A DEVELOPMENTAL INVESTIGATION OF INTRINSIC MOTIVATION: CORRELATES, CAUSES, AND CONSEQUENCES IN HIGH ABILITY STUDENTS

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ABSTRACT

Despite considerable interest in academic achievement of elementary school children, few studies have examined the influence of intrinsic motivation on achievement in early elementary school children. The present study investigated relations among intrinsic motivation, perceived competence, behavior problems and academic achievement measured at the beginning and end of a school year. The sample consisted of 975 second and third grade high ability students who participated in a national study of gifted program delivery that included fifteen school districts.

The first study question concerned the internal and external validity of the intrinsic motivation measure. Factor analyses indicated that intrinsic motivation can be reliably assessed and distinguished from perceived competence in second graders as well as third graders, boys and girls, minorities and non-minorities, and students in gifted programs and their regular education peers.

The second study question examined mean differences in intrinsic motivation subscales between groups defined by grade, gender, minority, and education status using multivariate analyses of variance (MANOVAs) followed by univariate analyses of variance (ANOVAs). Third graders showed greater autonomous judgment than second graders. Boys showed greater independent judgment than girls. There was little difference in the motivation of students placed

in gifted programs and peers in regular education programs. Overall, there was little difference between minority and non-minority students. However, sex X minority and grade X minority interaction effects were observed.

The third study question investigated whether intrinsic motivation related to behavior problems using canonical correlation followed by multiple regression. Intrinsic motivation negatively related to behavior problems in both boys and girls. Specifically, intrinsic motivation negatively related to inattentive behavior and unpopularity with peers in both boys and girls. For boys, intrinsic motivation negatively related to obsessive-compulsive behavior.

The fourth study question concerned causal relations among intrinsic motivation, perceived competence, and academic achievement. Structural equation modeling generated an exploratory causal model for relations among these constructs. The model suggests that intrinsic motivation positively influences perceived competence, which positively influences academic achievement. Academic achievement increases intrinsic motivation, forming a positive feedback loop. These findings raise implications for future research on intrinsic motivation, achievement, and related social cognition.

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DEDICATION

To family and friends, particularly those who appreciate the relation between dissertations and dragons and who are forgiving of mixed metaphors. Austin, Dave, Jeff, and Jen my friends/siblings/seconds in my adolescent quests to slay dragons. Austin, whose vision, humor, and passion built a solid place from which to "deck" dragons. Dave, who fights many of the same dragons, shares reflections on different approaches to the art, and helped me to make my home base. Jeff, who first showed me the value and tenuous nature of absolute honesty (sometimes I have trouble recognizing when I'm fighting the wrong dragon). Jen, who reminds me that there really are dragons sometimes, and that it's important to find them and fight them before they sneak up and hurt someone. Doug, Ed, and Scott who have laughed at and with me as I fought some of my college dragons and who will laugh at and with me whenever we say or hear "Dr. Goldberg". My father, who taught me that some dragons can be fought with courage, and timely use of smiling (sometimes that can really baffle them) and denial. Also, if a group of dragons confronts you, spoiling for a fight, don't become anxious, hit the biggest one first and the others will leave you alone. My mother, who taught me that with proper preparation (OK, maybe I haven't mastered this approach yet), some dragons can be trained. David and Winx who taught me to find the part of the dragon that I like -- the wings, which are the strongest part.

Discover the link between the wings and the fire-breathing part. Ally with the wings, fly together and there is nothing to fear. Allie and Sharon, who collaborate to remind me not to ignore the belly of the beast; maybe there are no dragons; the quest is important; there is magic. Susan, whose love, encouragement, and playful spirit (it's OK to play with dragons?) are correlates, perhaps causes, of the development of my sense of intrinsic motivation or wonder.

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Chapter 1

INTRODUCTION

What is intrinsic motivation?

Many children begin school with a hunger for learning. They are enthusiastic and curious; they seek out novel or challenging tasks. We say that these children have intrinsic motivation. When studying motivation it is useful to distinguish between two basic orientations: Intrinsic (or Mastery) versus Extrinsic (Performance) orientation to learning. Academic intrinsic motivation is characterized by enjoyment of learning as demonstrated by a mastery orientation (Dweck & Leggett, 1988); curiosity; persistence; and the pursuit of challenging, or previously unfamiliar school work. Intrinsic motivational patterns have been associated with high perceived ability and control, realistic task analysis and planning, and the belief that effort increases one's ability and control (Fincham & Cain, 1986). An extrinsic orientation toward learning is characterized by a concern with external reasons for working, such as the judgment of others regarding one's performance, grades, or some anticipated reward.

Why is intrinsic motivation important?

Children's motivation for learning exerts a profound influence upon their future goal orientation and achievement behavior. Children who are more intrinsically motivated show more adaptive responses to failure; they demonstrate persistence and an ability to learn from their failures to improve subsequent performance (Dweck, 1975; Andrews & Debus, 1978; Fowler & Peterson, 1981). Intrinsic interest in learning plays an integral role in determining pursuit of mathematical and scientific subject matter, choice of challenging careers and optimum performance in one's chosen career (Dweck & Elliot, 1983; Dweck, 1986).

Children with intrinsic motivation manifest higher self-perceptions of competence (Gottfried, 1982, 1985; Harter, 1981; Harter & Connell, 1984). In their reformulation of learned helplessness theory, Abramson, Seligman & Teasdale (1978) discuss the relationship between intrinsic motivation and attributional style (the explanations that people tend to give for success and failure experiences). They posit a critical role for motivational orientation in the loss of self-esteem and chronic, generalized lack of persistence observed in depression. Early & Barrett (1991) distinguish between locus of control and intrinsic motivation -- which they define as perceived control over initiation and engagement. They present findings consistent with their explanation that

extrinsic motivation is associated with helplessness, lower perceived competence, and an external locus of control. Thus, intrinsic motivation may be a key factor both in determining achievement behavior and maintaining a healthy self-regard.

Intrinsic Motivation and High Ability Students

Experts in gifted education generally describe high ability students as being more motivated, curious, and task-committed than children of average intellectual ability (Clark, 1979; Feldhusen & Kolloff, 1986; Khatena, 1982; Renzulli, Reis, and Smith, 1981; Renzulli & Reis, 1986; Wilson, 1957). These experts suggest that during early schooling, high ability students display a relatively high level of intrinsic motivation. Renzulli and Reis (1986) pose a triadic model for defining giftedness and selecting students for gifted programs; one of the three criteria is task commitment -- described as the challenge seeking, persistence, and independent mastery behavior that are the defining characteristics of intrinsic motivation. Khatena (1982) asserts that "in the main, motivation as it relates to the gifted is conceived as intrinsic" (p.298).

Yet, students of above average academic ability may be especially vulnerable to losing their intrinsic motivation for learning. Wilson (1957) asserts that when teachers attempt to encourage learning with positive and negative

contingencies, they inadvertently focus gifted children "on the superficial rather than on their deeper and inherently unique motives...[leading them to] become content merely to accept these strongly emphasized superficial satisfactions...[rather than being] responsive to their own deep and driving purposes, which alas, are so often disregarded by their teachers" (p.250). Despite the emphasis on intrinsic motivation in descriptions of gifted children, there is a lack of empirical research on the intrinsic motivation of high ability students.

Changes in Intrinsic Motivation

Intrinsic motivation is attenuated by use of extrinsic rewards and tends to decrease with increasing age. Kassin & Lepper (1984) have demonstrated that if children are given an external justification for engaging in an activity that they enjoy (e.g. performance expectations or rewards), they will infer that they participated because of that extrinsic reason and in the future will tend not to participate in the activity when reward is not present. That is, the activity will cease to be intrinsically rewarding. As children begin to adapt to the incentive structure of our elementary schools (e.g. grades, praise, criticism), their intrinsic motivation for learning diminishes (Harter, 1981). Some have suggested that those children who begin formal schooling with the highest levels of intrinsic motivation

are most vulnerable to the undermining effects of the school's incentive system (Rogers, 1985). The disturbing possibility of a decline in intrinsic motivation in highly motivated children merits empirical study in a high ability population.

Research Questions and Specific Aims

Research Questions

1) How does intrinsic motivation develop?

Intrinsic motivation has been studied primarily in older children (grades 3 and up). The studies on developmental aspects of intrinsic motivation have been largely cross-sectional. Developmental research suggests that children develop an ability to describe their motivation during the early elementary grades. A longitudinal study including second and third grade students has the potential to improve our understanding of the development of intrinsic motivation and its relation to other achievement-related perceptions and behaviors.

2) Are there minority group differences in intrinsic motivation? There is evidence of minority group differences on standardized measures of academic achievement (Helms, 1992) and in perceived competence (Cornell, Delcourt, Goldberg, & Bland, 1992b). Do minority groups differ in factor structure and means for intrinsic motivation?

3) Are there gender differences in intrinsic motivation?

There is considerable interest in observed gender differences in achievement, self-concept, and behavioral adjustment. Are there gender differences in the development of intrinsic motivation? For example, do boys come to prefer challenge more than girls, as has been suggested by some studies of children's behavior (e.g. Dweck, Davidson, Nelson, & Enna, 1978)?

4) Are there differences between high ability children and children of average ability in intrinsic motivation?

Despite the emphasis on intrinsic motivation in the literature in gifted education, there is a lack of empirical investigation on the topic. Students are routinely selected for gifted education programs at least in part based upon intrinsic motivational characteristics. For example, Renzulli's tripartite model (Renzulli, Reis, & Smith, 1981) for the identification of giftedness emphasizes task commitment as one of the three critical components. He defines task commitment as consisting of the elements of intrinsic motivation that we have described as independent mastery behavior and preference for challenge.

5) What is the relation between intrinsic motivation and behavior problems?

There are many studies that address the relation between self-concept and behavior problems (see Harter, 1983 for a review). As mentioned above, there are several studies linking self-concept and intrinsic motivation. Yet, there is a lack of empirical research regarding the relation between intrinsic motivation and behavior problems.

6) What are the relations among intrinsic motivation, self-concept, and academic achievement?

With few exceptions (see literature review below), studies have focused on relations between pairs of constructs to the neglect of interrelationships or patterns of relations among constructs. For example, there is a large literature relating self-concept with academic achievement (see Harter, 1983 for a review). Several studies examine self-concept and motivation (Gottfried, 1985; 1990; Harter, 1981; 1982). Only one study examined the interrelationship among intrinsic motivation, self-concept, and achievement (Harter & Connell, 1984). Yet, no studies to date have used longitudinal data to investigate causal relations or patterns of influence among these constructs. In order to interpret meaningfully the pairwise correlations in the literature, there is a need for a model of how these motivational variables and behaviors interrelate and influence one another over time.

Specific Aims

1) This study examines developmental changes in intrinsic motivation in early elementary school children (grades 2-3). The developmental changes investigated here are cross-sectional mean differences between second and third graders and differences in factor structure which suggest differences in understanding of the concepts. Susan Harter's self-report measure of Intrinsic versus Extrinsic Orientation in the Classroom (Harter, 1981) has not been used with children younger than third graders. This study examines the factor structure and means of the measure in a second-third grade, high ability population (as well as an average ability comparison group as discussed below). High ability second graders may show a precocious understanding of the informational or cognitive aspects of motivation (e.g. independent criteria for success and failure, independent judgment, see Harter, 1981 described in literature review). These informational components of motivation appear to rely more upon children's ability to process information and derive judgments and therefore may be more directly related to cognitive development than the strictly motivational behaviors such as challenge seeking and independent mastery.

2) This study examines minority group differences in mean level of intrinsic motivation and in the relations among intrinsic motivation subscales and between intrinsic

motivation and self-concept. It is predicted that minority students will have similar levels of intrinsic motivation in comparison with non-minority students.

3) This study investigates gender differences in mean level of intrinsic motivation, and in the relations between intrinsic motivation and the social cognition and behavioral constructs discussed above. As suggested by the finding that high ability girls' general self-worth is more closely related to better behavior than for boys (Hoge & McSheffrey, 1991), it is predicted that preference for challenge and independent mastery will be more closely related to positive behavioral outcomes for girls than for boys.

4) This study explores differences between high ability children who have been identified for specialized instruction and students of average academic ability. The gifted education literature theorizes that high ability students are more intrinsically motivated than average students. It is predicted that high ability students will be precocious in the informational cognitive aspects of motivation described above, because their intellectual precocity will allow them to more quickly learn what they need to make internalized judgments of the quality of their work. It is predicted that early elementary age high ability students will not differ from their regular education peers in mean levels of intrinsic motivation as

demonstrated by preference for challenge and independent mastery behavior.

5) This study examines the relationship between intrinsic motivation and behavioral adjustment. Some researchers suggest that higher intrinsic motivation is associated with mental health and therefore should be associated with fewer behavior problems (e.g., Deci & Ryan, 1985). Other research suggests that independent, non-conforming behavior is associated with lower self-esteem in young children (Hoge & McSheffrey, 1991) and that children who are more intrinsically motivated are rated by teachers as demonstrating poor behavior relative to extrinsically oriented children (Kowalski, Stipek, & Daniels, 1987). From this, it might be expected that intrinsic motivation is associated with more non-conforming, externalizing behavior problems. This study compares these opposing views.

6) This dissertation examines the correlates, causes, and consequences of intrinsic motivation in high ability early elementary students. It is predicted that intrinsic motivation will be positively related to perceived competence and academic achievement. What is the interrelationship or pattern of relations among intrinsic motivation, perceived competence, and academic achievement in early elementary school children? Using two waves of data collected at the beginning and end of a school year, an exploratory causal model is developed that investigates the

interrelations among intrinsic motivation, academic achievement, and perceived competence.

LITERATURE REVIEW

History of the concept of intrinsic motivation

The concept of intrinsic motivation grew out of White's (1959, cited in Harter, 1978) seminal theory of effectance motivation. Motivational schema prior to White were rooted in drive theories (e.g. Freud, 1915; Hull, 1943 cited in Deci & Ryan, 1985) that focused on the relief of tension through satisfaction of a drive. White proposed that people are innately motivated to gain mastery over their environment and gain what he termed feelings of effectance. His theory was revolutionary in that it clearly put forth a motivational system that was independent of drive reduction as a reinforcer. The locus of control (deCharms, 1968) and self-efficacy (Bandura, 1977) approaches to motivation and personality grew out of White's work and the related social learning work of Rotter (1966). Intrinsic motivation is a term which developed from a synthesis of this work on effectance motivation, personal causation, and self-efficacy. The unifying thread of this work is the observation of the intrinsic or self-reinforcing nature of some human behavior.

Susan Harter's Concept of Intrinsic Motivation

Susan Harter (1981) conceptualized intrinsic motivation as consisting of two primary dimensions: a purely

motivational dimension and a more cognitive dimension characterized by the information that people use in order to make judgments related to motivation. Such motivation related judgements include defining success and failure and making independent decisions about what to do and how to do it.' Harter describes the more purely motivational components of intrinsic motivation as challenge-seeking, curiosity, and mastery behavior. One of the central postulates of Harter's framework was that children with intrinsic motivation in academics would have higher self-perceptions of competence in academics and that children who are more extrinsically motivated would have lower perceived academic competence. She further hypothesized that the intrinsically motivated child should manifest higher actual academic achievement.

Harter's Measure of Intrinsic versus Extrinsic Orientation in the Classroom

Harter's (1981) measure of intrinsic motivation consisted of five dimensions each of which were defined by an intrinsic and an extrinsic pole: (1) Curiosity-learning motivated by curiosity versus learning in order to please the teacher, (2) Preference for Challenge-preference for challenging work versus preference for easy work, (3) Independent Mastery-desire to work independently versus dependence on the teacher for help, (4) Independent Judgment-feeling capable about making judgments about what

to do versus relying on the teacher's opinion about what to do, and (5) Internal Criteria-internal criteria for success or failure versus external criteria (e.g., grades, teacher feedback) to determine success or failure. The measure contains 30 items, 6 for each of the five subscales. Within each subscale, items were counterbalanced in the following manner: 3 items begin with the intrinsic pole, 3 with the extrinsic pole. Respondents were first asked to decide whether they were more like an intrinsic or an extrinsic student (e.g. Some kids like to go on to new work that's at a more difficult level but Other kids would rather stick to the assignments that are pretty easy to do) and then indicate whether their chosen self-description is "Sort of true for me" or "Really true for me" (The measure, as used in the current study, is included in Appendix A). The two-step decision process and the counterbalancing response format has been shown to be effective in limiting socially desirable responding (see Harter, 1982).

Six samples totalling more than 3000 students spanning grades 3-9 participated in scale construction studies. Harter obtained good Kuder-Richardson reliabilities for four of the five subscales: challenge (reliabilities for this subscale ranging across the six samples from .78 to .84), mastery (reliabilities ranging .68 to .82), judgment (.72 to .81), and criteria (.75 to .83). The reliability for the curiosity subscale was somewhat lower (.54 to .82).

Harter derived a five factor solution using oblique rotation that provided some internal validation for the subscale construction and naming described above. In addition to the five factor solution, a higher order, two factor solution was defined with curiosity, challenge, and mastery defining one factor and judgment and criteria defining the second factor. Harter interpreted these higher order factors as indicative of the purely motivational component which she named intrinsic mastery motivation, and the more cognitive-informational components to motivation which she named autonomous judgment (see description of differing patterns of developmental change for the two factors in "Developmental trends in intrinsic motivation" below).

Harter (1981) provided some initial external validation for the measure by demonstrating the expected mean differences across subscales in a comparison between 4th-6th graders in a private school in which the curriculum was geared toward enhancing intrinsic motivation and a matched group of children in a traditional public school. She further reports (Harter, 1981) that a sample of educable mentally retarded children ages 10-12 showed a considerably more extrinsic orientation than the standardization sample. A teacher rating scale using a parallel format was designed to investigate the validity of a self-report format. In a study of 120 third-sixth graders, Harter (1981) obtained

cross-informant correlations between teacher and pupil ratings of .73 for challenge, .67 for curiosity, .61 for mastery, .52 for judgment, and .61 for criteria. Harter (1981) also tested the hypothesized relations between perceived academic competence and intrinsic motivation. She found high correlations for challenge (.57) and mastery (.54). She found a moderate correlation between perceived academic competence and curiosity (.33). Correlations between perceived academic competence and the cognitive-informational subscales were lower: judgment (.03) and criteria (.26).

Intrinsic Motivation and Achievement

In an important effort to describe relations among achievement and motivational constructs, Harter & Connell (1984) used structural modeling techniques to test models that relate achievement, perceived academic competence, perceived control, and intrinsic motivation. Achievement was indexed by the Iowa Test of Basic Skills. Perceived academic competence was indicated by the subscale from the Perceived Competence Scale for Children (Harter, 1985). Perceived control was measured using Connell's (1985) Multidimensional Measure of Control Beliefs. Intrinsic motivation was defined by the higher order factors of Harter's (1981) measure described above. The first higher order factor was autonomous judgment, a combination of the information subscales: independent judgment and internal

criteria for success and failure. The second higher order factor was intrinsic mastery motivation, a combination of independent mastery behavior, curiosity, and preference for challenge. Initially, four theoretical models were compared: (1) Intrinsic mastery motivation leads to higher achievement which then leads to higher self-perceptions of competence and control; (2) Actual achievement is the "driving force", leading directly to higher perceptions of competence, control, and higher intrinsic motivation. (3) Perceived competence leads to higher actual achievement, intrinsic motivation, and perceptions of control. (4) Knowing the sources of control of school success and failure leads to greater actual achievement which in turn will lead to greater perceived competence and higher intrinsic mastery motivation.

The four models were tested in two samples, an elementary school sample, including grades 3-6, and a junior high school sample of grades 7-9. Harter and Connell report the total sample size to be 784, approximately equally distributed across grades. The best-fitting model, according to unspecified criteria, for elementary school children, is a variation of model 4. Unknown control is set at the origin of a causal chain in which it is negatively related to achievement. Achievement then leads to increased perceived competence, which in turn leads to increased intrinsic motivation.

There is a fundamental difficulty with asserting causal pathways from these data. Structural equation modeling, a correlational technique -- albeit a sophisticated one -- does not supersede one of the cardinal rules of behavioral research: simultaneous correlation does not establish causation. While Harter and Connell's work suggests a possible causal path, their design is cross-sectional and longitudinal data are necessary to make meaningful statements about causality.

It is difficult to determine how the four models initially proposed by Harter and Connell fare against one another. They do not specify their criteria for comparing models. Harter and Connell describe a best-fitting model, but do not indicate whether the differences between the models' fit to the data are substantial or by what process they arrived at their choice of a best fit. One way to build on Harter and Connell's work is to employ longitudinal data to test a causal model and to specify a "null" model that includes no causal paths. Comparative fit can be evaluated using the Goodness-of-fit statistic and minimizing the error of the reproduced correlation matrix.

Other studies imply a significant role for intrinsic motivation in relation to other school related attitudes and behaviors. In research with fourth through eighth graders, children with higher levels of intrinsic motivation demonstrated greater academic achievement, lower academic

anxiety, and more favorable perceptions of their academic competence (Gottfried, 1982; 1985). In a study that differentiated achievement in specific subject areas, intrinsic motivation for math in second grade was found to be related to higher scores on math achievement tests and to higher self-perceived competence in mathematics. More intrinsically motivated third graders had higher perceptions of competence as well (Harter, 1981). Yet there is a dearth of research on generalized academic intrinsic motivation in younger school children.

Teacher Orientation toward Autonomy and Children's Intrinsic Motivation

Intrinsic motivation is positively correlated with academic achievement. What types of feedback from adults enhance intrinsic motivation? Deci, Schwartz, Sheinman, and Ryan (1981) investigated the relation between adult feedback and children's subsequent intrinsic motivation. They developed a scale to assess adults' orientations toward controlling children versus supporting their autonomy. The scale consisted of eight vignettes describing common behavior problems that occur in the classroom followed by a choice of four adult responses to the problem, ranging from highly controlling (e.g. telling the child specifically what he or she must do and prescribing sanctions to assure compliance) to highly autonomy inducing (e.g. encouraging the child to compare his or her behavior to others and to

use that information to decide what to do). These responses to vignettes were combined to provide a single index of a teacher's orientation toward controlling versus supporting autonomy. After demonstrating internal consistency and temporal reliability, Deci et al. (1981) gave this measure to 35 teachers in the fourth through sixth grade. They also administered Harter's (1981) measure of intrinsic versus extrinsic orientation in the classroom and her perceived competence scale (Harter, 1982) to the students of these 35 teachers. Data were collected in two waves, once in late October, and once in May.

The results indicated a significant relation between teacher orientation toward autonomy and the children's score on the three intrinsic motivation subscales -- curiosity, independent mastery, and preference for challenge. The relation was found at two months and was maintained at a 7 month reassessment. Teacher orientation toward autonomy also was positively related to children's sense of self-worth, perceived academic competence, and perceived social competence. Interestingly, there was no significant relationship between teacher orientation toward autonomy and either of the two informational or evaluative subscales described above: internal criteria for success and failure, and independent judgment. Deci et al. (1981) suggest that the informational scales are more affected by cognitive or intellectual maturity. This is consistent with Harter's

(1981) finding of a developmental trend for judgment to become more independent and criteria for success to become more internal over grades three through nine.

Recognizing that the results of this study were correlational and inadequate for causal inference, Deci et al. (1981) did a follow-up study in which they assessed the children's perceived competence and intrinsic orientation during the first week of the school year and again in late October. They preselected classrooms of three teachers who were high in autonomy and contrasted them with those of three teachers who were low in autonomy orientation. They calculated change scores for each child based upon the difference between their baseline scores at the beginning of the school year and their scores two months later. The results were consistent with the findings in the original study, although somewhat weaker, which they plausibly explain as being due to the smaller sample. This study is important because it sheds light on some potential sources of increased motivational orientation and perceived competence: that is, adult feedback designed to foster autonomy. It also supports the distinction between the informational and motivational aspects of an intrinsic orientation toward learning in that the motivational aspects were affected by the autonomy oriented feedback but the informational aspects were unaffected by feedback on this dimension.

Adult feedback and related achievement cognitions

Dweck and Elliot (1983) asserted that some early schooling and parenting styles encourage short-term performance goals that are ultimately counterproductive. A feedback style that emphasizes praise for success and punishment for failure can be very effective in helping children to succeed in the short run (i.e. getting good grades). However, ultimate success (e.g. success in one's chosen career or choice of a satisfying career) requires intrinsic motivation including independent judgement and challenge-seeking behavior (risking failure).

In a sample of 107 9-year old third and fourth graders, Gottfried and Gottfried (1991) reported that mothers' reward strategies that emphasized children's competence were positively related to domain-specific academic intrinsic motivation. Reward strategies that emphasized extrinsic reinforcers were negatively related to achievement and intrinsic motivation. An extrinsic reward strategy was correlated with an increase in total teacher reported behavior problems, using the Teacher Report Form of the Child Behavior Checklist (Achenbach & Edelbrock, 1986).

Intrinsic motivation and learned helplessness

In a one year longitudinal study of 158 fifth-sixth graders, Early and Barrett (1991) explored the relations between intrinsic motivation (IM), locus of control, and learned helplessness. IM was assessed using Harter's (1981)

measure of intrinsic orientation in the classroom. They measured locus of control using the Intellectual Achievement Responsibility Scale or I.A.R. (Crandall, Katkovsky, & Crandall, 1965, cited in Early & Barrett, 1991). Learned helplessness was operationalized using persistence in the face of failure feedback -- a paradigm used by Diener & Dweck (1978). Academic achievement was indexed using the Iowa Test of Basic Skills math and reading subtests. They predicted that motivational orientation would be a better predictor of achievement and helplessness than locus of control because intrinsic motivation is a more global construct than locus of control and therefore likely to be a better predictor of global behavior patterns such as helplessness and achievement. They conceptualized locus of control, or a sense that outcomes are within one's control, as being a logical prerequisite to intrinsic motivation. Despite their assertion of a logical order in which locus of control precedes intrinsic motivation, they posited a causal pathway in which intrinsic motivation was causally prior to locus of control. The causal path that they proposed begins with the adoption of an extrinsic motivational orientation which leads to helplessness, which in turn leads to an external locus of control. Despite this possible inconsistency, Early and Barrett's causal hypotheses were supported by the data in that intrinsic motivation was a better predictor of improved academic performance and

decreased helplessness than was an internal locus of control, even when controlling for the effects of perceived academic competence. They also found that extrinsically motivated fifth graders were more likely to develop external loci of control as sixth graders than were their more intrinsically motivated peers.

Developmental trends in motivational orientation

In her standardization sample for the scale of Intrinsic versus Extrinsic Orientation in the Classroom (Harter, 1981), Harter found some interesting developmental trends. In a cross-sectional study, the challenge, curiosity, and independent mastery subscales showed relatively high intrinsic scores in third grade and demonstrated a statistically significant linear decline (becoming more extrinsic) each grade, through ninth grade. Conversely, the judgment and criteria subscales began with relatively extrinsic scores in third grade and increased, becoming more intrinsic through ninth grade. Harter theorized that the effect of increasing intrinsic orientation for judgment and criteria occurs because older children acquire and subsequently internalize more knowledge about the rules and judgments involved in school. She conceived of these two subscales as relatively informational; basically children learn the rules of school success and they begin to apply them without as much reliance on the teacher. The remaining three subscales,

mastery, curiosity, and challenge are more purely motivational in nature. Harter suggested that "perhaps...school systems are gradually stifling children's intrinsic interest in learning, specifically with regard to challenge, curiosity, and independent mastery" (p.310). She further suggested that this trend may be explained by children learning the rules of the game and "adapting to the demands of the school culture, which reinforces a more extrinsic orientation" (p. 310).

Intrinsic motivation in younger children

Gottfried (1990) investigated the longitudinal relations between intrinsic motivation, IQ, achievement, perceived competence, and academic anxiety in 107 children in the first, second, and third grade. Gottfried's study was unique in that she had two-year longitudinal data and she investigated these relations in younger elementary school children. The index of intrinsic motivation was the Young Children's Academic Intrinsic Motivation Inventory (Y-CAIMI) which assesses young children's intrinsic motivation in two subject areas, math and reading, as well as provides a score for general intrinsic motivation and a separate index of Enjoyment of Difficult School Work. The results of this study indicate that young children's enjoyment of difficult school work increases from first through third grades. This finding is interesting considering Harter's

(1981) robust findings that preference for challenge decreases each year over grades 3 through 9.

Gottfried found that in these younger children intrinsic motivation does not seem to be well-differentiated into subject areas and she used a total intrinsic motivation score derived from summing the four factor scores to explore relations with other constructs. She found that intrinsic motivation is negatively related to academic anxiety and positively related to IQ, achievement, and perceived competence. She also found that early intrinsic motivation correlates with later motivation and achievement and that later motivation is predictable from early achievement. Gottfried's work is an important contribution in validating the construct of intrinsic motivation in younger children. As a longitudinal study, it had the potential to investigate questions of causality, yet unfortunately these types of analyses were not reported. The variety of measures begs for an analysis of interrelationship among constructs, yet only simple correlations and multiple correlations are reported. These types of analyses may have been prohibited by the relatively small sample size. The sample size was inadequate for investigation of gender differences and modeling of the complex relations among constructs.

Summary of Developmental Studies of Related Constructs:

What does the research indicate regarding developmental changes in intrinsic motivation and related motivational variables in children? Are there developmental differences in IM? Are there developmental differences in the social cognitions and school behavior that have been shown to be related to IM in children?

Domain specific intrinsic motivation

Gottfried (1985) investigated academic intrinsic motivation for reading, math, social studies, and science in a cross-sectional study of grades 4-7. She found a decline in intrinsic motivation in grade 7 across all subjects which was most pronounced in social studies and reading.

Locus of control

Several studies have documented developmental change in control beliefs which have been shown to covary with intrinsic motivation (e.g. Harter & Connell, 1984). In a longitudinal study spanning grades 5-11, deCharms (1980, cited in Deci & Ryan, 1985) found that children's characterization of themselves as a pawn increases as children move into junior high school. In a cross-sectional study of grades 3-12, Crandall, Katkovsky, and Crandall (1965, cited in Early & Barrett, 1991) found that girls' locus of control became increasingly internal over time. Connell (1985) conducted a cross-sectional study of third-ninth grade children's endorsement of items suggesting that

they know or do not know the source of control of academic successes and failures. He found that knowledge of control increases until grade 6, decreases from grade 6 to grade 7, and once again begins to increase.

Self-Concept and perceived competence

Perceived competence is correlated with both intrinsic motivation (Harter, 1981; Harter & Connell, 1984) and general self-worth (Harter, 1982; 1985). How do these constructs change over time? Harter (1982; 1985) reported that while perceived competence in cognitive, social, physical, and general self worth did not change over grades 3-9 (cross-sectional), the predictive relations between perceived competence and school achievement declined at grade 7. Nicholls (1978) reported that self-concept in reading decreased generally from age 5-13 (cross-sectional); the most marked declines were between ages 6 and 7 and between ages 8 and 9. Simmons, Rosenberg, and Rosenberg (1973) reported a decline in self-esteem from ages 8-18 years (cross-sectional). In a longitudinal study spanning grades 6-10, Simmons, Blyth, and Carlton-Ford (1982) found that girls in grade 7 experienced a decline in self-esteem. Over grades 6-9 (cross-sectional), attitudes toward teachers and confidence in science and math abilities decreased (Yamamoto, Thomas, & Karns 1969); boys also declined in their estimates of their abilities in language. Clearly, there are many developmental changes in perceptions of

competence in childhood. How are these changes related to intrinsic motivation and behavior in school?

Attitudes toward school and schoolwork

While there has been little work directly linking school behavior and changes in intrinsic motivation, several studies have indicated developmental change in school behavior and attitudes. In a cross-sectional study of grades 6-12, Epstein and McPartland (1976) found a decline in commitment to schoolwork. In a cross-sectional study of grades 1-8, Haladyna and Thomas (1979) found a decline in attitudes toward school in general and toward math, physical education, art, music and science specifically. In a study of children ages 3-12 (cross-sectional), there was a marked drop in expectancy of future success following a failure experience between ages 6 and 7, followed by a gradual decline (Parsons, 1982, cited in Eccles, Adler, Futterman, Goff, Kaczala, Meece & Midgeley, 1983). In a cross-sectional study of fourth through eleventh graders, Hill (1980) reported that test anxiety increased and the magnitude of the disruptive effects of test anxiety on test performance increased as well. In a quasi-experimental, cross-sectional study of grades K, 1, 3, and 5, there was a grade-related decline across the sample in self-ratings of ability and effort expended following failure experiences (Rholes, Blackwell, Jordan and Walters, 1980); a behavioral index of learned helplessness revealed an increase in

helpless behavior in grade 5 following failure experience. What might account for some of these developmental changes in academic behavior and attitudes? As suggested by Early & Barrett (1991), intrinsic motivation may directly affect behavior, which may then affect locus of control. Alternatively, as Harter and Connell (1984) suggested, control beliefs may affect achievement which then affects self-concept and intrinsic motivation. Another alternative, investigated in this study, is that intrinsic motivation is causally prior to perceived academic competence, and academic achievement.

Developmental theory and findings related to intrinsic motivation

From a developmental perspective, it appears that children begin with a learning (mastery) oriented approach to achievement. This is due to multiple social/cognitive factors that seem to change during the time period between the beginning of second grade and the end of third grade. These include an egocentric conception of task difficulty or inability to utilize performance norms (Nicholls, 1980), an incomplete differentiation between the concepts of ability and effort (Nicholls, 1978; Nicholls & Miller, 1983; Phillips & Zimmerman, 1987), a tendency not to make causal attributions and to view causes as unstable (Diener & Dweck, 1978), and unrealistic success expectancy or wishful thinking (Stipek, 1984).

Young children (4-5 year olds) are significantly less likely than older children (8 years and older) to attribute events to internal, stable and global causes (Nolen-Hoeksema, Girgus, and Seligman, 1986). Specific attributional style begins to show predictive relations to academic performance at approximately age 10 (Dweck, 1986). Control beliefs begin to show stability and predictive relations for achievement in third grade (Harter and Connell, 1984). Yet, those children (as young as 7 years) who report that they do not know the source of control of events in their lives show poor academic performance relative to peers who identify themselves or powerful others as control sources (Skinner, 1989). Harter's developmental model of effectance motivation suggests that prior to approximately age 8, young children have not yet developed an internalized belief system that includes concepts of motivation and internal judgments of performance. Unlike the experts in gifted education, she hypothesizes that these younger children are too cognitively immature to have developed an intrinsic motivational orientation.

Harter's idea that younger children have not yet developed an intrinsic motivational orientation is inconsistent with the early behavioral studies of intrinsic motivation (e.g. Lepper & Green, 1975) in which preschool children's intrinsic motivation to play with certain toys was diminished by paying the children. A possible

resolution of the inconsistent theories about the development of intrinsic motivation is that the cognitive informational component of motivation, which Harter (1981) called autonomous judgment, develops separately from intrinsic mastery motivation behavior.

Yet even this explanation, which is consistent with the developmental trends cited above, is nonetheless incomplete. It is curious to note that preschool children behave in ways that are consistent with what we know about intrinsic motivation and the effects of extrinsic reinforcement. Yet, these children are years away from being able to articulate their motivation in an internally consistent manner. The finding that attitude change does not predict behavior change is commonplace in applied social science research. The relation between self-report of attitudes and more objective reports (that is, reports from other presumably less biased sources) of corresponding behavior are often vastly discrepant. While a detailed investigation of this complex issue is beyond the scope of the proposed study, the data used in this study contain both self-report and other less biased sources (i.e. teacher report, school records, achievement test scores). Assessing constructs through multiple data collection methods will provide some reassurance that the observed relations are not artifactual to method variance or a response bias within one source of information.

Self-Concept of High Ability Students

Hoge and McSheffrey (1991) studied the self-concept of 280 high ability students selected from gifted programs spanning grades 5-8. They examined children's self-perceptions of competence using Harter's Perceived Competence Scale (1982) and correlated perceived competence with teacher ratings of the children's competencies. The index that they used for teacher ratings was the Scale for Rating the Behavioral Characteristics of Superior Students (SRBCSS). The SRBCSS was developed by Renzulli, Smith, White, Hartman, and Callahan (1976) as a tool for assessing children's potential for gifted and talented programs. The SRBCSS is divided into four subscales: Learning, Motivation, Creativity, and Leadership.

Hoge and McSheffrey found no support for Harter's (1985) contention that perceived competence becomes more differentiated with age. Across grades 5-8, the perceived competence subscales appeared equivalently differentiated from each other and from general self-worth. They hypothesize that this may be a result of high ability children developing differentiated self-concepts earlier than average children.

In comparison with Harter's standardization sample (Harter, 1985), the high ability students studied by Hoge and McSheffrey (1991) had lower scores on perceived social and athletic competence, but considerably higher scores on

perceived scholastic competence. High ability girls had particularly high scholastic competence and general self-worth relative to the girls in the standardization sample who were drawn from regular classrooms. While it is important to look at differences between high ability and regular education students, Hoge and McSheffrey did not test the significance of these differences between samples.

Scholastic competence was found to be more closely related to general self-worth for girls than for boys. Their analysis of global self-worth and its relation to teacher reported competencies yielded interesting results. Two of the four SRBCSS scales were significantly related to global self-worth. Leadership was positively related to global self-worth as predicted. However, creativity was negatively related to global self-worth. While the creativity scale contains some items that teachers might consider clearly positive attributes (e.g. high levels of curiosity, divergent thinking, sensitivity), it also contains items that rate more controversial, often less-accepted behavior in young children (e.g. nonconforming, unwilling to accept authoritarian pronouncements without critical examination, high risk taker). It is conceivable that there may be a bimodal distribution of children with high self-worth who act creatively and independently, and children with low self-worth who behave in a reactive, non-conforming manner that betrays distrust of adults. This

type of pattern of individual differences might explain this somewhat counterintuitive finding.

Gender Differences in Self-Concept of High Ability Students

Three studies have suggested gender differences in the self-concepts of high ability students. In the Hoge and McSheffrey (1991) study described above, gender differences were found on three of the subscales of the perceived competence scale. Boys rated their own appearance and physical competence higher than girls. Girls reported that they liked their behavior more than boys. There were no significant gender differences found in global self-worth, perceived academic competence, or perceived social competence. Teacher ratings of children's positive learning behaviors showed a marginal relation to higher global self-worth for girls but not for boys.

Milgram and Milgram (1976, cited in Eccles et al., 1983) reported higher global self-concept scores for high ability girls compared with high ability boys. In contrast, another study of high ability children (Schneider, Clegg, Byrne, Ledingham, and Crombie, 1989, cited in Eccles et al., 1983) reported higher global self-worth and higher physical perceived competence for boys than for girls in grades eight and ten. Interestingly, there were no gender differences in high ability pupils in the fifth grade. While these studies are not consistent, they clearly suggest that gender differences in self-concept merit further study. How do

these differences in self-concept relate to perceived competence, motivation, and actual achievement?

Gender differences in achievement related cognitions

Dweck et al. (1978) demonstrated that the differing patterns of feedback that girls and boys receive lead girls to acquire a maladaptive extrinsic performance orientation and an attributional style in which failure is ascribed to ability. Dweck further hypothesized (1986) that this may account for girls' avoidance of mathematics and the sciences, as well as women's choices of less challenging careers.

Gender differences are also found in the social cognition literature. Boys have a tendency to overestimate their own ability relative to teacher ratings, while girls tend to be underestimaters of their ability (Ilardi & Bridges, 1988). Harter (1985) reported higher ratings of global self-worth in boys than in girls for grades 5-8. By the end of junior high school, girls showed a decline in perceived academic competence (Phillips & Zimmerman, 1987) and academic confidence (Eccles, 1983 cited in Eccles, Adler, Futterman, Goff, Kaczala, Meece & Midgeley, 1983). Boys tended to hold inflated views of their efficacy and personal power (Macoby & Jacklin, 1974). Boys were more likely to internalize credit for successes while girls were more likely to ascribe failure to internal, stable, global causes such as their ability (Dweck, 1975; Dweck et al.,

1978; Dweck, Goetz, & Strauss, 1980; Dweck & Reppucci, 1973, cited in Elliot & Dweck, 1988; Martin & Nivens, 1987). The finding of a less adaptive attributional style (internal, stable, global explanations for failure) for girls extended to adolescent populations as well (Ryckman & Peckham, 1987). Clearly, gender differences in self-perceptions and behavior are not unique to high ability students. Are there gender and ability related differences in self-perception, motivation, behavior, and their influence upon one another?

Gender differences in Mental Health

Gender differences in mental health are common; for example, women are approximately twice as likely to become depressed as are men (see Nolen-Hoeksema, 1987 for a review). Masculinity is negatively related to depression (Stoppard & Paisley, 1987). Adolescent girls admit more anger and anxiety than do boys (Ben-Zur & Zeidner, 1988). It seems, however, that this anger often goes unexpressed. Internalizing symptomatology is more common in girls than in boys and the opposite pattern is true for externalizing symptoms (Eme, 1979). Adolescents show gender differences in incidence of symptomatology (Kurdek, 1987) and boys tend to express depression through different behaviors (sleep disturbance, lower activity level) than girls (crying and other more overt expressions of unhappiness)(Baron & Joly, 1988). Boys seem more vulnerable to developing pathology under conditions of high stress than do girls as they are

more frequently referred to mental health professionals (Masten, Garmezy, Tellegen, & Pellegrini, 1988). One explanation for this finding is that externalizing behavior -- the common means of problem expression for boys -- is easier to detect than internalizing behavior, which is more characteristic of girls.

Chapter 2

Method

Subjects. The sample is drawn from the Learning Outcomes Project (LOP) of the National Research Center on the Gifted and Talented (NRCGT). The Learning Outcomes Project is a 2 year longitudinal study of different types of gifted programs and their effects on the socio-emotional as well as academic development of elementary school children. The students come from 15 school districts spanning 10 states. School districts were selected for the project based on their positive response to a national request for school districts with an interest in participating in one of the projects of the NRCGT. The following standard program types have been included: 1) within-classroom programs; 2) pull-out classroom programs; 3) separate class programs; and 4) special school programs. Two comparison groups were chosen for the study: 1) children identified as gifted in districts where no specialized gifted instruction is provided at the designated grade level; 2) regular education classmates of the students in gifted programs who were identified by teachers as performing well in school though not considered gifted.

As a condition for participation in the study, school systems identified students for their gifted programs in their usual manner. The researchers made no attempt to

define selection criteria for the schools or interfere with the identification process in any way. All of the programs employed multiple criteria to select students. All fifteen programs made use of teacher ratings of their students. Most of the programs employed IQ and achievement test scores and some of the programs used grades as a component of their identification process.

Parents of prospective subjects were contacted by mail and asked to return a postcard indicating agreement to participate in the study. Parents were informed of the goals of the study and that participation would entail four rounds of data collection over a two-year period. Parents of approximately 2850 students were contacted, with a consent rate of approximately 41%. A follow-up survey mailed to 200 parents who had not responded, indicated that the most common reasons for not giving consent included: they did not recall receiving the information, they lost the response card or forgot to return it, or that the project involved too much of their child's time (see Cornell et al., 1992a for more details regarding non-responders).

The full sample for this study consists of 1167 students assessed early in the 2nd, 3rd, or 4th grades and again at the conclusion of the academic year. The average time period between testing was approximately 25 weeks (ranging between 12 weeks and 35 weeks). The measures were administered in a classroom setting. The sample includes

858 students placed in gifted programs and 309 students placed in regular classrooms. Of these students, 807 are in the second grade, 318 are in the third grade, and 42 are in the fourth grade. There are 614 girls and 553 boys in the sample. The sample contains 689 caucasian children, 311 African-Americans, 57 Hispanics, and 35 Asians. Ethnicity/racial data were not available for 75 subjects.

Given the substantial variation in the interval between testing, preliminary analyses investigated whether test interval was related to achievement test scores at the second wave of testing. Test interval accounted for statistically significant though very small proportions of variance in excess of that explained by the corresponding achievement test score at the first wave of testing. No such testing interval effects were found for the intrinsic motivation or self-concept variables. For our present purposes, the structural modeling analyses were the only analyses that utilized achievement test scores. In preliminary modeling efforts, using test interval as a covariate did not substantially alter the interrelations among the factors. The model reported does not include test interval as a covariate. It should be noted that for students with a small interval between testing, the potential for growth in achievement test scores is limited. This limited variance consequently impairs the sensitivity

of the structural model to interrelations among the motivation and achievement factors.

In the analyses that are reported, the sample size varies due to missing data. Also, 42 fourth graders were excluded because the sample size was deemed inadequate for comparison with the second and third graders. For the factor analyses and MANOVA-ANOVAs, the sample size was 975. The canonical correlation-regressions were conducted with 953 children. The structural modeling was conducted with only 546 children. The loss of more than 400 children for the modeling was due to a combination of losing children through attrition between Fall and Spring testing and missing data on any of the 18 scales used to comprise the factors in the model (9 scales x 2 waves).

Measures

Intrinsic motivation. Intrinsic Motivation was assessed using a shortened version of Harter's self-report measure of Intrinsic versus Extrinsic orientation in the classroom (Harter, 1981). Reliability and validity studies on this measure were described in Harter (1981). This measure assessed four areas of intrinsic-extrinsic attitudes: Independent Mastery, Independent Judgment, Internal Criteria for Success and Failure, and Preference for Challenge. Due to limitations in project administration time, the project did not administer the curiosity subscale. This subscale was dropped because it had the lowest

reliability of the five subscales. The project also dropped the one question from each subscale that had the lowest correlation with the overall subscale score. These deletions resulted in a measure that contained 20 items (five per subscale). Ten of the questions load on the higher order intrinsic mastery motivation factor; the remaining ten load on the higher order autonomous judgment factor described above.

Perceived competence. Perceived competence was assessed using a shortened version of Harter's Self-Perception Profile for Children (Harter, 1985), a revision of the Perceived Competence Scale for Children (Harter, 1982). In this study, only two perceived competence scales (perceived academic competence and perceived social competence) were used. The range of Kuder-Richardson reliabilities obtained from the standardization samples for the two subscales were as follows: perceived academic competence (.80-.85), perceived social competence (.75-.80). The terms perceived competence and self-concept will be used interchangeably. Each of the two subscales was comprised of 6 questions, for a total of 12 questions. The intrinsic motivation scale and the perceived competence scale use an identical format. In this study, they were administered together in a 38 item questionnaire, which included 6 questions from a subscale not included in this study (see Appendix 1).

Behavioral adjustment. Behavioral adjustment was assessed using the Teacher Report Form (TRF) of the Child Behavior Checklist (CBC) (Achenbach & Edelbrock, 1986). The TRF and CBC both include scores for broad band internalizing and externalizing behavior problems, as well as narrow band behavior syndromes (Achenbach, 1991). The CBC was developed by Achenbach and colleagues over a period of several years. The initial items were based upon descriptions of common child and adolescent behavior problems reported by parents and mental health professionals. The TRF is also a 118-item instrument developed to parallel the CBC, with some changes in question format to include items more relevant to classroom behavior. Parents and teachers are asked to rate whether each of the problem behaviors are Not True (0), Somewhat or Sometimes True (1), or Always or Often True (2) based upon the student's recent behavior.

Factor analyses of clinic referred and non-clinic referred children resulted in the following scales (and Cronbach alpha internal-consistency reliabilities). For boys (standardization N=668 boys aged 5-11): Withdrawn (.83), Somatic complaints (.72), Anxious/Depressed (.88), Social problems (.85), Thought problems (.72), Attention problems (.94), Delinquent behavior (.70), and Aggressive behavior (.96). The broad band behavior problem scales were Internalizing (.90), Externalizing (.96), and Total problems (.97). The TRF scales for girls (standardization N=758)

were Withdrawn (.83), Somatic complaints (.76), Anxious/Depressed (.89), Social problems (.87), Thought problems (.63), Attention problems (.95), Delinquent behavior (.69), Aggressive behavior (.96). The broad band scales for girls were Internalizing (.91), Externalizing (.95), and Total problems (.97). Fifteen day test-retest reliabilities ranged from .82-.96 for boys and girls combined (Achenbach, 1991).

TRF validity studies indicated that there is a high degree of agreement between the TRF scales and corresponding scales on the Conners Revised Teacher Rating Scale (Achenbach, 1991). Correlations between the TRF and the CBC broad band scales ranged between .26 and .69 (Achenbach, 1991). The percent of variance in the broad band scales attributable to clinic status (referred/nonreferred) ranged from 7 to 37 percent (Achenbach & Edelbrock, 1986).

Academic achievement. Academic achievement was measured using achievement test scores from Form J of the Iowa Test of Basic Skills (ITBS). The ITBS scales used in this study were reading comprehension, mathematics concepts and mathematics problem solving. The coefficient alpha reliabilities for these subtests were in the range of .80's to .90's (Buros Institute of Mental Measurements, 1987). Grade Equivalent scores were used because students were compared who were in different grades and in some cases, students were tested using several different forms and

levels of the test. Grade Equivalents were the only score that allowed for a comparison between these alternate forms of the test.

In addition to running the analyses using Grade Equivalents, the ITBS data were cleaned in the following manner. If a student's scores on a subtest increased or decreased by more than one standard deviation from pre-test to post-test, the reliability of the students' scores on that subtest were considered suspect and that subtest was dropped from data. This cleaning resulted in the omission of approximately 200 students' data. The modeling analyses were run with both the cleaned and the uncleaned ITBS data. The results were similar with the model providing a slightly better fit to the uncleaned data and the coefficients from the uncleaned data are reported.

Data Analyses

(I) Minority differences in intrinsic motivation

In the initial data analyses, the relationship between minority status, intrinsic motivation, and perceived competence will be investigated. While the relations among minority status and these variables is an interesting area for exploration, a thorough investigation of these relations is beyond the scope of the proposed dissertation (For a more thorough investigation of this topic, see Cornell, Delcourt, Goldberg, & Bland, 1992b).

The confirmatory factor analyses used maximum likelihood factor extraction followed by Procrustean or target rotations in which the loadings were rotated toward values corresponding to their expected subscale loadings. In an effort to evaluate the distinction between intrinsic motivation and perceived competence, the factor analyses included 32 questions and 6 factors were extracted. The SAS statistical package was used for these analyses, and for subsequent analyses unless otherwise specified. This strategy addresses such questions as "Do these children seem to have developed a cognitive schema that includes ideas such as self-concept and intrinsic motivation?

The study also investigated differences in mean IM scores using multivariate analysis of variance (MANOVA) followed by appropriate univariate analyses of variance (ANOVAs) when the MANOVA proved significant. The IV or between group factor in this case was minority group status. This step-down or protected univariate approach is commonly used to provide some protection against inflated Type I error when testing correlated DVs (for a critique of this approach, see Huberty & Morris, 1989).

(II) Developmental change in intrinsic motivation

This study investigated differences in factor structure and means of the Intrinsic-Extrinsic Motivation Scales (IM) in second-third graders. The approach was parallel to the analyses described for minority group differences. As

discussed above, the second-third grade range seems to mark a time period in which these constructs begin to cohere for children and the data has been collected in two waves at the beginning and end of a school year.

(III) Gender differences in intrinsic motivation

The analytic strategy here was essentially the same as the investigation of minority and developmental differences in factor structure and mean described above. The two groups that were defined for the factor analyses were boys and girls. In the investigation of mean differences between gender groups, the MANOVAs and ANOVAs employed minority status, gender, grade, and the interactions among minority, gender and grade as independent variables.

Gender differences in the relation between intrinsic motivation and behavior problems were examined by developing separate canonical models, described below in (V), for boys and girls.

(IV) Differences between high ability and regular program students in IM

The analytic strategy was essentially identical to the comparison of boys and girls, outlined above with program type replacing gender as the grouping variable. Again, building upon previous analyses, the MANOVAs and ANOVAs included IVs shown to be significant in I, II, III, and their interaction terms.

(V) What is the relation between IM and behavior problems?

The analytic strategy here was two-staged: using canonical regression (or canonical correlation) with the 4 subscales of the Intrinsic-Extrinsic Scale (Independent Mastery, Independent Judgment, Internal Criteria for Success and Failure, and Preference for Challenge) as predictors and using the subscales of the TRF as outcome measures. When significant canonical relations were established, univariate regressions were conducted to investigate the relations among specific subscales. This strategy afforded some protection against Type I error similar to the MANOVA-ANOVA protected univariate strategy described in section I.

(VI) What are the relations among intrinsic mastery motivation, autonomous judgment, perceived competence, and academic achievement? What causal inferences can be derived?

To address the causal questions surrounding the interrelationships among these variables, this study utilized the longitudinal nature of the data and the techniques of structural equation modeling. Structural equation modeling applied to cross-lag panel design offers an excellent opportunity to address these complex relations (Kenny, 1973; Belsky, Hertzog, & Rovine, 1986). The null hypothesis for the purposes of this study is what Belsky et al. (1986) referred to as the isolated stability model, or what is sometimes called the autoregressive model. In this

model, the observed scores of the constructs at wave 2 are explainable only as a result of the correlations between the constructs at wave 1 and the autoregression or stability coefficient of these variables from wave 1 to wave 2. If this model provided a good fit to the data, then the interests of parsimony would preclude an investigation of more complicated causal pathways.

Cross-lagged coefficients refer to the correlation between a variable (latent or manifest) at wave 1 and another variable at time 2. In early use of cross-lag panel design (e.g. Rozelle & Campbell, 1969), causal relations were inferred when one cross-lagged correlation was demonstrably larger than another. In a two variable model, for example, one would first partial out the initial simultaneous correlation of intrinsic mastery motivation (IMAST) and achievement, and also partial out the stability coefficients for each of these variables. A comparison of the remaining two cross-lagged correlations ($IMAST_1$-Ach_2, Ach_1-$IMAST_2$) would justify causal inference if one of these two correlations was significantly larger than the other. In this case, one would infer that the larger correlation indicated a significant causal path.

Kenny (1973) pointed out that the validity of inferring causality from one correlation being larger than the other has not been adequately demonstrated. He suggested an alternative procedure that involves comparing the goodness

of fit between a model that uses one synchronous latent variable to account for the observed correlations of the manifest variables versus a model that adds a cross-lagged latent variable or factor. Kenny's technique is helpful in the two-wave, two variable case. Yet, he did not develop an extension of this inference process to two-wave, multivariate models (as would be necessary in the present study).

An alternative use of SEM and cross-lag panel design described by Belsky et al. (1986) involves comparison of the null or isolated stability model described above to models that include cross-lagged or causal relations among latent factors. If the fit of the more complex causal model that includes cross-lag paths is demonstrably better than the fit of the isolated stability model, then causal influence among the constructs can be asserted. Fit is evaluated through statistics that compare the actual correlation matrix to the one that is reproduced by the specified model. Good fit is indicated by large correlations between the model and the data and small residuals of the individual parameter estimates.

Structural equation modeling was conducted using the Calis Procedure of the SAS statistical package (SAS Institute, 1991). Calis is a procedure developed by SAS that utilizes similar statistical techniques as the more commonly used LISREL VII program (Joreskog & Sorbom, 1988).

Calis was chosen over LISREL VII for the present study because it allows for more simple methods of model specification.

Chapter 3

Results

Factor analyses of intrinsic motivation and self-concept

The first questions to be addressed involve the distinctions among the four intrinsic motivation subscales and the distinction between intrinsic motivation and self-concept. Are these distinctions equally valid in groups defined by minority status (minority or non-minority), grade level (2 or 3), education status (gifted or regular education), and gender? To address these questions, confirmatory factor analyses were conducted on the 32 items that comprise the 4 intrinsic motivation subscales (Preference for Challenge, Independent Mastery, Independent Judgment, and Internal Criteria for success and failure) and the two self-concept subscales (Academic and Social). Four pairs of factor analyses were conducted. The first pair was defined by minority status and consisted of Maximum Likelihood factor extraction followed by Procrustean rotation (SAS Institute, 1991) using a six-factor matrix which targeted the each of the 32 items toward its theoretical factor. Subsequent pairwise analyses were conducted grouping by grade, education, and sex. Note that these are overlapping groups; the sample was not sufficiently large to estimate factor loadings reliably for

all sixteen subgroups defined by the interaction of the four groups.

Minority group factor analyses

As indicated in Table 1, the factor loadings for minority students on the intrinsic motivation subscales were highly consistent with the expected distinction among the individual subscales. The distinction between intrinsic motivation and self-concept in minority students is also well supported. Using a semi-partial correlation coefficient of .30 as an arbitrary cut-off value to indicate a significant loading, all of the intrinsic motivation questions loaded significantly on their designated factors except for one of the Preference for Challenge questions. None of the intrinsic motivation questions loaded on any of the other intrinsic motivation or self-concept factors. The distinction between the two self-concept scales was less clear. While all of the academic self-concept items loaded significantly on the appropriate factor, two of the six items loaded significantly on the social self-concept factor as well. Only three of the six social self-concept items loaded on the appropriate factor and all three of these loaded on the academic self-concept factor as well.

For the non-minority population the distinctions among the intrinsic motivation scales were again well supported (see Table 2). All of the items loaded significantly on their expected factors except for one of the Independent

Mastery items. None of the intrinsic motivation items loaded on any of the other intrinsic motivation factors. The distinction between intrinsic motivation and self-concept in this population is not as well supported. Of the twenty intrinsic motivation items, eight of them loaded on the academic self-concept factor as well. Again, the distinction between social and academic self-concept was not as well-supported. All of the academic and social self-concept

Table 1

Factor Analysis for minority students

ITEMS	FACTORS					
	PrefChall	IndepMast	IndepJudg	InterCrit	AcademicSC	SocialSC
PC1	0.588	.	.	.	.	.
PC2	0.480	.	.	.	.	.
PC3	0.552	.	.	.	.	.
PC4	.	.	.	.	.	.
PC5	0.488	.	.	.	.	.
IM1	.	0.391	.	.	.	.
IM2	.	0.410	.	.	.	.
IM3	.	0.445	.	.	.	.
IM4	.	0.511	.	.	.	.
IM5	.	0.576	.	.	.	.
IJ1	.	.	0.446	.	.	.
IJ2	.	.	0.601	.	.	.
IJ3	.	.	0.391	.	.	.
IJ4	.	.	0.514	.	.	.
IJ5	.	.	0.514	.	.	.
IC1	.	.	.	0.585	.	.
IC2	.	.	.	0.604	.	.
IC3	.	.	.	0.481	.	.
IC4	.	.	.	0.514	.	.
IC5	.	.	.	0.425	.	.
AC1	.	.	.	.	0.313	.
AC2	.	.	.	.	0.421	0.435
AC3	.	.	.	.	0.360	.
AC4	.	.	.	.	0.446	0.300
AC5	.	.	.	.	0.317	.
AC6	.	.	.	.	0.401	.
SO1	.	.	.	.	0.516	0.492
SO2	.	.	.	.	0.423	0.486
SO3	.	.	.	.	.	.
SO4	.	.	.	.	.	.
SO5	.	.	.	.	.	.
SO6	.	.	.	.	0.315	0.301

NOTES: Values less than 0.3 have been printed as '.'.
Rotation Method: Procrustes
Reference Structure (Semipartial Correlations)

PC refers to Preference for Challenge items, IM=Independent Mastery, IJ=Independent Judgment, IC=Internal Criteria for Success/Failure, AC=Academic perceived competence, SO=Social perceived competence.

Table 2

Factor Analysis for non-minority students

ITEMS	FACTORS					
	PrefChall	IndepMast	IndepJudg	InterCrit	AcademicSC	SocialSC
PC1	0.476	.	.	.	.	.
PC2	0.462	.	.	.	0.326	.
PC3	0.521	.	.	.	.	.
PC4	0.376	.	.	.	0.464	.
PC5	0.424	.	.	.	0.511	.
IM1	.	0.395	.	.	0.381	.
IM2	.	0.347	.	.	.	.
IM3	.	0.378	.	.	0.390	.
IM4	.	0.405	.	.	.	.
IM5	.	.	.	.	.	.
IJ1	.	.	0.569	.	.	.
IJ2	.	.	0.515	.	.	.
IJ3	.	.	0.309	.	.	.
IJ4	.	.	0.576	.	.	.
IJ5	.	.	0.586	.	.	.
IC1	.	.	.	0.575	.	.
IC2	.	.	.	0.642	0.373	.
IC3	.	.	.	0.498	0.494	.
IC4	.	.	.	0.550	0.473	.
IC5	.	.	.	0.394	.	.
AC1	.	.	.	.	0.314	.
AC2	.	.	.	.	0.305	.
AC3	.	.	.	.	0.426	.
AC4	.	.	.	.	0.431	.
AC5	.	.	.	.	0.308	.
AC6	.	.	.	.	0.547	.
SO1	.	.	.	.	0.403	0.471
SO2	.	.	.	.	0.407	0.619
SO3	.	.	.	.	0.394	0.321
SO4	.	.	.	.	.	0.354
SO5	.	.	.	.	0.492	0.442
SO6	.	.	.	.	.	0.416

NOTES: Values less than 0.3 have been printed as '.'.
Rotation Method: Procrustes
Reference Structure (Semipartial Correlations)

PC refers to Preference for Challenge items, IM=Independent Mastery, IJ=Independent Judgment, IC=Internal Criteria for Success/Failure, AC=Academic perceived competence, SO=Social perceived competence.

items loaded on the appropriate factor. While the academic items did not load on any other factors, four of the social self-concept items loaded on the academic factor as well.

Grade group factor analyses

For second graders (Table 3), the distinctions among the four intrinsic motivation scales were again well supported. All of the items loaded significantly on their expected factors. The distinction between intrinsic motivation and self-concept was also well supported. Only one of the twenty items (Independent Mastery Item 3) loaded on the academic self-concept factor. Again the distinction between academic and social self-concept was less clear. Five of the six academic questions loaded on the appropriate factor. However, four of the six social items loaded on the appropriate factor and all of these loaded on the academic factor as well.

For third graders (Table 4), the intrinsic motivation subscale distinctions were again clear. All of the items loaded on the appropriate factors. Two of the Independent Mastery items loaded on the Preference for Challenge factor; there were no other cross loadings. The distinction between intrinsic motivation and self-concept was very clear in these older children; there were no cross loadings. The distinction between academic and social self-concept was well supported in third graders. All of the items loaded on

Table 3

Factor Analysis for second graders

ITEMS	FACTORS					
	PrefChall	IndepMast	IndepJudg	InterCrit	AcademicSC	SocialSC
PC1	0.518	.	.	.	.	.
PC2	0.447	.	.	.	.	.
PC3	0.507	.	.	.	.	.
PC4	0.312	.	.	.	.	.
PC5	0.475	.	.	.	.	.
IM1	.	0.371	.	.	.	.
IM2	.	0.373	.	.	.	.
IM3	.	0.354	.	.	0.320	.
IM4	.	0.403	.	.	.	.
IM5	.	0.488	.	.	.	.
IJ1	.	.	0.459	.	.	.
IJ2	.	.	0.495	.	.	.
IJ3	.	.	0.332	.	.	.
IJ4	.	.	0.521	.	.	.
IJ5	.	.	0.534	.	.	.
IC1	.	.	.	0.538	.	.
IC2	.	.	.	0.562	.	.
IC3	.	.	.	0.457	.	.
IC4	.	.	.	0.491	.	.
IC5	.	.	.	0.378	.	.
AC1	.	.	.	.	.	.
AC2	.	.	.	.	0.326	.
AC3	.	.	.	.	0.357	.
AC4	.	.	.	.	0.426	.
AC5	.	.	.	.	0.314	.
AC6	.	.	.	.	0.391	.
SO1	.	.	.	.	0.469	0.477
SO2	.	.	.	.	0.397	0.521
SO3	.	.	.	.	.	.
SO4	.	.	.	.	.	.
SO5	.	.	.	.	0.352	0.334
SO6	.	.	.	.	0.372	0.380

NOTES: Values less than 0.3 have been printed as '.'.
. Rotation Method: Procrustes
Reference Structure (Semipartial Correlations)

PC refers to Preference for Challenge items, IM=Independent Mastery, IJ=Independent Judgment, IC=Internal Criteria for Success/Failure, AC=Academic perceived competence, SO=Social perceived competence.

Table 4

Factor Analysis for third graders

ITEMS	FACTORS					
	PrefChall	IndepMast	IndepJudg	InterCrit	AcademicSC	SocialSC
PC1	0.623	.	.	.	.	.
PC2	0.647	.	.	.	.	.
PC3	0.655	.	.	.	.	.
PC4	0.453	.	.	.	.	.
PC5	0.454	.	.	.	.	.
IM1	.	0.439	.	.	.	.
IM2	0.341	0.497	.	.	.	.
IM3	.	0.339	.	.	.	.
IM4	.	0.301	.	.	.	.
IM5	0.407	0.416	.	.	.	.
IJ1	.	.	0.551	.	.	.
IJ2	.	.	0.594	.	.	.
IJ3	.	.	0.404	.	.	.
IJ4	.	.	0.594	.	.	.
IJ5	.	.	0.554	.	.	.
IC1	.	.	.	0.692	.	.
IC2	.	.	.	0.715	.	.
IC3	.	.	.	0.546	.	.
IC4	.	.	.	0.566	.	.
IC5	.	.	.	0.459	.	.
AC1	.	.	.	.	0.392	.
AC2	.	.	.	.	0.314	.
AC3	.	.	.	.	0.491	.
AC4	.	.	.	.	.	.
AC5	.	.	.	.	0.389	.
AC6	.	.	.	.	0.461	.
SO1	.	.	.	.	.	0.566
SO2	.	.	.	.	.	0.728
SO3	.	.	.	.	.	0.417
SO4	.	.	.	.	.	0.465
SO5	.	.	.	.	.	0.460
SO6	.	.	.	.	.	0.383

NOTES: Values less than 0.3 have been printed as '.'.
Rotation Method: Procrustes
Reference Structure (Semipartial Correlations)

PC refers to Preference for Challenge items, IM=Independent Mastery, IJ=Independent Judgment, IC=Internal Criteria for Success/Failure, AC=Academic perceived competence, SO=Social perceived competence.

Gender group factor analyses

For the boys (Table 5), the distinctions among the intrinsic motivation scales were again well supported. All of the items loaded significantly on their expected factors except for one of the Independent Mastery items (Independent Mastery Item 3 which cross-loaded similarly in the second grade factor analysis described above), which loaded only on the Academic self-concept factor. Two of the Independent Criteria items loaded on the Academic factor as well. Thus, there was some support for the distinction between intrinsic motivation and self-concept. The distinction between Academic and Social self-concept in boys was not well supported. While five of the six Academic items and four of the six Social items loaded on the appropriate factor, five of the six social items cross-loaded on the Academic factor.

For girls (Table 6), the distinctions among the intrinsic motivation subscales were exactly as predicted. Every item loaded significantly on its expected factor and there were no cross-loadings. The distinction between intrinsic motivation and self-concept was again well supported. No motivation items loaded on self-concept factors nor did any self-concept items load on intrinsic motivation factors. The distinction between Academic and Social self-concepts was again unclear. All of the Social items loaded on the appropriate factor and there was one cross-loading on Academic. Yet, only three of the Academic

items loaded on the expected factor; the remaining three did not load significantly on any factor.

Table 5

Factor Analysis for boys

ITEMS	FACTORS					
	PrefChall	IndepMast	IndepJudg	InterCrit	AcademicSC	SocialSC
PC1	0.531	.	.	.	.	.
PC2	0.488	.	.	.	.	.
PC3	0.531	.	.	.	.	.
PC4	0.325	.	.	.	.	.
PC5	0.383	.	.	.	.	.
IM1	.	0.339	.	.	.	.
IM2	.	0.371	.	.	.	.
IM3	.	.	.	.	0.328	.
IM4	.	0.428	.	.	.	.
IM5	.	0.346	.	.	.	.
IJ1	.	.	0.445	.	.	.
IJ2	.	.	0.584	.	.	.
IJ3	.	.	0.328	.	.	.
IJ4	.	.	0.520	.	.	.
IJ5	.	.	0.576	.	.	.
IC1	.	.	.	0.597	.	.
IC2	.	.	.	0.647	.	.
IC3	.	.	.	0.476	0.440	.
IC4	.	.	.	0.486	0.344	.
IC5	.	.	.	0.382	.	.
AC1	.	.	.	.	.	.
AC2	.	.	.	.	0.327	.
AC3	.	.	.	.	0.374	.
AC4	.	.	.	.	0.352	.
AC5	.	.	.	.	0.302	.
AC6	.	.	.	.	0.433	.
SO1	.	.	.	.	0.525	0.523
SO2	.	.	.	.	0.461	0.535
SO3	.	.	.	.	0.386	.
SO4	.	.	.	.	.	.
SO5	.	.	.	.	0.462	0.369
SO6	.	.	.	.	0.367	0.377

NOTES: Values less than 0.3 have been printed as '.'.
Rotation Method: Procrustes
Reference Structure (Semipartial Correlations)

PC refers to Preference for Challenge items, IM=Independent Mastery, IJ=Independent Judgment, IC=Internal Criteria for Success/Failure, AC=Academic perceived competence, SO=Social perceived competence.

Table 6

Factor Analysis for girls

ITEMS	FACTORS					
	PrefChall	IndepMast	IndepJudg	InterCrit	AcademicSC	SocialSC
PC1	0.550	.	.	.	.	.
PC2	0.505	.	.	.	.	.
PC3	0.536	.	.	.	.	.
PC4	0.358	.	.	.	.	.
PC5	0.476	.	.	.	.	.
IM1	.	0.362	.	.	.	.
IM2	.	0.402	.	.	.	.
IM3	.	0.471	.	.	.	.
IM4	.	0.453	.	.	.	.
IM5	.	0.515	.	.	.	.
IJ1	.	.	0.536	.	.	.
IJ2	.	.	0.510	.	.	.
IJ3	.	.	0.359	.	.	.
IJ4	.	.	0.583	.	.	.
IJ5	.	.	0.562	.	.	.
IC1	.	.	.	0.610	.	.
IC2	.	.	.	0.605	.	.
IC3	.	.	.	0.480	.	.
IC4	.	.	.	0.526	.	.
IC5	.	.	.	0.424	.	.
AC1	.	.	.	.	.	.
AC2	.	.	.	.	.	.
AC3	.	.	.	.	0.427	.
AC4	.	.	.	.	0.404	.
AC5	.	.	.	.	.	.
AC6	.	.	.	.	0.393	.
SO1	.	.	.	.	.	0.429
SO2	.	.	.	.	.	0.598
SO3	.	.	.	.	.	0.321
SO4	.	.	.	.	.	0.417
SO5	.	.	.	.	0.360	0.340
SO6	.	.	.	.	.	0.430

NOTES: Values less than 0.3 have been printed as '.'.
Rotation Method: Procrustes
Reference Structure (Semipartial Correlations)

PC refers to Preference for Challenge items, IM=Independent Mastery, IJ=Independent Judgment, IC=Internal Criteria for Success/Failure, AC=Academic perceived competence, SO=Social perceived competence.

Education group factor analyses

For students in gifted education programs (Table 7), the distinctions among the intrinsic motivation subscales were exactly as predicted. Every item loaded significantly on its expected subscale and there were no cross-loadings. The distinction between intrinsic motivation and self-concept was again well supported. There were no cross-loadings between the two domains. Again, there was difficulty distinguishing between Academic and Social self-concepts. While five of the six Social items loaded on the appropriate factor, three of these five items loaded on the Academic factor and the sixth Social item loaded only on the Academic factor. Only three of the six Academic items loaded on the expected factor.

For students in regular education programs (Table 8), the distinctions among the intrinsic motivation subscales received support. All of the Preference for Challenge and Internal Criteria items loaded on the expected factors and four of the five Independent Judgment items loaded on the expected factor. Only three of the five Independent Mastery items loaded on the appropriate factor. There were no cross-loadings for any of the motivation items. The distinction between intrinsic motivation and self-concept was well supported. There no cross-loadings between the two domains. Again, the distinction between Academic and Social self-concept was not supported in this population. Five of

Table 7

Factor Analysis for students in gifted education programs

ITEMS	FACTORS					
	PrefChall	IndepMast	IndepJudg	InterCrit	AcademicSC	SocialSC
PC1	0.555	.	.	.	.	.
PC2	0.538	.	.	.	.	.
PC3	0.550	.	.	.	.	.
PC4	0.365	.	.	.	.	.
PC5	0.445	.	.	.	.	.
IM1	.	0.387	.	.	.	.
IM2	.	0.393	.	.	.	.
IM3	.	0.477	.	.	.	.
IM4	.	0.453	.	.	.	.
IM5	.	0.412	.	.	.	.
IJ1	.	.	0.566	.	.	.
IJ2	.	.	0.576	.	.	.
IJ3	.	.	0.412	.	.	.
IJ4	.	.	0.556	.	.	.
IJ5	.	.	0.541	.	.	.
IC1	.	.	.	0.614	.	.
IC2	.	.	.	0.612	.	.
IC3	.	.	.	0.496	.	.
IC4	.	.	.	0.533	.	.
IC5	.	.	.	0.405	.	.
AC1	.	.	.	.	.	.
AC2	.	.	.	.	.	.
AC3	.	.	.	.	0.413	.
AC4	.	.	.	.	.	.
AC5	.	.	.	.	0.306	.
AC6	.	.	.	.	0.443	.
SO1	.	.	.	.	0.394	0.478
SO2	.	.	.	.	0.301	0.599
SO3	.	.	.	.	0.332	.
SO4	.	.	.	.	.	0.365
SO5	.	.	.	.	0.453	0.389
SO6	.	.	.	.	.	0.423

NOTE: Values less than 0.3 have been printed as '.'.
Rotation Method: Procrustes
Reference Structure (Semipartial Correlations)

PC refers to Preference for Challenge items, IM=Independent Mastery, IJ=Independent Judgment, IC=Internal Criteria for Success/Failure, AC=Academic perceived competence, SO=Social perceived competence.

Table 8

Factor Analysis for students in regular education programs

ITEMS	FACTORS					
	PrefChall	IndepMast	IndepJudg	InterCrit	AcademicSC	SocialSC
PC1	0.425	.	.	.	.	.
PC2	0.428	.	.	.	.	.
PC3	0.511	.	.	.	.	.
PC4	0.348	.	.	.	.	.
PC5	0.443	.	.	.	.	.
IM1	.	.	.	.	.	.
IM2	.	0.395	.	.	.	.
IM3	.	.	.	.	.	.
IM4	.	0.640	.	.	.	.
IM5	.	0.388	.	.	.	.
IJ1	.	.	0.311	.	.	.
IJ2	.	.	0.453	.	.	.
IJ3	.	.	.	.	.	.
IJ4	.	.	0.533	.	.	.
IJ5	.	.	0.664	.	.	.
IC1	.	.	.	0.511	.	.
IC2	.	.	.	0.646	.	.
IC3	.	.	.	0.523	.	.
IC4	.	.	.	0.456	.	.
IC5	.	.	.	0.441	.	.
AC1	.	.	.	.	0.317	.
AC2	.	.	.	.	0.426	0.350
AC3	.	.	.	.	.	.
AC4	.	.	.	.	0.389	0.353
AC5	.	.	.	.	0.347	.
AC6	.	.	.	.	0.332	.
SO1	.	.	.	.	0.415	0.462
SO2	.	.	.	.	0.506	0.474
SO3	.	.	.	.	0.300	.
SO4	.	.	.	.	0.352	0.309
SO5	.	.	.	.	.	.
SO6	.	.	.	.	0.395	0.347

NOTE: Values less than 0.3 have been printed as '.'.
Rotation Method: Procrustes
Reference Structure (Semipartial Correlations)

PC refers to Preference for Challenge items, IM=Independent Mastery, IJ=Independent Judgment, IC=Internal Criteria for Success/Failure, AC=Academic perceived competence, SO=Social perceived competence.

the six Academic items loaded on the expected factor, but two of these five loaded on the Social factor as well. Four of the six social items loaded on the social factor, but all of these loaded on the Academic factor as well. One of the two remaining Social items loaded only on the Academic factor.

In summary, the distinctions among the intrinsic motivation subscales were well-supported in the groups defined by Minority, Grade, Gender, and Education. The distinction between intrinsic motivation and self-concept was generally well supported in these groups. In contrast, with few exceptions, the distinction between Academic and Social self-concept did not receive support in these analyses. Despite copious research support for the distinction between these domains of perceived competence in older children, it appears that younger children may not readily differentiate their self-concept in the same manner. In light of this validity problem, social and academic perceived competence scores will be combined in subsequent analyses and treated as a single construct of perceived competence. These preliminary analyses suggest that this measure of intrinsic motivation as conceptualized and validated by Harter (1981) into distinct domains may be appropriately used (in our sample) with minority and non-minority populations, with boys as well as girls, with high ability as well as average ability children, and with

children as young as 7 years (second graders as well as third graders).

It is worthy of note that while the intrinsic motivation factors received strong overall support in the eight groups investigated here, it may prove problematic to generalize this internal validity to other populations. A specific caveat regarding developmental validity is appropriate here. While no significant differences were shown between the gifted and regular program students overall, one cannot presume that a homogeneous second grade, average ability population would show similar validity. This population consists of a large proportion of cognitively precocious (Cornell et al., 1992a) students selected for gifted education programs. Without factor analyses on the groups defined by the interaction of the four variables of interest (e.g. minority, gifted, second grade boys), caution should be used in generalizing to other populations of interest. This validity question for other samples is also applicable to potential minority and gender group differences.

Group mean differences in intrinsic motivation

The factor analyses demonstrated that there are few group differences in the distinctions among intrinsic motivation subscales, or between intrinsic motivation and self-concept. The next step was to investigate group mean differences in intrinsic motivation. Multivariate analyses

of variance (MANOVAs) were conducted with the four intrinsic motivation subscales as the dependent variables. The independent variables in the initial analysis included grade level (2 or 3), education status (gifted or regular education), minority status (minority or non-minority), sex, and all permutations of two-, three-, and four-way interactions. In the interest of clarity, only the results from a follow-up MANOVA omitting the insignificant interaction effects will be reported. In this MANOVA, there were significant main effects for grade level, $F(4, 965) = 7.19$, $p<.0001$, and for sex, $F(4, 965) = 2.66$, $p<.03$. The main effects for education status, $F(4, 965) = 1.23$, and for minority status, $F(4, 965) = 0.93$, were not significant. The only significant interaction effects were for grade level * minority status, $F(4, 965) = 3.64$, $p<.006$, and for sex * minority status, $F(4, 965) = 3.5$, $p<.008$.

Follow-up univariate analyses of variance (ANOVAs) were conducted with each of the intrinsic motivation subscales, using the significant predictors from the MANOVA described above. While the overall model for independent mastery behavior was significant, $F(6,968) = 2.2$, $p<.04$, it accounted for only 1.3 % of the variance in the dependent variable and none of the independent variables were significant predictors. Means are reported in Table 9.

For preference for challenge, the model was significant, $F(6, 968) = 3.30$, $p<.003$, yet accounted for

only 2 percent of the variance in the dependent variable. The only significant single predictor was the sex * minority interaction effect ($p<.002$), means are reported in Table 10. Minority girls were not significantly different in preference for challenge than minority boys. Non-minority boys preferred greater challenge than did non-minority girls ($t=3.85$, $p<.0001$).

For independent judgment, the model was significant, $F(6, 968) = 6.13$, $p<.0001$, accounting for 3.7 % of the variance. The main effects for grade level ($p<.001$) and for sex ($p<.008$) were significant. The grade * minority interaction was significant ($p<.004$), means are reported in Table 11. Boys reported higher levels of independent judgment than did girls. Overall, third graders reported higher levels of independent judgment than did second graders. Minority third graders had greater independent judgment than did minority second graders ($t=3.44$, $p<.0008$). There were no significant differences between the non-minority second and third graders.

Table 9

Independent Mastery Behavior by Grade, Sex, and Minority Status

Grade	Sex		Minority Status: Minority	Non-Minority	ALL
2	Boys	N	72.00	154.00	226.00
		MEAN	3.10	3.38	3.29
		STD	0.70	0.68	0.70
	Girls	N	100.00	150.00	250.00
		MEAN	3.24	3.32	3.28
		STD	0.70	0.59	0.64
	ALL	N	172.00	304.00	476.00
		MEAN	3.18	3.35	3.29
		STD	0.70	0.64	0.67
3	Boys	N	8.00	79.00	87.00
		MEAN	3.32	3.39	3.39
		STD	0.71	0.60	0.60
	Girls	N	12.00	76.00	88.00
		MEAN	3.15	3.13	3.13
		STD	0.93	0.65	0.69
	ALL	N	20.00	155.00	175.00
		MEAN	3.22	3.26	3.26
		STD	0.84	0.63	0.66

Table 10

Preference for Challenge by Grade, Sex, and Minority Status

Grade	Sex		Minority Status: Minority	Minority Status: Non-Minority	ALL
2	Boys	N	72.00	154.00	226.00
		MEAN	3.10	3.29	3.23
		STD	0.74	0.82	0.80
	Girls	N	100.00	150.00	250.00
		MEAN	3.17	3.05	3.10
		STD	0.84	0.79	0.81
	ALL	N	172.00	304.00	476.00
		MEAN	3.14	3.17	3.16
		STD	0.80	0.81	0.81
3	Boys	N	8.00	79.00	87.00
		MEAN	3.47	3.42	3.43
		STD	0.80	0.78	0.77
	Girls	N	12.00	76.00	88.00
		MEAN	3.52	3.08	3.14
		STD	0.58	0.88	0.85
	ALL	N	20.00	155.00	175.00
		MEAN	3.50	3.26	3.28
		STD	0.66	0.84	0.82

Table 11

Independent Judgment by Grade, Sex, and Minority Status

Grade	Sex		Minority Status: Minority	Minority Status: Non-Minority	ALL
2	Boys	N	72.00	154.00	226.00
		MEAN	2.03	2.17	2.12
		STD	0.71	0.69	0.70
	Girls	N	100.00	150.00	250.00
		MEAN	1.81	2.06	1.96
		STD	0.74	0.74	0.75
	ALL	N	172.00	304.00	476.00
		MEAN	1.91	2.11	2.04
		STD	0.73	0.72	0.73
3	Boys	N	8.00	79.00	87.00
		MEAN	2.12	2.16	2.16
		STD	0.82	0.84	0.83
	Girls	N	12.00	76.00	88.00
		MEAN	2.44	2.13	2.17
		STD	0.92	0.80	0.81
	ALL	N	20.00	155.00	175.00
		MEAN	2.31	2.15	2.16
		STD	0.87	0.82	0.82

For internal criteria for success and failure, the model was significant, $F(6, 968) = 7.71$, $p<.0001$, accounting for 4.6 % of the variance. There was a significant main effect for grade level ($p<.0001$). There were significant interactions for grade * minority ($p<.003$) and sex * minority ($p<.005$); means are reported in Table 12. Overall, third graders reported greater internality than did second graders. For the minority students, third graders reported greater internality than did second graders ($t=4.01$, $p<.0001$). For the non-minority students, there were no significant differences between second and third graders. Non-minority boys indicated greater internality than did non-minority girls. There were no significant sex differences for the minority children.

In summary, there were no differences between students in gifted education programs and those in regular education programs on any of the motivational subscales. There were no group mean differences in Independent Mastery behavior. Sex X minority group differences were found in Preference for Challenge: non-minority boys preferred greater challenge than non-minority girls. For Independent Judgment, grade, sex, and grade X minority interaction effects were observed: third graders were more independent than second graders; boys were more independent than girls; minority third graders were more independent than minority second graders. For Internal Criteria for success and failure, grade, grade

X minority, and sex X minority effects were found: third graders were more internal; non-minority second graders and minority third graders were more internal; Non-minority boys were more internal than non-minority girls. These analyses indicate the existence of differences in the intrinsic motivation of children with differing background characteristics. The next question is "What is the relationship between intrinsic motivation and behavior?".

Table 12

Internal Criteria for Success and Failure by Grade, Sex, and Minority Status

Grade	Sex		Minority Status: Minority	Minority Status: Non-Minority	ALL
2	Boys	N	72.00	154.00	226.00
		MEAN	2.07	2.44	2.32
		STD	0.81	0.85	0.85
	Girls	N	100.00	150.00	250.00
		MEAN	2.18	2.33	2.27
		STD	0.87	0.87	0.87
	ALL	N	172.00	304.00	476.00
		MEAN	2.13	2.39	2.29
		STD	0.85	0.86	0.86
3	Boys	N	8.00	79.00	87.00
		MEAN	2.42	2.68	2.66
		STD	1.09	0.88	0.90
	Girls	N	12.00	76.00	88.00
		MEAN	2.91	2.43	2.50
		STD	1.00	0.82	0.86
	ALL	N	20.00	155.00	175.00
		MEAN	2.71	2.56	2.58
		STD	1.04	0.86	0.88

Relations between intrinsic motivation and behavior problems

The relations between intrinsic motivation and behavior problems were explored using canonical correlation followed by univariate regressions in a strategy analogous to the MANOVA-ANOVA step-down strategy used above. The independent variables were the four intrinsic motivation subscales; the dependent variables were the problem behavior scales for the Teacher Report Form (TRF) of the Achenbach Child Behavior Checklist. Because the TRF scales are different for boys and girls, the analyses were performed separately for each gender group. In view of the grade differences reported above, a partial canonical correlation was performed in which the relation with grade was removed from both the independent and dependent variables. The partial canonical correlation for boys indicated a significant relation between the intrinsic motivation variables and behavior problems, $F(32, 1602) = 1.81$, $p<.004$. The canonical correlation between intrinsic motivation and behavior problems was equal to .26, which accounts for 7% of the variance in behavior problems in boys.

The partial canonical correlation for girls indicated a significant relation between the intrinsic motivation variables and behavior problems, $F(32, 1819) = 2.03$, $p<.0006$. The canonical correlation between intrinsic motivation and behavior problems was equal to .27, which

accounts for 7% of the variance in behavior problems in girls.

Follow-up univariate multiple regressions were conducted to determine which specific behavior syndromes were predictable from intrinsic motivation. Grade and the intrinsic motivation subscales were the independent variables. For boys, significant effects were found for the TRF subscales Unpopular, Obsessive-compulsive, and Inattentive. For Unpopular with Peers, the model was significant, $F(5, 441) = 2.14$, $p<.05$, accounting for 2.4 % of the variance. Preference for challenge was the only significant predictor, B = -.30 ($p<.03$). For Obsessive-compulsive behavior, the model was significant, $F(5, 441) = 2.34$, $p<.04$, accounting for 2.6 % of the variance. Internal criteria for success and failure was the only significant predictor, B = -.19 ($p<.04$). For Inattentive behavior, the model was significant, $F(5, 441) = 3.71$, $p<.003$, accounting for 4.0 % of the variance. Preference for challenge was the only significant predictor, B = -1.29 ($p<.008$). In summary, these findings suggest that boys who prefer challenge tend to be more popular and less inattentive in class. Boys who are more self-reliant for their evaluation of their own work tend to exhibit less obsessive-compulsive behavior.

For girls, Independent Mastery behavior emerged as the single predictor of behavior problems. Univariate regressions with Social Withdrawal, Unpopular, Inattentive,

and Aggressive subscales demonstrate a consistent negative relation between these problems and Independent Mastery behavior. For Social Withdrawal behavior, the model was significant, $F(5, 500) = 2.25$ ($p<.05$), accounting for 2.2 % of the variance ($B= -.42$, $p<.002$). For Unpopularity with peers, the model was significant, $F(5, 500) = 3.52$ ($p<.004$), accounting for 3.4 % of the variance ($B = -.25$, $p<.005$). For Inattentive behavior, the model was significant, $F(5, 500) = 2.83$ ($p<.02$), accounting for 2.7 % of the variance ($B = -.75$, $p<.03$). For Aggressive behavior, the model was significant, $F(5, 500) = 4.00$ ($p<.001$), accounting for 3.9 % of the variance ($B = -1.66$, $p<.0004$).

It is interesting to note that while there is a negative relation between intrinsic motivation and behavior problems for both boys and girls, the single subscale predictor differs across gender. For boys, Preference for Challenge was negatively related to the Unpopular and Inattentive subscales and Independent Criteria for Success and Failure was negatively related to the Obsessive-Compulsive behavior syndrome. For girls, the only significant predictor was Independent Mastery behavior, which was negatively related to Social Withdrawal, Unpopular, Inattentive, and Aggressive subscales.

A causal model of the relations among achievement and related cognitions.

The previous analyses have addressed questions of internal, external, and predictive, but not longitudinal validity of the intrinsic motivation measure. In this final section, the longitudinal and multivariate nature of the data were utilized in an effort to develop a causal model. The logic of cross lag panel inference was employed.

In the simple bivariate, two wave case, cross-lag correlation could be used. Consider the example of variables A and B measured at two points in time. An estimate of the causal influence of variable A upon variable B other could be inferred from the partial correlation coefficient that estimates the relation between variable A at time 1 and variable B at time 2, partialing out the initial correlation of A and B measured at time 1, as well as the autologous correlation or stability coefficient of B (the correlation of B measured at time 1 and B measured at time 2). There are several deficiencies of this simple correlational technique in addressing the complex issue of causality (see Cook & Campbell, 1979 for a thorough critique). In the present study, two problems are prohibitive. First, the question of causality among achievement, intrinsic motivation, and perceived competence begins with too many constructs to accommodate with a simple bivariate partial correlation.

Second, the previously reported factor analyses suggest that each of these constructs are not unitary phenomena and can be distinguished into several subscales. The alternative method of hierarchical regression would also be considered inadequate to address the causal question because it does not allow for multivariate dependent variables. Canonical correlation, the multivariate version of regression, does not provide reliable estimation of multivariate partial correlations (Cook & Campbell, 1979; Blalock, 1985).

Because of the limitations of cross-lag panel correlation, hierarchical regression, and canonical correlation, structural equation modeling was employed as a more flexible multivariate method. Specifically, this study used the Calis Procedure (SAS Institute, 1991). This procedure combines elements of factor analysis and regression into a single analysis. It permits use of the logic of cross-lag panel inference in a regression design but makes use of both multivariate predictors and multivariate outcome measures.

The hypothesized causal relations among four latent constructs were investigated: Intrinsic Mastery Motivation (subscales Preference for Challenge and Independent Mastery behavior); Autonomous Judgment (using subscales Independent Judgment and Internal Criteria for success/failure); Perceived Competence (using subscales Perceived Academic

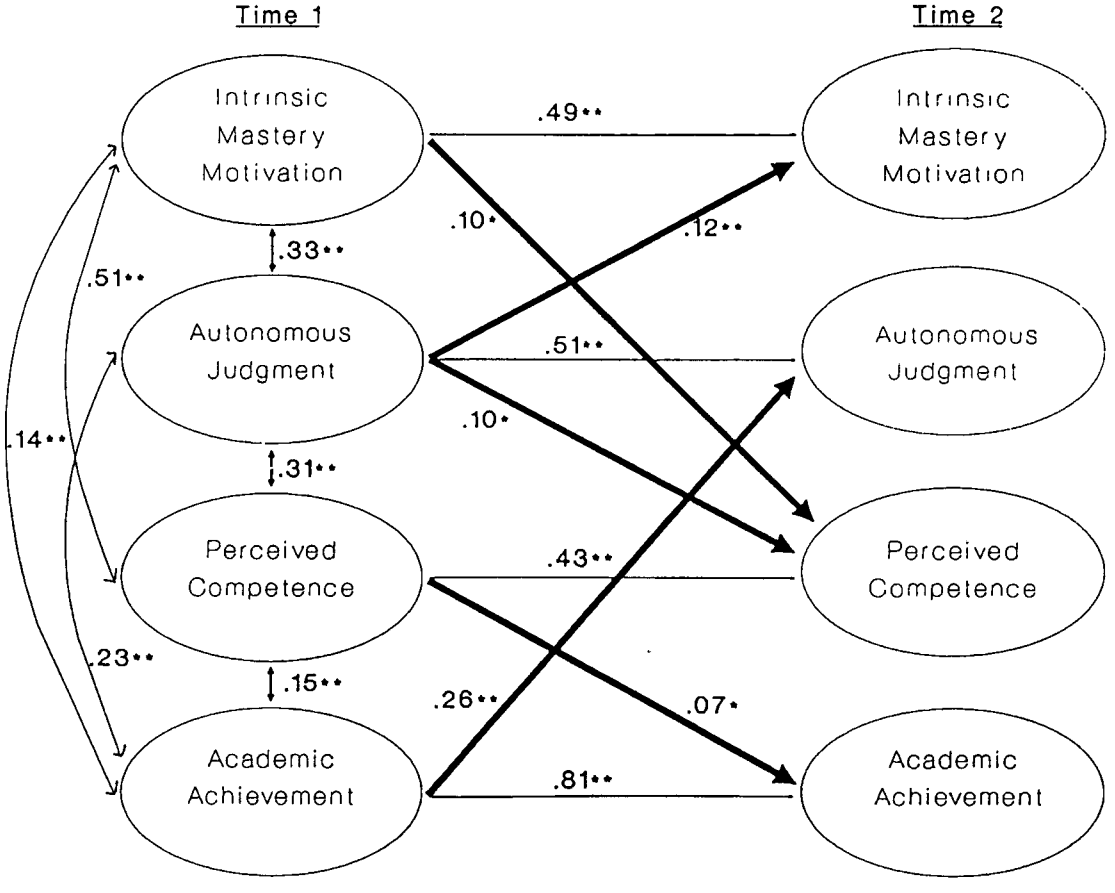
Competence and Perceived Social Competence); and Academic Achievement (using subtests for Reading, Math Concepts, and Math Problem Solving).

The structural model with significant estimates of path coefficients is presented in Figure 1. The model estimated relations between each of the four constructs at time 1 and time 2. All constructs demonstrated good stability over the course of the year, particularly achievement (stability coefficient=.81). In addition to the autologous correlations, the following cross-lag paths were significant: Intrinsic Mastery Motivation and Autonomous Judgment contribute to subsequent perceived competence. Autonomous Judgment contributes to subsequent Intrinsic Mastery Motivation. Achievement contributes to Autonomous Judgment. Perceived competence is the significant predictor of later achievement.

The model (which does not estimate the cross-lag paths that were not significant) provided a very good fit to the data as reflected in a Goodness-of-Fit statistic of 0.937 and root mean square residual (RMR) of 0.064 (the Chi-square value was 163 with 13 degrees of freedom). The null model, or isolated stability model without cross-lag paths had a Goodness-of-Fit of 0.898 and RMR of 0.113 (the Chi-square value was 272 with 18 degrees of freedom). The goodness of fit statistic ranges between 0 and 1 with large values reflecting better fit based upon maximal observed covariance

among estimated parameters and minimal residuals (Herting & Costner, 1985). The goodness of fit index is not dependent upon sample size (as is the Chi-square statistic that can be useful with smaller samples with minimal deviations from normality) and is "relatively robust against departures from normality" (Joreskog & Sorbom, 1988). The RMR is an index of the square of the average size of the residual or error term for the parameter estimates.

Figure 1.
Exploratory Causal Model



Chapter 4

Discussion

The results of this study support the internal and external validity of the concept of intrinsic motivation as measured by Harter's (1981) scales. These issues of internal and external validity will be addressed in separate sections based upon minority, program, grade, and gender status. Next, the relation between intrinsic motivation and behavior problems will be discussed. Finally, the exploratory causal model developed through structural equation modeling and its substantive and methodological implications for future research will be discussed.

In general, the factor analyses provide support for Harter's assertion that intrinsic motivation can be reliably differentiated into at least four domains: preference for challenge, independent mastery behavior, independent judgment, and internal criteria for success and failure.

Correlations among these first order factors suggest that these four domains can be usefully grouped as the second order factors intrinsic mastery motivation (R=.54 between Independent Mastery Behavior and Preference for Challenge) and autonomous judgment (R=.44 between Independent Judgment and Internal Criteria for Success and Failure), as asserted by Harter (1981). The improved fit of structural models which employed the higher order factors

supports this assertion. In sum, the motivational scales show good internal validity.

In general, factor analyses demonstrate that the intrinsic motivation scales can be reliably distinguished from the perceived competence scales. Intrinsic motivation was demonstrated to be related to, yet distinct from perceived competence. Thus, support was provided for the external validity of the motivational scales.

Minority group differences.

The results of the factor analyses suggested that Harter's measure of intrinsic motivation is appropriate for use in minority as well as non-minority populations. Both minority and non-minority students seem to distinguish between intrinsic motivation and perceived competence. However, the students do not distinguish clearly between academic and social perceived competence. This distinction is particularly unclear for minority students. This finding is consistent with a previous investigation of self-concept distinctions among White and African-American students using the same project data (Cornell et al., 1992b). In a previous factor analysis of social and academic self-concept, the distinction between the two domains was supported in White but not African-American students. While these findings require replication in another sample, they suggest that the distinction between the constructs of academic and social self-concept may not generalize across

minority groups. This lends support to the contention that the self-concept of minority students may have a qualitatively different structure than what is commonly found in White students.

There were no simple mean differences in intrinsic motivation between minority and non-minority students, but there were interactions between minority status and gender. Minority girls preferred greater challenge than non-minority girls. In contrast, non-minority boys reported greater preference for challenge than minority boys.

The reason for a sex X minority group interaction is not clear. It is a common finding that minorities tend to score lower than non-minorities on standardized achievement tests (Helms, 1992). Are many of the issues regarding the appropriateness of standardized achievement tests such as differential test validity, test bias and cultural equivalence of the measures, applicable to achievement related cognitions such as intrinsic motivation and self-concept? The relatively poor internal validity of the perceived competence scales as shown in the minority group factor analyses raises questions about the meaning of self-concept and the utility of the Perceived Competence Scales (Harter, 1982) with young minority children. It is difficult to interpret mean group differences if the factor structure of a measure is different between the groups. These results suggest that a sex X minority factor analysis

might be helpful in an effort to understand the meaning of self-concept and intrinsic motivation in minority girls, non-minority girls, minority boys, and non-minority boys.

The finding that non-minority boys show greater preference for challenge than minority boys is consistent with the observations of minority differences in achievement (Helms, 1992). This observed difference in preference for challenge is also consistent with popular notions that minorities have lower self-esteem and reject majority culture values such as conventional work ethic and challenge seeking (Ogbu, 1981). However, this popular notion that minorities have lower self-esteem has received little empirical support (Harter, 1985). Furthermore, it should be noted that other work from the Learning Outcomes Project (LOP) did not find minority group mean differences in perceived competence or self-esteem (Cornell et al., 1992b). Thus, the evidence for differences in social cognition between minority and non-minority boys is mixed. Minority differences are not the focus of the present study. Further study of intrinsic motivation and self-concept among different minority groups (e.g. African-Americans, Hispanic, Asians), controlling for SES effects is recommended.

It is difficult to interpret with confidence the unanticipated finding that minority girls report greater preference for challenge than non-minority girls. Intrinsic motivation is related to self-concept and academic

achievement as shown in the present study and in prior work (e.g. Harter & Connell, 1984). The minority sample is predominantly African-American; African-American girls tend to have higher self-esteem than girls from other ethnic groups (Steinberg, Dornbusch, & Brown, 1992, cited in Kofkin, 1993). Socioeconomic status (SES) is correlated with minority group membership in our sample. At low SES, girls tend to have an academic edge over boys (AAUW report of High School and Beyond Study, cited in Kofkin, 1993). Given the interdependence of perceived competence, achievement and intrinsic mastery motivation in the exploratory causal model derived from the full heterogeneous sample, it would be interesting to investigate whether these relations vary in different groups defined by minority status and gender. This possibility is consistent with a previous finding that for white students perceived academic competence correlated significantly with academic achievement while no significant correlation was demonstrated for African-American students (Cornell et al., 1992). One way to investigate the possibility of different correlations underlying observed mean differences would be to test correlational models in different groups. Evaluating the comparative fit and estimating correlations among the constructs of self-concept and intrinsic mastery motivation in structural models developed in four groups defined by minority X sex would address this possibility.

Within the second grade, minority students reported less independent judgment and internalized success criteria than non-minority students. For the third graders, the opposite pattern of minority status differences were observed. It seems as if the minority students begin second grade with a less internalized sense of their own performance. By third grade, they seem to have similar schema to non-minority students. Perhaps the socializing effect of the school system and the majority culture begins to exert an effect that leads children to view the world more similarly to adults. However, the variance within the minority status groups does not decrease from grade 2 to grade 3. In other words, while third graders do show a greater preference to judge their own performance than do second graders, it does not seem that children become more homogeneous between second and third grade in this preference.

Grade group differences

It is interesting to note that factor analyses suggest that the intrinsic motivation measure is appropriate for use with academically capable children in the beginning of their second grade. This measure had previously been validated with children as young as third graders.

The analyses did reveal developmental differences in intrinsic motivation. The MANOVA-ANOVAs indicated that there were significant mean differences between second and

third graders on the autonomous judgment subscales. Third graders reported greater independent judgment (explaining 1.3% of the variance) and more internal criteria for success and failure (explaining 2.1 % of the variance). These findings are consistent with the developmental trend reported by Harter (1981) for her standardization sample. They extend the finding to second graders and provide further support for the explanation that as children mature, they develop an increasingly internalized schema for evaluating their performance.

Gender group differences.

Boys reported higher levels of independent judgment than did girls. This sole gender main effect is interesting in light of prior research findings on gender differences in motivational response to praise (Kast, 1983 cited in Deci & Ryan, 1985; Zinser, Young, & King, 1982). A study by Zinser, Young, and King (1982) found that boys in second and third grade tended to interpret feedback as a source of information about their performance whereas girls in this age group seemed biased to view the feedback as an effort by adults to control their behavior. Informational feedback was viewed as supportive of the children's interest and had positive effects on children's intrinsic motivation. Controlling feedback was viewed as an extrinsic effort by adults to control children's interest and had an undermining effect on the children's intrinsic motivation. This

inference regarding the motivation of the feedback provider was hypothesized by the authors to play a critical role in determining subsequent intrinsic motivation. If students evaluate feedback as informational, their intrinsic motivation should increase; if students evaluate feedback as controlling, intrinsic motivation should decrease.

Kast (1983, cited in Deci & Ryan, 1985) provided support for this hypothesized relation between feedback and intrinsic motivation. In a quasi-experimental study of early elementary school children, Kast varied the informational versus controlling components of feedback given to boys and girls. Informational feedback led to intrinsic motivation; controlling feedback decreased subsequent intrinsic motivation. When feedback was ambiguous, boys tended to interpret it as informational and increase their intrinsically motivated behavior (e.g. spontaneously engaging in the previously praised activity) whereas girls tended to interpret ambiguous feedback as controlling and decrease their intrinsically motivated behavior. Boys' higher level of independent judgment, such as that found in the present study, may provide a buffer against the unfortunate tendency -- more often seen in girls -- to internalize ambiguous praise as controlling and to suffer a decrease in intrinsic motivation.

Education group differences.

The results of this study indicate little difference in intrinsic motivation between elementary school students recently placed in gifted programs and comparison students in regular education programs. Factor analyses suggest that both groups of students respond to questions in a way that is consistent with the theoretical distinctions between the differing subscales representing intrinsic motivation and those of academic and social self-concept. The factor analytic results also are consistent with the standardization samples for the instruments (Harter, 1981; 1982).

Multivariate and univariate analyses of variance indicate that there are no mean differences between students in gifted programs and their regular education peers. This finding is consistent with the hypothesis that there would not be program type differences for the intrinsic mastery motivation subscales, Preference for Challenge and Independent Mastery Behavior. However, it was expected that children in gifted programs would be intellectually precocious and that this precocity would be reflected in higher scores on the autonomous judgment subscales, Internal Criteria for Success/Failure and Independent Judgment. Developmental trends in these scales suggest that older, more cognitively advanced children demonstrated greater autonomous judgment (Harter, 1981) and it was predicted that

children in gifted programs might also have more autonomous judgment. This hypothesis was not supported by the data. One possible explanation for this finding is that autonomous judgment is less related to native cognitive ability than it is to experience with the way in which schoolwork is evaluated.

Intrinsic motivation and behavior problems

Both Autonomous Judgment subscales, Internal Criteria for Success and Failure (IC) and Independent Judgment were unrelated to behavior problems in boys or girls, with one exception: IC was a significant negative predictor of Obsessive-Compulsive behavior in boys. It seems that boys who are more secure in their own judgments regarding their performance are less likely to obsess and worry, or to engage in anxiously repetitive behaviors.

The Intrinsic Mastery Motivation (IMM) subscales, Independent Mastery behavior (IM) and Preference for Challenge (PC) were negatively related to behavior problems in girls and boys, respectively. This observation that the more behavioral outcome measures (IM and PC) are better predictors than the Autonomous Judgment (AJ) subscales (Internal Criteria for Success and Failure, Independent Judgment) further supports the idea that one higher order factor (IMM) is behavioral in nature and the other (AJ) is cognitive-informational in nature. For example, the item that indicates that a child prefers to do challenging work

which is interesting (versus easy work that is less interesting) is a self-statement about behavior. Alternatively, the item that indicates that a child believes that s/he knows whether s/he has done good work on a test before receiving the grade from the teacher is a self-statement about the child's beliefs. That is, it was predicted that Intrinsic Mastery Motivation comprised of behavioral indices such as challenge seeking and independent mastery behavior would be more closely related to behavior (problems or strengths) than would beliefs or internal criteria for evaluation.

The negative relation between Intrinsic Mastery Motivation and behavior problems is also consistent with the hypothesis that intrinsic motivation is adaptive and may have a potential buffering effect against the deleterious effects of the controlling feedback that adults give children in a well-intentioned effort to motivate children to achieve. Controlling feedback has been demonstrated to decrease children's spontaneous interest in learning, persistence, and choice of challenging pursuits (Dweck, 1986; Kast, 1983 cited in Deci & Ryan, 1985).

For both boys and girls, Independent Mastery Motivation is negatively related to Inattentive Behavior and Unpopularity. Children who prefer challenge and are more independent tend to be more attentive to the teacher and more popular with peers. It is interesting to note that

these children are at once more independent, yet more interactive with others. One possible explanation for this somewhat counter-intuitive finding is that intrinsically motivated children may be engaging in more active behavior than less motivated students. Time spent attending to teachers and peers do not appear to be mutually exclusive. Intrinsically motivated children are not limited in their ability to engage with others by spending a portion of their finite time in independent behavior. Rather, these children may be more active and spend more time than less motivated peers both in interaction with others and in independent activity.

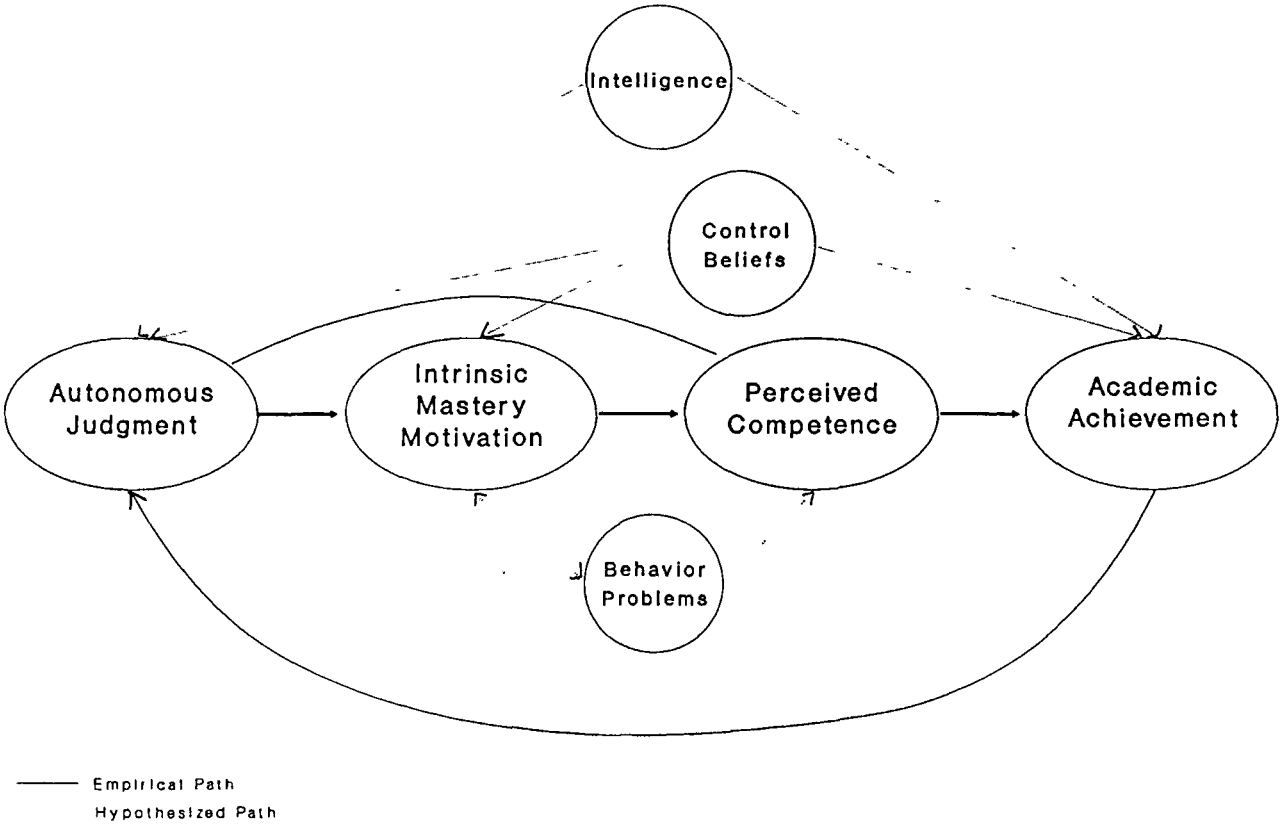
There is a gender difference in which subscale of Intrinsic Mastery Motivation is predictive. For girls, Independent Mastery behavior is solely predictive, whereas for boys, Preference for Challenge seems more critical. Challenge seeking and related behaviors such as pursuit of mathematics and scientific study and careers are more characteristic of boys (see Dweck, 1986 for a review and discussion). This difference might be traced to the different sources of feedback that boys and girls receive for success and failure (Dweck et al., 1978). Teachers tend to praise boys more for the content of their work, focusing on factors such as their ability and effort. Girls tend to receive praise for aspects of their presentation such as neatness. Dweck et al. (1978) further demonstrated that

experimentally administering this differential pattern of feedback to fifth grade boys and girls resulted in behavioral changes. Content-oriented feedback resulted in higher persistence and challenge seeking, whereas presentation-oriented feedback resulted in decreases in these adaptive behaviors. The results from the present study suggest that preference for challenge may be more central to boys' adaptive behaviors as well as more characteristic of boys.

Causal relations

The exploratory structural model presented in this study suggests that the relations among motivation, self-concept, and achievement are complex. A single causal source did not emerge and the process might best be considered as a continual feedback loop with paths of mutual influence. The following paths of influence were observed: from Autonomous Judgment to Intrinsic Mastery Motivation and Perceived Competence, from Intrinsic Mastery Motivation to Perceived Competence, from Perceived Competence to Academic Achievement, and from Academic Achievement to Autonomous Judgment (see Figure 1). The empirical model is consistent with the theoretical model presented in Figure 2. The theoretical model is an attempt to hypothesize the possible

Figure 2.
Theoretical Model



relations among the constructs based upon the current study and prior empirical results. Causal paths drawn in solid lines are empirically demonstrated relations (over the course of one school year in the case of the present study). Hypothesized relations are drawn in broken lines. This model posits Autonomous Judgment as causally prior to Intrinsic Mastery Motivation (and Perceived Competence), which influences Perceived Competence, which finally influences Academic Achievement. Actual Academic Achievement then feeds back to Autonomous Judgment.

When investigating motivation and achievement, many questions of "third variable" or exogenous causation arise. That is, how would we expect variables that were not included in the model to influence our results? Variables such as IQ, control beliefs or locus of control, and behavior problems are of particular interest because they have been demonstrated to correlate with the components of the model. IQ has been shown to be related to achievement. The theoretical model suggested here includes IQ as directly influencing Achievement and Autonomous Judgment (Autonomous Judgment is related to developmental changes in intellectual ability and may be related to intelligence). Control beliefs (or locus of control) are hypothesized to directly influence Intrinsic Mastery Motivation and Achievement (consistent with Harter & Connell, 1984). The model posits behavior problems as a mediating variable between Intrinsic

Mastery Motivation (IMM) and Perceived Competence (PC). This assertion is consistent with the results of the present study in which behavior problems are shown to be related to IMM and a previous study from the same project in which PC was found to be related to behavior problems (Goldberg, Cornell, Delcourt, & Bland, 1991).

What is intrinsic motivation?

Intrinsic motivation consists of curiosity, preference for challenge, persistence and independent inquiry. Extrinsic motivation is characterized by behavior that is motivated by an external reward such as grades, another person's approval, or money. Intrinsic motivation is related to children's academic achievement, self-concept, and behavior problems. Intrinsic motivation has been demonstrated to be undermined by extrinsic motivators, particularly when these extrinsic motivators are perceived to be controlling rather than informational (Zinser et al., 1982). The difficulty for educators lies in determining how to motivate children without undermining children's intrinsic motivation.

While the present study is supportive of Harter's measure of intrinsic motivation, the measure has a major conceptual and applied weakness. Harter (1981) conceived of intrinsic motivation as a bipolar construct; more intrinsic motivation indicates less extrinsic motivation and vice versa. This subtle assumption limits investigation of the

relation between intrinsic motivation and extrinsic motivation. It is theoretically possible for children to be high in both intrinsic and extrinsic motivation (e.g. "I really enjoy reading and I want to get a good grade"). Presumably, this "double dose" of motivation would result in the greatest amount of engagement in the motivated behavior (e.g. reading). The challenge for educators is to determine ways of maximizing motivated behaviors without undermining intrinsic or long-term motivation. A measure that allows for assessment of motivation on both the intrinsic and extrinsic dimensions independently would allow for a more refined examination of the effects of different motivational interventions or teaching strategies.

Directions for future research:

Asking questions rather than testing hypotheses

In his classic paper entitled "Theoretical Risks and Tabular Asterisks", Paul Meehl (1978) critiqued the "soft psychology", for its pursuit of statistically significant rather than clinically significant or meaningful results. Probability values are but one index of generalizability of findings. Meehl asserted that our efforts to obtain "tabular asterisks", the mark of statistically significant results has frequently led psychologists to present tables and publications full of statistically significant correlations, yet lacking in meaning. This unfortunate lack of value or understanding resulted from a frequent reporting

of significant bivariate correlations, when many of the variables of interest were intercorrelated yet the nature of these intercorrelations remained a mystery. For example, a study might show that intrinsic motivation is related to academic achievement, perceived competence is related to academic achievement, and intrinsic motivation is related to perceived competence. Demonstrating these three relations offers little in the way of understanding true relations among these constructs in people. Which variable influences which other variable? In just this simple three variable example, many causal hypotheses are possible: Intrinsic motivation directly influences both perceived competence and achievement; intrinsic motivation directly influences perceived competence, which mediates an influence on achievement; intrinsic motivation directly influences achievement, which mediates an influence upon perceived competence; perceived competence directly influences intrinsic motivation and achievement; perceived competence directly influences intrinsic motivation, which mediates an influence on achievement; perceived competence directly influences achievement, which mediates an influence on intrinsic motivation; achievement directly influences both perceived competence and intrinsic motivation; achievement directly influences perceived competence, which mediates an influence on intrinsic motivation; achievement directly influences intrinsic motivation, which mediates an influence

on perceived competence. The presentation of the possible permutations of the source of merely three observed correlations illustrates that this type of finding may raise more questions than it answers.

This problem was more pronounced at the time Meehl was writing since multivariate techniques were not in common use. However, even now that path analysis, MANOVA and other multivariate techniques are available, the problem of intercorrelation among variables that are excluded from a particular analysis or "third variable causation" issues still remain. That is, what if the observed relations are due to another variable (e.g. parent's orientation toward autonomy versus control) that was the underlying cause of all of the observed correlations?

To some extent, this problem may be insoluble because human behavior is so complex and multiply determined that it is exceptionally difficult to measure all of the relevant variables for any interesting psychological outcome. However, with a large sample and longitudinal data related to a particular question, meaningful answers to complex questions can perhaps be better addressed by exploring the causal relations in the data rather than attempting conventional hypothesis testing. Is it always appropriate to attempt to fit the data to our theories? In Piagetian terms, I believe that when the data permit, we can learn more from shifting back and forth between the processes of

accommodation and assimilation. The hypothesis testing tradition is primarily a process of assimilation and implies that we may be "capitalizing on chance" or "fishing" if we ask questions without investing ourselves in a particular answer. The common practice of reporting the results of large developmental data sets in several publications utilizing overlapping or intercorrelated variables is encouraged by the career pressures of academic life. Yet, the result of this pressure is that we try to maximize the amount of variance that we can explain in dependent variables in an effort to obtain significant (i.e. publishable) findings.

Without this pressure, the questions of interest are closer to wondering what is the true amount of variance that a particular construct (e.g. intrinsic motivation) affects in a particular outcome (e.g. achievement). To ask this question in a skillful way, we need to put as many of the relevant variables into the prediction equation as possible and observe the complex relations in the data. Large longitudinal data sets offer a unique opportunity to ask these broad, fundamental questions because the large sample size permits us to estimate a large number of intercorrelations reliably. The guidance of a theory may be best used in data collection; assessing as many of the relevant constructs as possible is critical. Including all of them in our quantitative model is just as critical. I

suggest that testing a particular hypothesis to the exclusion of others is not only unnecessary when addressing these questions with this type of data, but limits our ability to learn from our data. Comparing the fit of alternative models or hypotheses -- expanding rather than focusing our questions -- may often offer valuable sources of understanding.

When the data are consistent with several alternative explanations (e.g. several models fit the data equally well), reliance upon theories or biases is inevitable and is common in all fields of science. The rule of parsimony, giving preference to a more simple, powerful theory over a more complex theory if both explain the data equally well, may be helpful in making choices between competing theories in psychology. This rule can be quantified in a ratio of Goodness of Fit to Degrees of Freedom. However, decisions regarding similarly parsimonious explanations will need to be made and reliance upon prior theories is indispensable. The method of scientific inquiry advocated here suggests that this type of decision be suspended until the information contained in the data is more thoroughly exploited.

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Appendix 1

Measure of Intrinsic Motivation and Perceived Competence

What I Am Like

Name _____ Date _____

School _____ Birthday _____

Boy or Girl (circle which)

SAMPLE SENTENCES

	Really True for me	Sort of True for me				Sort of True for me	Really True for me
(a)	☐	☐	Some kids would rather play outdoors in their spare time	BUT	Other kids would rather watch T.V.	☐	☐
(b)	☐	☐	Some kids like hamburgers better than hotdogs.	BUT	Other kids like hotdogs better than hamburgers.	☐	☐
1.	☐	☐	Some kids feel that they are very good at their schoolwork	BUT	Other kids worry about whether they can do the schoolwork assigned to them.	☐	☐
2.	☐	☐	Some kids find it hard to make friends	BUT	Other kids find it's pretty easy to make friends.	☐	☐
3.	☐	☐	Some kids are often unhappy with themselves	BUT	Other kids are pretty pleased with themselves.	☐	☐
4.	☐	☐	Some kids like hard work because it's a challenge	BUT	Other kids prefer easy work that they are sure they can do.	☐	☐
5.	☐	☐	When some kids don't understand something right away they want the teacher to tell them the answer	BUT	Other kids would rather try and figure it out by themselves.	☐	☐
6.	☐	☐	Some kids almost always think that what the teacher says is O.K.	BUT	Other kids sometimes think their own ideas are better.	☐	☐
7.	☐	☐	Some kids know whether or not they're doing well in school without grades	BUT	Other kids need to have grades to know how well they are doing in school.	☐	☐
8.	☐	☐	Some kids feel like they are just as smart as other kids their age	BUT	Other kids aren't so sure and wonder if they are as smart.	☐	☐

	Really True for me	Sort of True for me				Sort of True for me	Really True for me
9.	☐	☐	Some kids have a lot of friends	BUT	Other kids don't have very many friends.	☐	☐
10.	☐	☐	Some kids don't like the way they are leading their life	BUT	Other kids do like the way they are leading their life.	☐	☐
11.	☐	☐	Some kids like difficult problems because they enjoy trying to figure them out	BUT	Other kids don't like to figure out difficult problems.	☐	☐
12.	☐	☐	When some kids make a mistake they would rather figure out the right answer by themselves	BUT	Other kids would rather ask the teacher how to get the right answer.	☐	☐
13.	☐	☐	Some kids agree with the teacher because they think the teacher is right about most things	BUT	Other kids don't agree with the teacher sometimes and stick to their own opinion.	☐	☐
14.	☐	☐	Some kids need to get their report cards to tell how they are doing in school	BUT	Other kids know for themselves how they are doing even before they get their report card.	☐	☐
15.	☐	☐	Some kids are pretty slow in finishing their schoolwork	BUT	Other kids can do their school-work quickly.	☐	☐
16.	☐	☐	Some kids would like to have a lot more friends	BUT	Other kids have as many friends as they want.	☐	☐
17.	☐	☐	Some kids are usually happy with themselves as a person	BUT	Other kids are often not happy with themselves.	☐	☐
18.	☐	☐	Some kids like to go on to new work that's at a more difficult level	BUT	Other kids would rather stick to the assignments which are pretty easy to do.	☐	☐
19.	☐	☐	If some kids get stuck on a problem they ask the teacher for help	BUT	Other kids keep trying to figure out the problem on their own.	☐	☐
20.	☐	☐	Some kids think that what the teacher thinks of their work is the most important thing	BUT	For other kids, what they think of their work is the most important thing.	☐	☐

	Really True for me	Sort of True for me				Sort of True for me	Really True for me
21.	☐	☐	Some kids aren't really sure if they've done well on a test until they get their papers back with a mark on it	BUT	Other kids pretty much know how well they did even before they get their paper back.	☐	☐
22.	☐	☐	Some kids often forget what they learn	BUT	Other kids can remember things easily.	☐	☐
23.	☐	☐	Some kids are always doing things with a lot of kids	BUT	Other kids usually do things by themselves.	☐	☐
24.	☐	☐	Some kids like the kind of person they are	BUT	Other kids often wish they were someone else.	☐	☐
25.	☐	☐	Some kids like school subjects where it's pretty easy to just learn the answers	BUT	Other kids like those school subjects that make them think pretty hard and figure things out.	☐	☐
26.	☐	☐	Some kids like to try to figure out how to do school assignments on their own	BUT	Other kids would rather ask the teacher how it should be done.	☐	☐
27.	☐	☐	Some kids think they should have a say in what work they do in school	BUT	Other kids think that the teacher should decide what work they should do.	☐	☐
28.	☐	☐	Some kids aren't sure if their work is really good or not until the teacher tells them	BUT	Other kids know if it's good or not before the teacher tells them.	☐	☐
29.	☐	☐	Some kids do very well at their classwork	BUT	Other kids don't do very well at their classwork.	☐	☐
30.	☐	☐	Some kids wish that more people their age liked them	BUT	Other kids feel that most people their age do like them.	☐	☐
31.	☐	☐	Some kids are very happy being the way they are	BUT	Other kids wish they were different.	☐	☐
32.	☐	☐	Some kids don't like difficult schoolwork because they have to work too hard	BUT	Other kids like difficult schoolwork because they find it more interesting.	☐	☐

	Really True for me	Sort of True for me				Sort of True for me	Really True for me
33.	☐	☐	Some kids like to do their schoolwork without help	BUT	Other kids like to have the teacher help them do their schoolwork.	☐	☐
34.	☐	☐	Some kids think it's best if they decide when to work on each school subject	BUT	Other kids think that the teacher is the best one to decide when to work on things.	☐	☐
35.	☐	☐	Some kids know they didn't do their best on an assignment when they turn it in	BUT	Other kids have to wait til the teacher grades it to know that they didn't do as well as they could have.	☐	☐
36.	☐	☐	Some kids have trouble figuring out the answers in school	BUT	Other kids almost always can figure out the answers.	☐	☐
37.	☐	☐	Some kids are popular with others their age	BUT	Other kids are not very popular.	☐	☐
38.	☐	☐	Some kids are not happy with the way they do a lot of things	BUT	Other kids think the way they do things is fine.	☐	☐

APPENDIX 2

Descriptive Statistics and Intercorrelations among Measures

The following tables report simple descriptive statistics and intercorrelations for the factor scores used in the analyses described above. The Independent Mastery factor is a factor score derived from the Independent Mastery and Preference for Challenge subscales. The Autonomous Judgment factor is derived from the Internal Criteria for Success/Failure and the Independent Judgment subscales. The Perceived Competence factor is derived from the Social and Academic perceived competence subscales. The Achievement factor is derived from the ITBS subtest scores for Reading, Math Problem Solving, and Math Concepts.

IMAST=Independent Mastery factor, AUTJUD=Autonomous Judgment factor, ACH=Achievement factor, PERCOMP=Perceived Competence factor; The numerical suffix of 1 or 2 indicates the whether the data were collected in the Fall or Spring, respectively. All variables were converted to z-scores for the analyses and for the descriptive statistics reported here.

Variable	N	Mean	Std Dev	Minimum	Maximum
IMAST1	777	0	.919	-3.234	1.245
AUTJUD1	777	0	.898	-1.857	2.541
PERCOMP1	777	0	.891	-2.905	2.005
ACH1	777	0	.949	-1.901	3.800
IMAST2	819	0	.918	-3.668	1.525
AUTJUD2	819	0	.914	-2.043	2.191
PERCOMP2	819	0	.916	-3.618	2.175
ACH2	819	0	.928	-2.292	2.821

Table of Correlations Among Variables

	IMAST1	AUTJUD1	PERCOMP1	ACH1
IMAST1 Prob > 0 N	1.000 777	.245 .0001 777	.519 .0001 777	.123 .0006 777
AUTJUD1 Prob > 0 N		1.000 777	.258 .0001 777	.290 .0001 777
PERCOMP1 Prob > 0 N			1.000 777	.156 .0001 777
ACH1 Prob > 0 N				1.000 777

Correlations among variables (continued)

	IMAST2	AUTJUD2	PERCOMP2	ACH2
IMAST2 Prob > 0 N	1.000 819	.223 .0001 819	.576 .0001 819	.194 .0001 819
AUTJUD2 Prob > 0 N		1.000 819	.182 .0001 819	.343 .0001 819
PERCOMP2 Prob > 0 N			1.000 819	.235 .0001 819
ACH2 Prob > 0 N				1.000 819
IMAST1 Prob > 0 N	.558 .0001 546	.211 .0001 546	.369 .0001 546	.164 .0001 546
AUTJUD1 Prob > 0 N	.258 .0001 546	.587 .0001 546	.248 .0001 546	.218 .0001 546
PERCOMP1 Prob > 0 N	.359 .0001 546	.223 .0001 546	.505 .0001 546	.247 .0001 546
ACH1 Prob > 0 N	.145 .0007 546	.395 .0001 546	.132 .0020 546	.824 .0001 546