of Change in Value Beliefs Over Time

Our findings indicate that changes in interest and importance beliefs are affected by classroom perceptions, especially in mathematics, and these effects were comparable in size to those of entry levels of value beliefs in mathematics. Significant positive effects on change in math interest and change in math importance for low achievers were found for teachers who students perceived as providing interesting instruction. These findings support a view that academic tasks can be an important influence on the value related aspects of student motivation (Doyle, 1983), and that the design of appropriate tasks may be an important way to increase student investment in learning, especially low achieving students. Again, these results suggested that initial beliefs influence perceptions of the environment (e.g. class is interesting), which in turn influence beliefs.

Student perceptions of classroom climate also had strong positive effects on change in interest in math. These findings extend research that shows a positive relationship between classroom climate and attitudes towards the subject matter in older students (Fraser & Fisher, 1982; Trickett and Moos, 1974). Our findings indicate that classroom climate influences change in upper elementary-aged children's motivation, and that this influence is especially evident for changes in interest and liking of math, but not for beliefs about the importance and usefulness of math. In addition, these findings corroborate other work on math values that demonstrated the positive influence of the teacher-student relationship on intrinsic valuing, importance and usefulness of math before and after the transition to middle school (Midgley et al., 1989). It is interesting to note that the only significant finding for class climate in reading was that higher levels of climate were related to more worry. This could be because students who felt the teacher cared more, were also more concerned about the consequences of their poor performance on that relationship. Finally, as was the case for self-concept of ability beliefs, no significant effects between grades and task values were found.

Overall, results of this study suggest that teachers in the upper elementary grades can have an impact on students' competence beliefs and values in math and reading, and may play a critical role in ameliorating some of the decline in these beliefs that begins prior

to fifth grade and continues throughout middle school (Eccles, 1983; Wigfield et al., 1991). These findings provide further confirmation of suggestions that teachers and administrators should structure environments so as to reflect the belief that all students can and are expected to learning (e.g. Ames, 1992), provide information on the importance and relevance of academic work (Brophy, 1987), and design meaningful, interesting tasks and instruction (Lepper & Hodell, 1989).

Conclusion

This study examined the effects of perceived classroom experience on change in upper elementary students' motivation in reading and math. Findings indicate that perceptions of the class as interesting and social support especially impact change in interest and importance in mathematics, while changes in self-concept were primarily influenced by perceived teacher expectations. The results also extend work on the developmental course of beliefs about reading and mathematics, showing that declines in value beliefs typically found for children in the middle school years in math begin in the upper elementary years. Further research is necessary to examine how classroom practices are related to students' perceptions of teacher expectations, class climate and interest, and subsequently, motivational beliefs. It may be that in the upper elementary years classroom practices such as formal evaluations, social comparison and competition impact on these perceptions, especially in mathematics, thereby undermining motivational beliefs (Eccles et al., 1984; Marshall & Weinstein, 1984; Trickett & Moos, 1974). This study represents one step in our research program that aims to understand how the school and home environments influence self-concepts and task values over time.

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Table 1
Repeated Measures Analysis of Variance Results by Gender, School Type, Achievement Level and Time for Motivational Variables Across Fifth and Sixth Grades

Motivation Measure	Degrees of Freedom		F-Value		Effect Size: Eta-Squared	
	Reading	Math	Reading	Math	Reading	Math
1. Self-Concept of Ability						
School Type	267	271	0.53	0.64	.00	.00
Gender	1	1	3.12	14.75***	.01	.05
Achievement	1	1	32.06***	51.75***	.11	.16
Time	1	1	0.38	1.92	.00	.01
Gender x Time	1	1	0.29	0.74	.00	.00
Achievement by Time	1	1	0.16	1.56	.00	.01
School Type by Time	1	1	0.45	4.21†	.00	.02
2. Importance/Usefulness						
School Type	268	272	4.95†	0.72	.02	.00
Gender	1	1	0.87	1.50	.00	.01
Achievement	1	1	2.16	8.54*	.01	.03
Time	1	1	0.88	1.98	.00	.01
Gender x Time	1	1	0.02	4.31†	.00	.02
Achievement by Time	1	1	0.45	0.30	.00	.00
School Type by Time	1	1	0.34	4.96†	.00	.02
3. Interest						
School Type	269	272	3.49	5.46†	.01	.02
Gender	1	1	5.94†	3.13	.02	.01
Achievement	1	1	1.94	9.93*	.01	.04
Time	1	1	11.94**	26.30***	.04	.09
Gender x Time	1	1	0.15	0.27	.00	.00
Achievement by Time	1	1	1.69	0.49	.01	.00
School Type by Time	1	1	0.42	6.26†	.00	.02
4. Worry						
School Type	266	270	0.80	1.58	.00	.01
Gender	1	1	0.45	1.43	.00	.01
Achievement	1	1	7.08*	9.04*	.03	.03
Time	1	1	6.18†	1.76	.02	.01
Gender x Time	1	1	0.05	1.24	.00	.00
Achievement by Time	1	1	2.10	0.93	.01	.00
School Type by Time	1	1	3.00	1.50	.01	.01

†p≤.05, *p≤.01, **p≤.001 , ***p≤.0001

Table 2
Comparison of Means for Achievement Levels, Boys and Girls and Time on Reading and Math Beliefs in Fourth and Fifth Grade

Motivation Measure	Reading		Math	
	Time 1	Time 2	Time 1	Time 2
1. Self-concept	5.32	5.33	5.27	5.20
Girls	5.48	5.46	5.14	5.03
Boys	5.14	5.20	5.41	5.38
Low Achievers	4.87	4.94	4.82	4.63
High Achievers	5.60	5.58	5.50	5.49
2. Importance	5.35	5.28	5.35	5.22
Girls	5.42	5.35	5.38	5.14
Boys	5.28	5.20	5.32	5.31
Low Achievers	5.23	5.20	5.12	5.07
High Achievers	5.43	5.33	5.47	5.24
3. Interest	4.62	4.23	4.49	3.90
Girls	4.85	4.50	4.37	3.84
Boys	4.37	4.06	4.62	3.96
Low Achievers	4.41	4.22	4.10	3.62
High Achievers	4.76	4.33	4.69	4.04
4. Worry	4.08	3.69	4.18	3.91
Girls	4.01	3.63	4.18	4.12
Boys	4.15	3.77	4.18	3.69
Low Achievers	4.31	4.13	4.46	4.40
High Achievers	3.93	3.42	4.03	3.66

Note. N =277 for Reading, including 144 Girls, 133 Boys, 106 Low and 171 High Achievers
N =280 for Math, including 147 Girls, 133 Boys, 96 Low and 184 High Achievers.
Cell n's vary due to missing data and casewise deletion.
MANOVA tests revealed no significant interactions of gender by achievement, so means are reported by gender and achievement level separately.

Table 3
Comparison of Means by Gender and Achievement Level for Reading and Math Class Perceptions and Performance

Classroom Perception	Reading	F-Value	Math	F-Value
1. Perceived Teacher Expectations	4.69		4.86	
Girls	4.75	0.53	4.74	2.50
Boys	4.62		5.01	
Low Achievers	4.18	21.36***	4.25	29.55***
High Achievers	5.01		5.18	
2. Different Treatment by Ability	3.29		2.98	
Girls	3.13	1.32	2.99	0.00
Boys	3.46		2.98	
Low Achievers	3.68	4.33†	2.93	0.09
High Achievers	3.04		3.01	
3. Class is Interesting	3.78		4.04	
Girls	3.83	0.20	3.95	0.62
Boys	3.72		4.13	
Low Achievers	3.69	0.89	3.76	3.31
High Achievers	3.83		4.18	
4. Class Climate	4.35		4.52	
Girls	4.38	0.12	4.58	0.37
Boys	4.31		4.46	
Low Achievers	4.27	0.32	4.31	2.34
High Achievers	4.40		4.63	
5. Year Course Grade	-0.06		-0.09	
Girls	0.01	2.07	-0.05	0.88
Boys	-0.14		-0.14	
Low Achievers	-0.36	22.50***	-0.59	60.90***
High Achievers	0.13		0.17	

†p≤.05, *p≤.01, **p≤.001 , ***p≤.0001
Note: ANOVA tests revealed only one significant interaction of gender by achievement for perceptions of differential treatment in reading classes F=36.98. Low achieving boys reported the most differential treatment, while high achieving boys reported the least.

Table 4

Zero-order Correlations for Reading, Math Motivation Variables at Time 1 and Time 2, and Classroom Perceptions at Time 2

	Motivation Measures								Classroom Perceptions				
Motivation Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Self-Concept T1	----	.59**	.43**	.29**	.57**	.37**	-.01	.00	.30**	.02	.05	-.10	.14†
2. Self-Concept T2	.51**	----	.30**	.37**	.36**	.53**	-.03	-.01	.41**	-.03	.06	.01	.11†
3. Importance T1	.35**	.18**	----	.45**	.43**	.28**	.24**	.14†	.21**	.03	.08	.08	.11†
4. Importance T2	.21**	.29**	.39**	----	.24**	.48**	.07	.25**	.25**	.01	.19**	.19**	.07
5. Interest T1	.57**	.39**	.48**	.36**	----	.54**	.14†	.08	.15*	-.05	.09	.09	.04
6. Interest T2	.28**	.53**	.23**	.49**	.51**	----	.04	.24**	.18*	-.03	.18*	.18**	-.04
7. Worry T1	-.16*	-.09	.18**	.14*	.07	-.01	----	.41**	-.03	.03	-.02	-.02	-.05
8. Worry T2	-.11†	-.26**	.03	.27**	.07	-.01	.32**	----	-.16*	.15*	.01	.01	-.16*
Classroom Perceptions													
9. Teacher Expectations	.45**	.71**	.17*	.27**	.30**	.44**	-.09	-.24**	----	-.15*	.25**	.33**	.27**
10. Diff Treat x Ability	.07	-.03	-.07	-.15*	-.01	-.12†	-.03	.03	-.05	----	-.40**	-.49**	-.06
11. Class is Interesting	.09	.26**	.12†	.32**	.29**	.57**	-.01	-.02	.24**	-.31**	----	.66**	.08
12. Class Climate	.04	.14†	.13†	.26**	.15*	.46**	.01	.01	.12†	-.50**	.61**	----	.12†
13. Year Average Grades	.16*	.25**	.09	.07	.08	.01	-.01	-.13†	.32**	-.05	.08	.07	----

Note. *N*=255 for Math, *N*=253 for Reading, Correlations are for all students, high and low achieving together
Correlations for reading motivation and class perceptions are represented on the top half of the matrix, while the scores for math are below the diagonal.

†p≤.05, *p≤.01, **p≤.001 (Fifth grade measures, Time 1, followed by "T1"; Sixth grade measures, Time 2 followed by "T2")

Table 5
Step One Regressions by Ability Level of Student: Standardized Regression Effects of Gender, School Type, and Time 1 Motivation on Class Perceptions and Grades in Reading

	Teacher Expectations		Different Treatment by Ability		Class is Interesting		Reading Class Climate		Reading Class Grades: Year Average	
Predictors	Low	High	Low	High	Low	High	Low	High	Low	High
School Type	.06	-.04	.13	.21*	-.09	-.19†	-.09	-.26**	.39***	-.09
Gender	.20†	.06	.23†	-.05	-.09	.04	-.08	.02	-.06	-.08
Self-concept T1	.01	.32***	-.02	.08	.06	.09	.00	-.09	.15	-.08
Adjusted R-Squared	.02	.08**	.05†	.04†	.00	.03	.00	.07*	.15**	.00
School Type	.08	.01	.14	.23*	-.08	-.19†	-.07	-.28**	.40***	-.10
Gender	.01	.02	.24†	-.05	-.09	.02	-.08	.03	-.07	-.07
Importance T1	.18	.22*	.06	.01	.13	.05	.20†	.01	.20†	-.02
Adjusted R-Squared	.01	.03†	.06†	.04†	.01	.02	.03	.07*	.17***	.00
School Type	.06	.03	.13	.23*	-.09	-.16†	-.09	-.27**	.39***	-.12
Gender	.02	.03	.23†	-.06	-.08	.05	-.07	.04	-.05	-.09
Interest T1	.12	.22*	-.06	-.03	.15	.22*	.16	.07	.13	-.13
Adjusted R-Squared	.00	.03†	.06†	.04†	.01	.07*	.01	.07*	.15**	.01
School Type	.07	-.01	.14	.23*	-.07	-.19†	-.08	-.28**	.38***	-.10
Gender	.00	.00	.23†	-.06	-.10	.01	-.09	.03	-.05	-.07
Worry T1	.08	-.05	.00	.02	-.12	.03	.02	-.01	.05	-.07
Adjusted R-Squared	.00	.00	.05†	.04†	.00	.02	.00	.06*	.12*	.00

†p≤.05, *p≤.01, **p≤.001 , ***p≤.0001
N=106 For Low Group, *N*=172 For High Group, Column N's vary due to missing data and listwise deletion of cases

Table 6
Step Two Regressions by Ability Level of Student: Standardized Regression Effects of Gender, School Type, Time 1 Motivation, Class Perceptions, and Grades in Reading on Student Reading Motivation at Time 2

	Reading Self-Concept Time 2		Reading Importance Time 2		Reading Interest Time 2		Reading Worry Time 2	
Predictors	Low *n=95*	High *n=155*	Low *n=94*	High *n=157*	Low *n=95*	High *n=157*	Low *n=94*	High *n=155*
Self-concept T1	.47***	.49***	----	----	----	----	----	----
Importance T1	----	----	.45***	.34***	----	----	----	----
Interest T1	----	----	----	----	.35**	.60***	----	----
Worry T1	----	----	----	----	----	----	.37**	.39***
School Type	.06	-.04	-.16	.05	-.08	.02	-.25†	.02
Gender	.03	-.07	.00	-.07	.06	-.14†	.07	-.05
Teacher Expectations	.32**	.26**	.24†	.03	.18	.03	-.15	-.14
Differential Treatment by Ability	-.06	.02	.04	.16	.06	.12	.24†	.13
Class is Interesting	.13	-.07	.19	.13	.20	.08	-.15	-.13
Reading Class Climate	-.17	.03	.03	.11	.04	.10	.31†	.21
Reading Grades	-.06	-.07	.04	-.06	-.08	-.07	.02	-.11
Adjusted R-squared	.30***	.36***	.37***	.15***	.16*	.45***	.19**	.17***

†p≤.05, *p≤.01, **p≤.001 , ***p≤.0001
N=95 For Low Group, *N*=157 For High Group, Column N's vary due to missing data and listwise deletion of cases

Table 7
Step One Regressions by Ability Level of Student: Standardized Regression Effects of Gender, School Type, and Time 1 Motivation on Class Perceptions and Grades in Math

	Teacher Expectations		Different Treatment by Ability		Class is Interesting		Math Class Climate		Math Class Grades: Year Average	
Predictors	Low	High	Low	High	Low	High	Low	High	Low	High
School Type	-.03	-.04	.21	.10	-.08	-.14†	-.11	-.06	.35**	-.01
Gender	.08	.06	-.03	.00	.05	.07	-.03	.01	.00	-.02
Self-concept T1	.27*	.47***	.02	.07	.01	.10	.08	-.01	.00	.08
Adjusted R-Squared	.06†	.22***	.01	.00	.00	.02	.00	.00	.09*	.00
School Type	.00	-.02	.24†	.10	-.10	-.14	-.12	-.06	.36**	-.01
Gender	.12	.14†	-.02	.01	.05	.09	-.02	.01	-.01	.00
Importance T1	.23†	.08	-.22†	.01	.20	.10	.20	.08	-.04	.06
Adjusted R-Squared	.04	.01	.06†	.00	.02	.02	.02	.00	.10*	.00
School Type	.03	.00	.21†	.10	-.08	-.12	-.10	-.05	.35**	.00
Gender	.08	.13	-.02	.01	.01	.07	-.04	.01	-.01	-.01
Interest T1	.31*	.27**	-.07	.02	.37**	.21*	.19	.13	.04	.11
Adjusted R-Squared	.08	.08**	.02	.00	.12*	.06*	.01	.00	.10*	.00
School Type	.03	-.01	.20	.10	-.06	-.14	-.11	-.07	.36**	-.01
Gender	.11	.14	-.03	.00	.06	.09	-.03	.02	-.01	.00
Worry T1	.15	-.11	-.02	-.03	.18	-.07	-.02	.03	.15	.03
Adjusted R-Squared	.00	.01	.01	.00	.01	.02	.00	.00	.11*	.00

†p≤.05, *p≤.01, **p≤.001 , ***p≤.0001
N=146 For Low Group, *N*=185 For High Group, Column N's vary due to missing data and listwise deletion of cases

Table 8
Step Two Regressions by Ability Level of Student: Standardized Regression Effects of Gender, School Type, Time 1 Motivation, Class Perceptions, and Grades in Math on Student Math Motivation at Time 2

	Self-Concept Time 2		Math Importance Time 2		Math Interest Time 2		Math Worry Time 2	
Predictors	Low n=85	High n=170	Low n=85	High n=171	Low n=85	High n=171	Low n=84	High n=170
Self-concept T1	.22†	.18*	----	----	----	----	----	----
Importance T1	----	----	.43***	.27***	----	----	----	----
Interest T1	----	----	----	----	.36***	.30***	----	----
Worry T1	----	----	----	----	----	----	.10	.38***
Persistence T1	----	----	----	----	----	----	----	----
School Type	-.14	.08	-.21†	-.01	-.20†	-.09	-.16	-.08
Gender	.12	.04	.19†	-.06	.11	-.13†	-.05	-.14†
Teacher Expectations	.53***	.61***	.03	.22*	.24*	.31***	-.22	-.14
Differential Treatment by Ability	.05	.00	.16	-.07	.20†	.11	.01	.13
Class is Interesting	.14	.07	.34*	.10	.26*	.29***	.25	-.05
Math Class Climate	-.07	.05	.05	.13	.26†	.28***	-.03	.06
Math Grades	.01	.04	.17	-.08	-.05	-.07	.07	-.08
Adjusted R-squared	.41***	.55***	.35***	.17***	.53***	.56***	.02	.19***

†p≤.05, *p≤.01, **p≤.001 , ***p≤.0001
N=85 For Low Group, *N*=171 For High Group, Column N's vary due to missing data and listwise deletion of cases

Appendix A: Motivation Measures and Alphas for Math and Reading

Scales and Items	Scale Alphas Time 1 and Time 2	
	Math	Reading
Self-concept of Ability Scale	.79/.85	.90/.87
1. If you were to list all the students in your class from the worst to the best in **math/reading**, where would you put yourself?		
2. Compared to most other school subjects, how good are you at **math/reading**?.		
3. How well do you expect to do in **math/reading** this year?		
4. How good would you be at learning something new in **math/reading**?		
5. How good at **math/reading** are you?		
Importance Scale	.61/.70	.81/.73
1. In general, how useful is what you learn in **math/reading**?		
2. Compared to most of your other activities, how useful is what you learn in **math/reading**?		
3. For me, being good at **math/reading** is: (not at all impt, very impt).		
4. Compared to most of your other activities, how important is it to you to be good at **math/reading**?		
Interest Scale	.80/.80	.82/.84
1. In general, I find working on **math/reading** assignments (very boring, very interesting).		
2. How much do you like doing **math/reading**? (a little, a lot).		
3. Compared to most other activities, how much do you like **math/reading**?		
Worry Item	----	----
1. How much do you worry about doing badly in **math/reading**? (a little, a lot).		

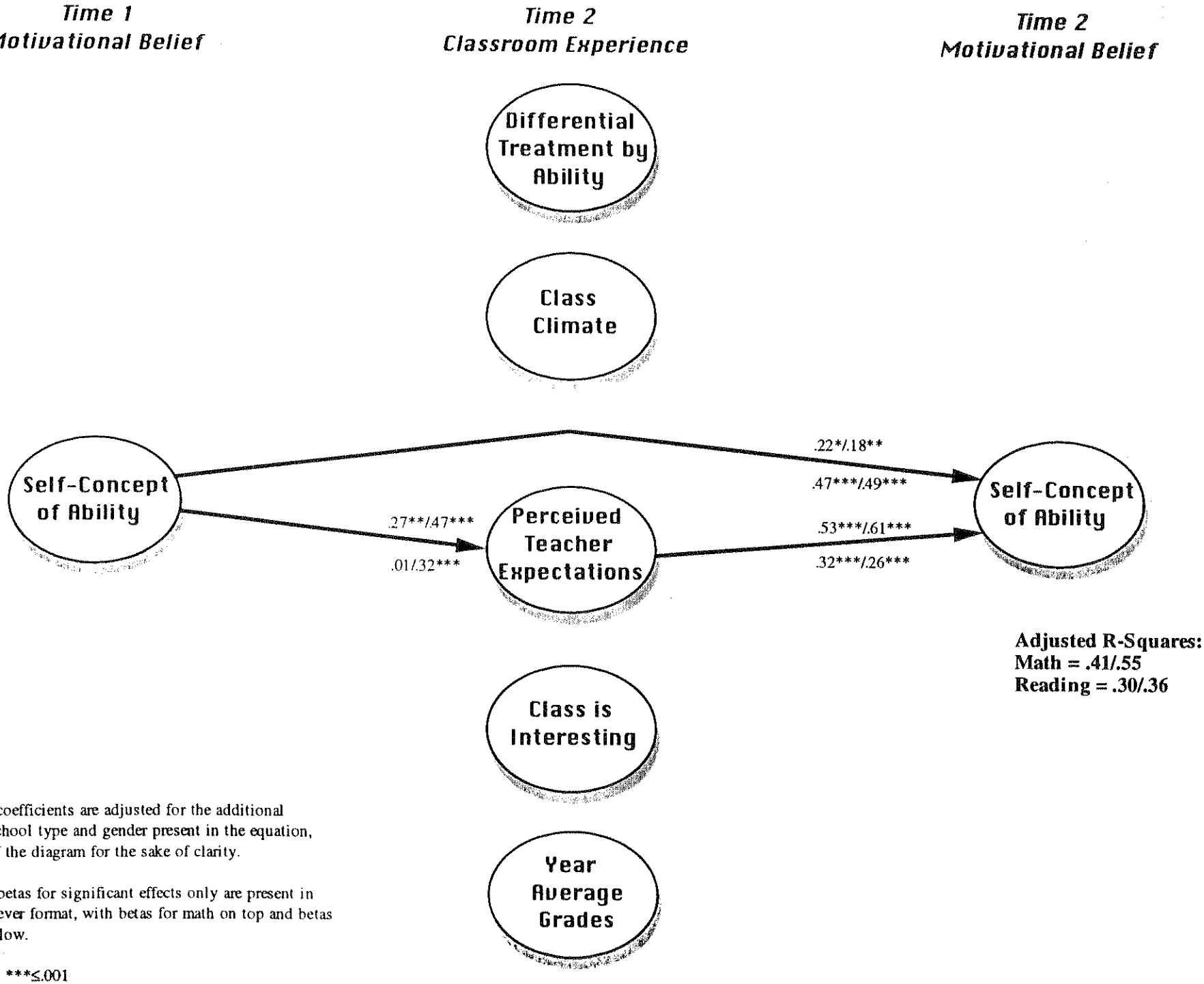
Appendix B: Classroom Perception Measures and Alphas for Math and Reading[3]

Scales and Items	Scale Alphas	
	Math	Reading
Differential Treatment by Ability Item[4]	----	----
1. My teacher treats smart kids better than other kids (in **math**). (not at all true, very true)		
Class Climate Scale	.78	.80
1. The teacher is friendly to us in **math/reading.** (not at all true, very true)		
2. How much does your **math/reading** teacher like you? (not at all, very much)		
3. Children seem to like **math /reading** class. (not at all true, very true)		
Perception of Teacher Expectations Item	----	----
1. How well does your teacher expect you to do in **math/reading** this year?.(not very well, very well)		
Perception of Class as Interesting Item	----	----
1. The teacher makes **math/reading** interesting in this class. (almost never, all of the time)		
Class Grades Scale	----	----
Composite z-score average of fall and spring semester final grades		

[3] Scales for reading class perceptions were worded generally, e.g. my teacher.... In math, the items were worded to refer specifically to math, e.g. my teacher does this **in math**.

[4] This scale was measured reliably with two items in the previous wave of data, with an alpha=.88/.83 in math and reading. Only one item was used to assess differential treatment in this wave of data.

Figure 1.

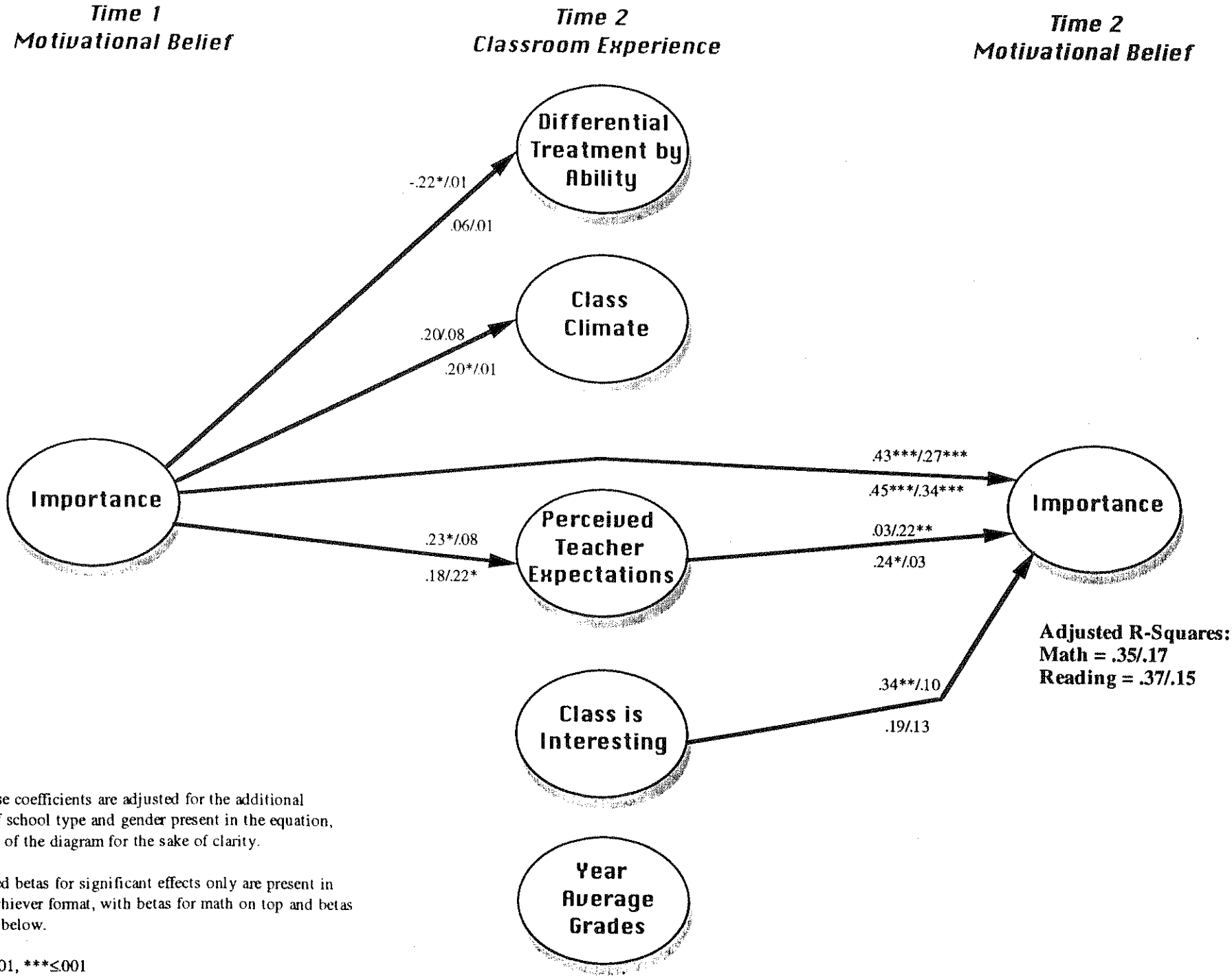


Note: These coefficients are adjusted for the additional variables of school type and gender present in the equation, but left out of the diagram for the sake of clarity.

Standardized betas for significant effects only are present in low/high achiever format, with betas for math on top and betas for reading below.

*≤.05, **≤.01, ***≤.001

Figure 2.

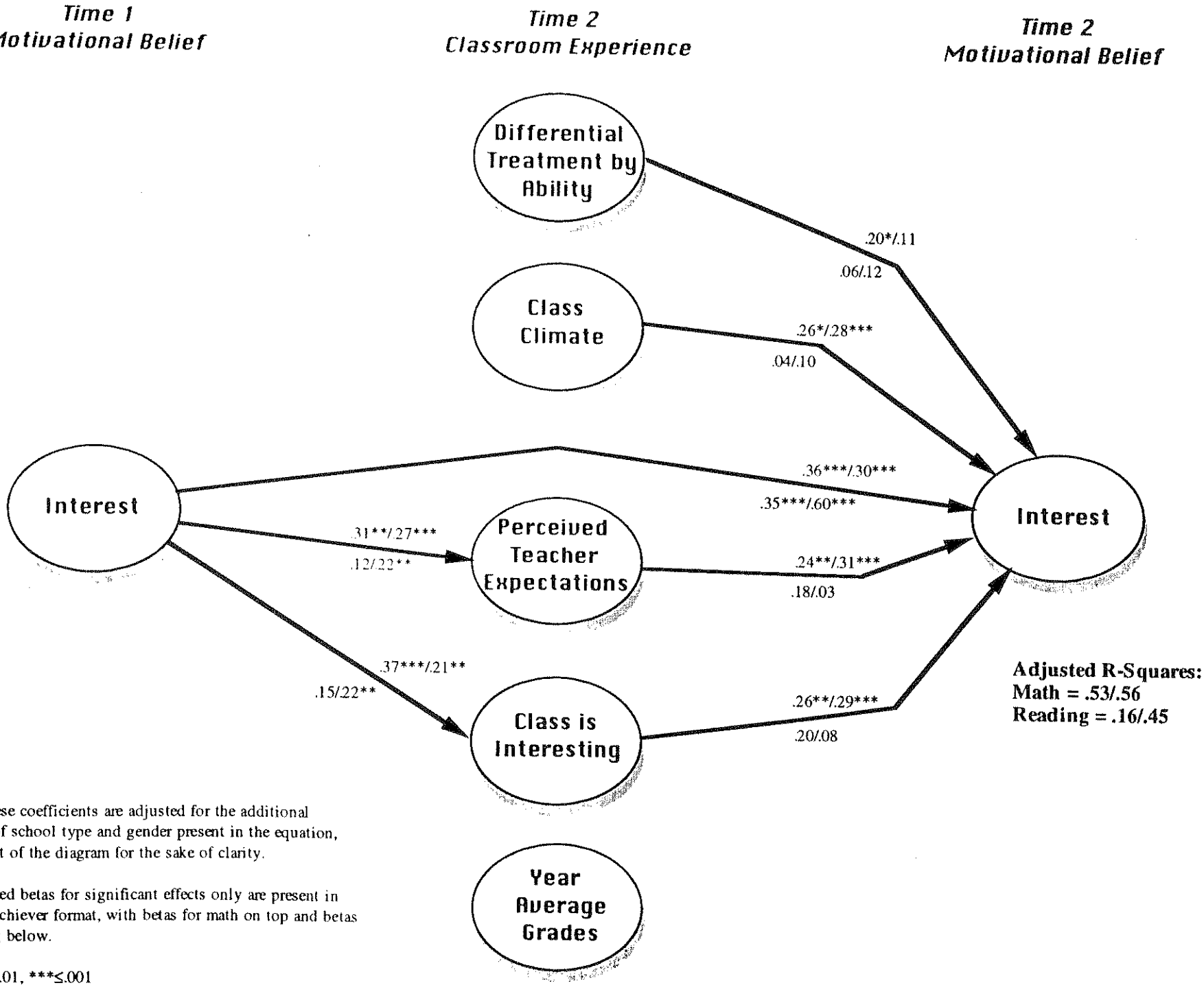


Note: These coefficients are adjusted for the additional variables of school type and gender present in the equation, but left out of the diagram for the sake of clarity.

Standardized betas for significant effects only are present in low/high achiever format, with betas for math on top and betas for reading below.

*≤.05, **≤.01, ***≤001

Figure 3.

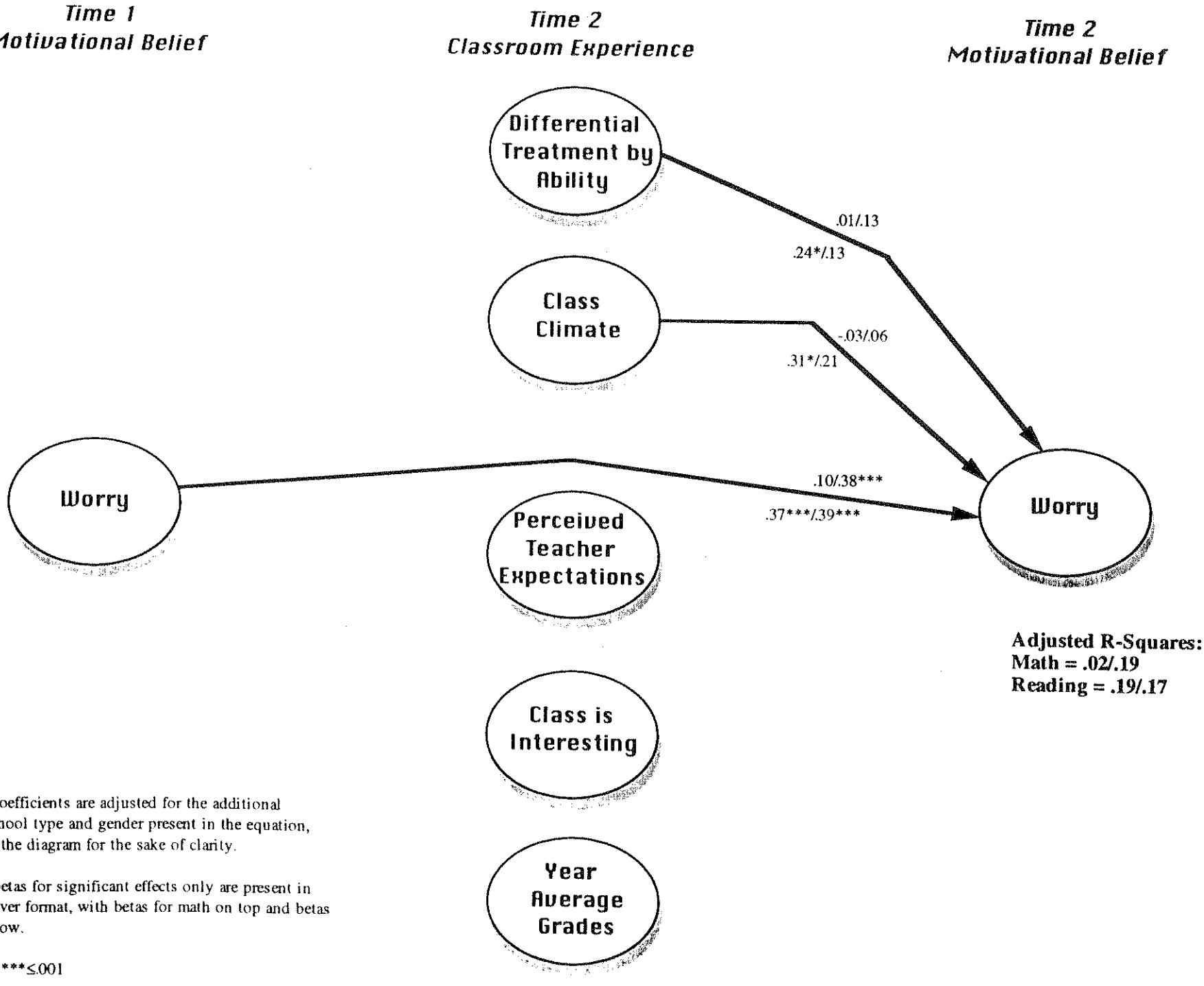


Note: These coefficients are adjusted for the additional variables of school type and gender present in the equation, but left out of the diagram for the sake of clarity.

Standardized betas for significant effects only are present in low/high achiever format, with betas for math on top and betas for reading below.

*≤.05, **≤.01, ***≤.001

Figure 4.



Note: These coefficients are adjusted for the additional variables of school type and gender present in the equation, but left out of the diagram for the sake of clarity.

Standardized betas for significant effects only are present in low/high achiever format, with betas for math on top and betas for reading below.

*≤.05, **≤.01, ***≤.001