A Model of Academic Self-Concept:
Perceived Difficulty, Social Comparison, and Achievement Among Academically Accelerated Secondary School Students

Hope Elisabeth Wilson
University of Connecticut, 2009

This study investigates the relationship of ability, academic achievement, social comparison, perceived level of difficulty, academic self-concept, and future goals in three populations of accelerated high school students. Structural equation modeling was used to model the relationships between each of the variables for each of the groups. It was found that students in Advanced Placement (AP) programs, International Baccalaureate (IB) programs, and residential schools on college campuses have different patterns of self-concept according to the present model. For the IB students, academic achievement and perceived level of difficulty proved to be full mediators for the relationship between ability and student self-concept. For all three populations of students, perceived difficulty and achievement were larger predictors of academic self-concept than the social comparison variables. This provides evidence that the curriculum provided to academically talented students is an important component of how they develop their perceptions of themselves as students and learners. This has important implications for educators, because the study also found a strong relationship between a student's academic self-concept and his or her future educational aspirations.

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Chapter 1

Rationale

Academic self-concept represents how students feel about themselves as learners in school contexts and has implications for both student achievement and well-being. As a measure of students' confidence in their abilities, it informs their opinions about not only their current tasks and school-related activities, but also their future goals and academic aspirations. If students have low academic self-concept, they may chose academic and career paths that are less rigorous, challenging, or fulfilling, which creates a potential loss of skills and advancement for both the individual and society.

Statement of the Problem

High-ability students often experience a drop in academic self-concept when they move from heterogeneously grouped to homogeneously grouped classrooms (e.g., Marsh, 1991, 2004). Many researchers have attributed this drop to social comparisons (e.g., Marsh, 1987; Zeidner & Schleyer, 1999a). For example, students who were previously doing better than most of their peers in a heterogeneous class who are subsequently grouped with students with much higher abilities perceive themselves as less capable academically because they compare themselves to their new classmates. This is especially relevant for students with high abilities who have the potential to be placed rigorous and accelerated school programs. These programs might include programs within a public school, such as International Baccalaureate or Advanced Placement, or separate schools.

Academic self-concept influences students' later achievement (e.g., Marsh, Byrne, & Yeung, 1999) and affects students' future goals. For example, students with low academic self-concept are less likely to choose difficult academic coursework, engage in challenging educational opportunities, and apply for highly selective programs (Marsh, 1991; Nagy, Trautwein, Baumert, Koller, & Garrett, 2006). Thus, academic self-concept may have serious repercussions for students' college and career goals, and ultimately, life outcomes and satisfaction.

Previous Research

Research concerning the factors affecting academic self-concept, especially the academic self-concept of gifted and talented students, has focused on social comparison theories (e.g., Craven, Marsh, & Print, 2000; Marsh, 1991, 2004; Marsh & Hau, 2004; Marsh & Parker, 1984) and internal comparison theories (e.g., Marsh & Yeung, 2001; Rost, Sparfeldt, Dickhauser, & Schilling, 2005; Skaalvik & Skaalvik, 2002). Social comparison theories center around the idea that a student's academic self-concept is derived from how a student compares his or her academic ability to other students in the peer group. Internal comparison theories focus on the internal state of the student. These theories predict that students compare their ability in one subject to their ability in another subject. For example, if a student perceives him or herself as talented in math, then that student will rate his or her ability in language arts lower. There is an inverse relationship between subject area academic self-concept. Interestingly, math and verbal self-concepts are positively related to general academic self-concept (Marsh & Hau, 2004; Skaalvik & Skaalvik, 2002).

While much of the previous research has focused on social comparison, it has not considered the differences in the challenge or difficulty level of the curriculum as a predictor of students' academic self-concept. The current study investigates the effects of perceived difficulty of the coursework in addition to the social comparison of academic ability and academic achievement on academic self-concept. Theoretically these factors are predictors of academic self-concept. Additionally, this study investigates the effects of academic self-concept on students' future goals. This emphasizes the importance of the study in the larger context of a student's life.

Hypothesis

These variables are important to study because of the documented positive relationship between academic self-concept and ability in previous research. It is important to know if there are additional factors that can predict self-concept, and how these factors might affect high-ability students. In addition, it is important to know how academic self-concept is linked to students' future goals. It was hypothesized that ability, achievement, social comparison, and perceived difficulty will predict academic self-concept and that academic self-concept will predict future goals. It is theorized that academic self-concept affects students' life choices; this study will provide additional insights into this theory.

Acceleration and Self-Concept

This study utilized three different populations of high school students to identify and describe patterns of self-concept among the populations. Each of the populations of students represents a different method of curricular acceleration, including students in an accelerated early college entrance program, an Advanced Placement program, and an

International Baccalaureate program. The circumstances of students' education, such as the relative abilities of the peer group or the rigor of the curriculum, may affect the social comparison of ability, because of changes in the relative level of ability of the peer group. It may also affect their perceived difficulty of their coursework, based on the perceptions of differing levels of difficulty of the programs. Thus, the patterns of effects in the model may differ among the groups of students.

All of the students in this study attended schools in a large southern state. Accelerated early college entrance programs allow students with high abilities from across the state to attend a university. This select group of students lives on-campus in a residence hall and takes a rigorous curriculum consisting entirely of classes offered at the university. Thus, this group of students encounters a level of coursework that is considerably more challenging than the previous curriculum at their original high school. This group of students also encounters students of a higher academic caliber than in their previous peer groups. The additional component of separation from other support groups, namely family, makes this population of students distinct from the other populations in the study.

Students in Advanced Placement (AP) programs, on the other hand, remain at their home high schools. Students may elect to be in one or more AP courses. There is no overall set of courses or curriculum for students to participate in the program. Thus, a student who only enrolls in one AP course may have a vastly different experience from that of a student who participates in many AP courses. The peer groups of these hypothetical students may differ, and thus their social comparisons might produce different results. In addition, there is no required training or licensure for teachers of AP

courses, and the level of challenge in these courses may vary widely. However, AP classes are among the most widely used acceleration programs across the United States. The influence of academic self-concept among this population of students, therefore, is worthy of study.

International Baccalaureate (IB) programs, in contrast, adhere to regimented guidelines and schools must pass an accreditation process in order to issue IB diplomas. Students must pass a series of set curricula, as well as submit items for a portfolio and essay review. The peer groups of these students may be similar to the students enrolled in AP classes, but the peer group is more stable. In other words, students in IB programs take the same number of advanced classes and typically remain as a cohort throughout high school. In addition, there is more consistency across IB classes because teachers must undergo training to be qualified to teach IB courses. IB is another popular accelerated and enriched curricular program offered in schools across the United States and the world. The patterns of academic self-concept among this population will also be of interest to educators.

While the patterns of academic self-concept could be studied in any population of students, they are especially relevant for students in accelerated programs. As schools group high-ability students together for instruction, they typically raise the level of challenge for those students. Acceleration represents one way that schools can introduce additional rigor into the curriculum. Students in accelerated programs experience not only change in the academic achievement of their classmates, but also an increase in the difficulty level of the curriculum. The model presented in this study, therefore, have a particular significance to high-ability students in accelerated programs, due to the

programs' emphasis on increasing the challenge level of the curriculum and placement in programs with other high-ability students.

Implications

This study will help inform school personnel, administration, and policy makers about the complexities of the relationship between ability and academic self-concept. This information may be helpful for educators in planning appropriate acceleration strategies for high-ability learners, especially when considering the various programs that are available. With information about how students construct academic self-concept, programs can be developed to help students overcome dips in academic self-concept that may occur when they are homogeneously grouped. This study, therefore, has implications for both researchers and practitioners.

Research Questions

Specifically, this study will address research questions pertaining to the patterns of self-concept across three populations of students (residential school, AP, and IB students). The following questions will be addressed through this study:

1. Are there mean group differences between the groups on the measures of Ability, Achievement, Perceived Change in Achievement, Social Comparison, Perceived Difficulty, Ability Comparison Orientation, Opinion Comparison Orientation, Student Self-Concept, Learner Self-Concept, and Future Goals?
2. Are the models of the relationships of Ability, Achievement, Perceived Change in Achievement, Social Comparison, Perceived Difficulty, Ability Comparison Orientation, Opinion Comparison Orientation, Student Self-Concept, Learner

Self-Concept, and Future Goals for each of these populations invariant across the following populations of 11th- and 12th-grade high school students:

   a. students in residential high schools at college campuses;
   b. students in Advanced Placement (AP) classes; and
   c. students in International Baccalaureate (IB) classes?

3. What is the effect of Ability on Achievement, Perceived Change in Achievement, Social Comparison, Perceived Difficulty, Ability Comparison Orientation, and Opinion Comparison Orientation for the following populations of 11th- and 12th-grade high school students:

   a. students in residential high schools at college campuses;
   b. students in Advanced Placement (AP) classes; and
   c. students in International Baccalaureate (IB) classes?

4. What are the effects of Achievement, Perceived Change in Achievement, Social Comparison, Perceived Difficulty, Ability Comparison Orientation, and Opinion Comparison Orientation on Student Self-Concept and Learner Self-Concept for the following populations of 11th- and 12th-grade high school students:

   a. students in residential high schools at college campuses;
   b. students in Advanced Placement (AP) classes; and
   c. students in International Baccalaureate (IB) classes?

5. What are the effects of Student Self-Concept and Learner Self-Concept on the Future Goals for the following populations of 11th- and 12th-grade high school students:

   a. students in residential high schools at college campuses;

b. students in Advanced Placement (AP) classes; and

c. students in International Baccalaureate (IB) classes?

6. Do Achievement, Perceived Change in Achievement, Social Comparison, Perceived Difficulty, Ability Comparison Orientation, and Opinion Comparison Orientation mediate the relationship between Ability and Student Self-Concept for the following populations of 11th- and 12th-grade high school students:

    a. students in residential high schools at college campuses;

    b. students in Advanced Placement (AP) classes; and

    c. students in International Baccalaureate (IB) classes?

7. Do Achievement, Perceived Change in Achievement, Social Comparison, Perceived Difficulty, Ability Comparison Orientation, and Opinion Comparison Orientation mediate the relationship between Ability and Learner Self-Concept for the following populations of 11th- and 12th-grade high school students:

    a. students in residential high schools at college campuses;

    b. students in Advanced Placement (AP) classes; and

    c. students in International Baccalaureate (IB) classes?

Definitions

For the purposes of this study, specific terms in this paper refer to constructs that are defined both in terms of the theoretical and operationalized meaning. These terms will be used throughout the study as defined below.

Ability

Ability is the capacity that a student has for intellectual and/or academic endeavors in this study. This construct is measured in this study with self-reported SAT scores collected from the participants.

Achievement

Achievement is the level to which a student is performing within his or her academic program. Self-reported grades are used in this study to measure a student's level of achievement.

Social Comparison

Social comparison is the interaction between a student's achievement and his or her tendency to compare him or herself with others. This interaction is critical to understanding social comparison, because it is not only important how much a student compares himself or herself to others, but if that comparison is being made to students who are doing better or worse in their classes. For example, a student who is doing poorly compared to his or her classmates and does much social comparison will have a lower self-concept than a student who does the same amount of social comparison but is at the top of the class.

Perceived Difficulty

Perceived difficulty is the level of challenge that the students' perceive in their academic program. If a student scores highly on this construct it indicates that he or she feels overwhelmed by the coursework and confused by the content. For this study, it is measured by a subscale of the Perceived Challenge and Academic Self-Concept scale (PCSC; Wilson, 2007).

Ability Comparison Orientation

Ability comparison orientation is a measure of a student's tendency to compare himself or herself to others. It emphasizes the participant's inclination to compare as a means of self-evaluation. It is one of the two subscales that measure Comparison Orientation on the INCOM (Gibbons & Buunk, 1999).

Opinion Comparison Orientation

Opinion comparison orientation is a measure of a student's tendency to self-assess using other's opinions. As opposed to the ability comparison orientation, this construct emphasizes the participant's inclination to ask others about his or her opinions about mutual or shared experiences. It is one of the two subscales that measure Comparison Orientation on the INCOM (Gibbons & Buunk, 1999).

Student Self-Concept

Student self-concept is how a student perceives himself or herself as a student in an academically rigorous program. This construct focuses on how well a student does in the context specific to school and coursework. It is one of the two subscales measuring academic self-concept on the PCSC (Wilson, 2007).

Learner Self-Concept

Learner self-concept is how a student perceives himself or herself as a learner in an academically rigorous program. As opposed to student self-concept, this construct focuses on learning and understanding rather than being successful in school or coursework. It is one of the two subscales measuring academic self-concept on the PCSC (Wilson, 2007).

Future Goals

Future goals is the level of educational attainment that a student is planning on pursuing. This educational attainment ranges from high school diploma to doctoral level degree. It is a self-reported measure in this study.

Final Thoughts

This study addresses many of the fundamental aspects of academic self-concept, including contributing factors as well as outcomes for students. In addition, it compares these patterns aspects between three different populations of students attending academically rigorous programs. The answers to these questions will provide important information for researchers and practitioners. Not only will it inform future research endeavors and provide additional information about the nature of academic self-concept, it will aid administrators and teachers in developing the best practices for accelerated and academically rigorous programs for talented secondary students. The next chapter will outline a more detailed description of the background research to support this study.

Chapter 2

Review of Research

The self-concept of students, particularly academic self-concept, is an important construct for educators and researchers to understand, due to the ways in which it influences student achievement (e.g., Altmann & Dupont, 1988; Marsh, Smith, & Barnes, 1984) and future goals (e.g., Ahmavaara & Houston, 2007; Marsh, 1991). Research concerning academic self-concept demonstrates the implications of certain educational practices, such as grouping (e.g., Marsh, 2004; Shields, 1996) and programming options (e.g., Colangelo, Kelly, & Schrepfer, 1987; Manor-Bullock, 1995) particularly for students with high abilities. Much of the research has focused on the grouping patterns used with this population (e.g., Craven et al., 2000; Ludtke, Koller, Marsh, & Trautwein, 2005; Marsh, 1991), rather than changes in the depth and complexity of curriculum and other variables that may contribute to academic self-concept. Additional research and syntheses of existing research is needed to document the relationships between the various components of academic self-concept among high-ability students.

This review of research focuses on the relationship of ability and academic self-concept and potential variables that may affect this relationship, particularly among high-ability students. These variables include gender, cultural background, subject area strengths, social comparison, grouping options, and difficulty level of the curriculum. It is important to inform practitioners and researchers about how these variables contribute to

the causes and implications of academic self-concept. A careful analysis of the results of this research can inform classroom practice, programming options, and contribute to the creation of new research agendas.

Definition

Self-concept, or the way in which people perceive themselves (Hoge & Renzulli, 1993), is a cornerstone of many psychological and educational theories. It has been the topic of numerous research projects, journal articles, and debates within the educational community. Yet the research has failed to reach a consensus on many aspects of self-concept (e.g., Marsh, 1991; Rinn, 2007; Shaunessy, Suldo, Hardesty, & Shaffer, 2006). In particular, scholars have debated research surrounding the differences in self-concept between groups of students (e.g., Colangelo & Bower, 1987; Shields, 1996); the relationship between academic self-concept and achievement (Altmann & Dupont, 1988); and the multiple contributions to self-concept, including instructional practices (Ludtke et al., 2005b) and motivational characteristics (Ahmavarra & Houston, 2007).

Historical Context

Although self-concept was originally conceived as a global self-evaluation construct (i.e., Parker, 1966), further research has demonstrated that it may be composed of many dimensions, domains, and interactions (Lewis & Knight, 2000; Marsh & Parker, 1984; Mui, Yeung, Low, & Jin, 2000; Trautwein, Ludtke, Koller, & Baumert, 2006). In an early review of the literature, Shavelson, Hubner, and Stanton (1976) emphasized the "organized, multi-faceted, hierarchical, stable, developmental, evaluative, differentiatable" (p. 411) nature of self-concept. The current research supports the differentiation of self-concept into academic and nonacademic domains (e.g., Marsh &

Parker; Shavelson et al., 1976). Nonacademic has been divided into different domains, including physical, social, and athletic self-concepts (Shavelson et al., 1976).

When academic self-concept was further classified into specific domains, such as verbal and mathematical (e.g., Marsh, 1992a; Skaalvik & Skaalvik, 2002), the research suggested that general measures of self-concept may mask individual differences between domains (Lewis & Knight, 2000). As the research in the field progressed, more interest was paid to the contributions of various elements to the development of academic self-concept. Recent models of academic self-concept have included social comparison models (e.g., Marsh, 1987), internal comparison models (e.g., Skaalvik & Skaalvik, 2002), and reflected glory models (e.g., Marsh, Kong, & Hau, 2000).

It is important to research academic self-concept because of its effects on future educational aspirations (e.g., Ahmavaara & Houston, 2007). If students' perceptions about themselves in academic domains affect the choices they make to pursue further education and their life goals, a drop in academic self-concept (especially among the high-ability population) could adversely change a student's life. Thus, it is important for teachers, parents, and counselors to understand the factors associated with academic self-concept.

Students' academic self-concept is significantly correlated with their future goals (Ahmavaara & Houston, 2007; Deosaran, 1978; Garg, Melanson, & Levin, 2007; Koumi, 2000; Marsh, 1991; Nagy et al., 2006). Some studies showed that students' self-concept in a particular course influenced their choices for the subsequent year in course selection (Koumi, 2000; Nagy et al., 2006). Additionally, in a study including a sample of students at selective schools in England, there was a link between confidence in one's own

intelligence and educational aspirations (Ahmavaara & Houston, 2007). However, in a study of school effectiveness, Marsh found that the mediating effect of academic self-concept on educational aspirations did not overcome the negative effect that school-level achievement had on educational aspirations (Marsh, 1991). In other words, the overall achievement level of the school that the student attended had a stronger effect on the future goals of the student than the student's academic self-concept. Despite the possible implication of Marsh's study, academic self-concept does appear to have an effect on the students' future goals in the majority of studies. This underscores the value of research into the factors that affect academic self-concept.

Ability and Academic Self-Concept

There is a robust collection of research to support a positive relationship between ability and academic self-concept (e.g., Marsh, 2004; Montague & Garderen, 2003; Pyryt & Mendaglio, 1994). This research has found similar findings under a variety of contexts. For example, research conducted in Africa (Akande, 1997), Finland (Hotulainen & Shofield, 2003), Canada (Pyryt & Mendaglio, 1994), Germany (Ziegler, Heller, & Broome, 1996), and Australia (Marsh, 2004) have demonstrated that students with higher abilities have higher academic self-concept. In addition, these studies have varied according to how and if the students are provided programming for the gifted (e.g., Hotulainen & Shofield; Colangelo et al., 1987), ability grouping (e.g., Pajares & Graham, 1999; Marsh, 2004), and instrumentation (e.g., Kelly & Jordan, 1990; Pyryt & Mendaglio, 1994; Winne, Woodlands, & Wong, 1982). Despite all of these differences between the studies, they show the positive correlation between ability and academic self-concept, providing evidence of the strong research base in this area.

The differences in academic self-concept between high-ability and average-ability groups did not seem to vary by participation in programming options, such as acceleration or enriched curriculum. Akande (1997) demonstrated differences in gifted and average-ability students in Africa, despite lack of any programming, as did Hotulainen and Shofield (2003) in Finland. Colangelo and colleague's (1987) study included students identified as gifted who participated in a variety of programs, including both full-time and part-time programs; finding differences between all of the gifted and average-ability students' academic self-concept. They investigated middle school students (N=243) from across the United States that were participating in gifted programs offered by their school district (Colangelo et al., 1987). These programs included both part-time pull-out programs and self-contained classes for the gifted, but high-ability students in both types of programs had higher academic self-concept than average ability students. Finally, other studies have found that students who were identified for and participated in gifted programs also have higher academic self-concept than students who were not identified for gifted programs (e.g., Colangelo & Bower, 1987; Kelly & Jordan, 1990; McCoach & Siegle, 2002; Montague & Garderen, 2003; Pajares & Graham, 1999; Ziegler et al., 1996). Students with higher levels of ability, regardless of availability of gifted programming, had higher academic self-concept across studies.

Studies also varied in how they investigated the relationship between ability and academic self-concept. Some researchers used a regression framework to study direct and/or indirect relationships between the constructs (e.g., Ludtke et al., 2005; Marsh, 2004). Other studies grouped students together by ability to compare their academic self-concepts (e.g., Kelly & Jordan, 1990; Pajares & Graham, 1999; Ziegler et al., 1996).

These studies consistently found that the higher-ability groups had higher academic self-concept (e.g., Kelly & Jordan, 1990; Pajares & Graham, 1999; Ziegler et al., 1996). In Kelly and Jordan's (1990) research, students were divided into three groups, highly gifted (above the 95th percentile on an ability test), moderately gifted (90th-94th percentile), and average ability (45th-65th percentile). The highly gifted students had higher academic self-concept than the moderately gifted students, who had higher academic self-concept than the average-ability students (Kelly & Jordan, 1990). Ziegler and colleagues (1996) found a similar pattern of results with highly gifted (98th percentile), gifted (98th-84th percentile), and average ability (82nd-16th percentile) students in Germany. In addition, studies that did not look at gifted students, but students with learning disabilities, found a relationship between academic self-concept and ability. Cosden and McNamara (1997) compared college students with learning disabilities and average abilities, and found that students with learning disabilities had lower academic self-concept. Meltzer, Roditi, Houser, and Perlman (1998) and Zeleke (2004) found similar results with elementary and secondary students with average abilities and learning disabilities. All of these studies, considered together, imply a continuous relationship between academic self-concept and ability, in that as ability at all levels increases, academic self-concept also increases. Studies showing a positive relationship through a regression analysis (e.g., Ludtke et al., 2005; Marsh, 2004) or through group mean difference tests (e.g., Kelly & Jordan, 1990; Pajares & Graham, 1999; Ziegler et al., 1996) both demonstrate that higher ability students have higher academic self-concepts.

The studies that compared high-ability and average ability groups varied in terms of how they defined the groups (Colangelo et al., 1987; Kelly & Jordan, 1990; Montague

& Garderen, 2003). Several studies used the identification procedures used by the school to place students in gifted programs to classify high ability groups (e.g., Colangelo et al, 1997; Bouffand & Couture, 2003; Pajares & Graham, 1999; McCoach & Siegle, 2002). Another study used a longitudinal design to compare the academic self-concept among Finnish adolescents (Hotulainen & Shofield, 2003). These students had been classified as high-ability and average ability in preschool using an ability test. Despite the lack of differentiated programming for talented students in Finland, the high ability students had significantly higher academic self-concept in middle school (Hotulainen & Shofield, 2003). One of the studies that did not use further testing to classify students into high ability and average ability groups, used district placement that relied heavily on grades and teacher recommendations (Bouffard & Couture, 2003). This study did not find differences between the two groups, but it is difficult to compare the results with other research due to the vague identification procedures. In general, studies with clear cut-off scores on either ability or achievement tests, despite where along the normal curve these cut-off scores fell, showed that high ability students had greater academic self-concept than average ability students (e.g., Kelly & Jordan, 1990; Pajares & Graham, 1999; Ziegler et al., 1996).

Studies also varied in how they determined a comparison group (e.g., Colangelo & Bower, 1987; Hotulainen & Shofield, 2003; McCoach & Siegle, 2002). While many studies used a control group at the same school or location (e.g., Montague & Garderen, 2003; Pajares & Graham, 1999) or across the country (e.g., McCoach & Siegle, 2002; Ziegler et al., 1996), one study found differences between groups through the analysis of sibling pairs (Colangelo & Bower, 1987). They studied pairs of siblings in which only

one sibling was identified for gifted programming based on ability and achievement test scores and demonstrated that the students with higher abilities had higher academic self-concept than their siblings with lower scores. Although there were differences between the studies on what population from which the comparison group was drawn, they found that high ability students had higher academic self-concepts than the average ability comparison group (e.g., Colangelo & Bowe, 1987r; Hotulainen & Shofield, 2003; McCoach & Siegle, 2002).

Finally, the studies varied by the instrumentation used to measure academic self-concept. Studies that used an instrument specifically designed to measure academic self-concept (Akande, 1997; Boersma & Chapman, 1981; Colangelo & Bower, 1987; Marsh, 2004; Pajares & Graham, 1999) or an academic self-concept subscale of a larger instrument (Colangelo et al., 1987; Cosden & McNamara, 1997; Hotulainen & Shofield, 2003; Kelly & Colangelo, 1984; Kelly & Jordan, 1980; McCoach & Siegle, 2002; Meltzer et al., 1998; Montague & Garderen, 2003; Pyryt & Mendaglio, 1994; Zeleke, 2004; Ziegler et al., 1996) tended to find a strong positive relationship between ability and academic self-concept. On the other hand, studies using global measures of self-concept did not tend to find significant differences between groups (Vlahovic-Stetic, Vidovic, & Arambasic, 1999; Winne et al., 1982). Vlahovic-Stetic and colleagues investigated the self-concept of students in Croatia, using the Rosenberg Perceived Self-Concept scale. However no academic subscale is included in this measure, and thus the lack of differences in self-concept on a global level may mask the differences in academic self-concept. Winne and colleagues (1982) showed that students of various ability levels have different patterns of weights of the subscales of global self-concept,

even if there are no differences between the overall measures between the groups. This means that instrumentation matters when results are compared. Table 1 in Appendix A summarizes the instruments used to measure Academic Self-Concept.

Despite differences in instrumentation, populations, and study designs, the research has shown the positive relationship of ability and academic self-concept (e.g., Colangelo et al., 1987; Hotulainen & Shofield, 2003; Kelly & Colangelo, 1984; Kelly & Jordan, 1980; McCoach & Siegle, 2002). See Appendix A, Table 2 for a summary of studies considering ability and academic self-concept. However, there is additional variability of academic self-concept within the high ability population, above what can be accounted for by ability (e.g., Dai, 2001; Dixon, Cross, & Adams, 2001; Nagy et al., 2006). Given the relationship between ability and academic self-concept, it is important to consider other factors that can contribute to (or cause a decline in) academic self-concept among high-ability learners. These additional factors may include gender, subject areas abilities, achievement, social comparison, and perceived difficulty, which will be discussed in the following sections.

Gender

One factor that has been considered as having an effect on academic self-concept among high ability students is gender (e.g., Dai, 2001; Lewis & Knight, 2000; Nagy et al., 2006). Some research indicates that gifted or high-ability girls follow the same pattern as the population in general, having lower academic self-concept than boys (Akande, 1997; Dai; Kelly & Jordan, 1990; Ziegler et al., 1996). Other research has shown no gender difference in the academic self-concept of high-ability students (Colangelo et al., 1987; Hotulainen & Shofield, 2003; Kelly & Colangelo, 1984; Pajares & Graham, 1999).

Still other research concentrated on differences in subject-specific academic self-concepts between genders (Nagy et al., 2006; Olszewski-Kubilius & Turner, 2002; Plucker & Stocking, 2001; Siegle & Reis, 1998).

There are differences in instrumentation between the studies of academic self-concept. Three of the studies that found no differences in self-concept between genders used a general measure of academic self-concept (Colangelo et al., 1987; Hotulainen & Shofield, 2003; Kelly & Colangelo, 1984), rather than analyze more specific subscales or subject-area domains. The final study that did not find differences only tested mathematics self-concept (Pajares & Graham, 1999). However, several studies that also used general measures did find that boys with higher academic self-concept than girls (Akande, 1997; Dai, 2001) or only used one subject-area domain (Ziegler et al., 1996).

Cultural differences between the populations studied may account for the differences in results concerning whether or not there are gender effects on academic self-concept for high ability students. The studies that used global academic self-concept and found that boys had higher self-concept were conducted outside the United States, in Africa (Akande, 1997), China (Dai, 2001), and Germany (Ziegler et al., 1996). On the other hand, the studies that did not find gender differences were in the United States (Colangelo et al., 1987; Kelly & Colangelo, 1984; Pajares & Graham, 1999) and Finland (Hotulainen & Shofield, 2003).

More conclusive than the studies that used general measures of academic self-concept were the studies that investigated gender differences in subject-specific domains. In general, girls had higher academic self-concept in verbal areas, such as language arts than boys, while boys had higher academic self-concept in mathematical areas (Nagy et

al., 2006; Olszewski-Kubilius & Turner, 2002; Plucker & Stocking, 2001; Siegle & Reis, 1998). Specifically, Nagy and colleagues and Plucker and Stocking found that girls rate themselves higher in biology, while boys rate themselves higher in mathematics. Olszewski-Kubilius and Turner found that more than twice as many boys than girls rated themselves higher in math than in language arts. Lewis and Knight (2001) found that gifted girls tended to rate themselves higher in intellectual domains (such as being 'smart'), while boys tended to rate themselves higher in school status domains (such as being a 'good student').

Although there is not a consensus in the research as to the direction and extent of gender effects on academic self-concept for high ability students, this may be due to differing subject-area academic self-concept between genders. For example, a general measure of academic self-concept may mask or confound differences in subject-area domains. See Appendix A, Table 3 for a summary of research concerning gender and academic self-concept among high-ability students.

Subject-area Domains

The academic self-concept of high-ability students also varies depending on subject area domains (e.g., Nagy et al., 2006; Plucker & Stocking, 2001). The Internal/External (I/E) frame of reference theory is one model to explain how students construct academic self-concept with several subject area domains. The I/E frame of reference theory states that students use both internal and external comparisons when formulating their academic self-concept. External frames of references include comparisons to classmates and also teacher and parent appraisals. This aspect makes this theory compatible with the BFLPE theory. The internal frame of reference includes

comparisons that students make with their own ability levels. For example, in this theory math ability and self-concept are negatively related to verbal self-concept (e.g., Skaalvik & Skaalvik, 2002). Support for the I/E frame of reference theory has been reported in a variety of settings and ability levels (e.g., Marsh & Hau, 2004; Moller, Streblow, & Pohlmann, 2006; Mui et al., 2000; Plucker & Stocking, 2001; Skaalvik & Skaalvik; Zeidner & Schleyer, 1999a).

The I/E frame of reference model may have important implications for gifted students (Mui et al., 2000; Plucker & Stocking, 2001; Williams & Montgomery, 1995). Verbal academic self-concept and math academic self-concept were negatively related in a sample of gifted students from a residential high school, even when the students showed high levels of achievement in both areas (Plucker & Stocking, 2001). Another study showed, that despite high correlations between verbal and mathematics achievement, there was no correlation between math and verbal self-concept scores in 9th grade honors students (Williams & Montgomery, 1995). This implies the effect of internal comparisons, independent of the relationship between ability and self-concept in a given subject area. If students feel they are competent in one subject area, then they are likely to feel that they are less competent in another subject area, even if they have high achievement in both areas.

While the I/E frame of reference model predicts a negative correlation between verbal and mathematical self-concepts (and a negative relationship between verbal achievement and math self-concept and between math achievement and verbal self-concept), the relationship between math and verbal self-concepts and general academic self-concept both tend to be positive. In other words, both verbal and math self-concepts

predict general academic self-concept (e.g., Mui et al., 2000; Yeung & Lee, 1999). Thus, general academic self-concept appears to be a separate construct that is positively influenced by multiple domains of academics. See Appendix A Table 3 for a summary of research concerning the I/E frame of reference theory.

Social Comparison

Another factor that influences the academic self-concept of high ability students is social comparison. Social comparison is how students compare themselves with their peers (i.e., classmates). Social comparison theories, such as the Big Fish Little Pond Effect (BFLPE), state that the average ability of the group (school, classroom, or other grouping environment) has a negative relationship with the individual academic self-concept of the students in the group (e.g., Marsh, 1987; Marsh, 2004). In other words, as students are placed in academic environments with students of higher ability, and they compare themselves to the group, their academic self-concept decreases. Numerous studies have shown support for the BFLPE in a variety of settings and cultural contexts (e.g., Gibbons, Benbow, & Gerrard, 1994; Ludtke et al., 2005; Marsh & Hau, 2003b; Marsh, Hau, & Kong, 2002; Marsh, Koller, & Baumert, 2001; Zeidner & Schleyer, 1999b, 1999d). On the other hand, some researchers have not found support for the effect (Cheung & Rudowicz, 2003; Rinn, 2007; Shaunessy et al., 2006; Shields, 1996).

To investigate the BFLPE, researchers must carefully construct their research to study various ability grouping options. Many researchers have used pre-existing situations in which homogeneously and heterogeneously grouped classrooms, schools, or programs were compared. For example, Marsh et al. (2001) compared the academic self-concepts of students in East and West Germany directly after reunification. East German

students were accustomed to a comprehensive school curriculum with heterogeneous grouping, while West German students had traditionally been a part of a more tracked, ability-based grouping model. After reunification, the majority of the country adopted the West German system. Students from the traditionally heterogeneously grouped East Germany displayed little of the BFLPE initially, but it increased over the course of time spent in the newly tracked unified school system (Marsh et al., 2001).

Another common way to research BFLPE is to compare students who elect to participate in homogeneous gifted classes and students who meet the same criteria but choose not to participate in such programs (Craven et al., 2000; Marsh, Chessor, Craven, & Roche, 1995; Rinn, 2007; Shaunessy et al., 2006). This method has produced mixed results, with some showing evidence for the BFLPE (Craven et al., 2000; Marsh et al., 1995) and others that do not (Rinn, 2007; Shaunessy et al., 2006). Specifically Craven and colleagues found that Australian students who chose to participate in selective gifted classes requiring a change in schools had lower academic self-concepts than those students who remained in heterogeneous classes. Marsh and colleagues reached similar conclusions when studying two samples of identified gifted students in Australia who participated in homogeneous and heterogeneous classroom groupings. Over time, the gifted students in homogeneous grouping showed a larger decline in academic self-concept than their peers in heterogeneous classrooms (Marsh et al., 1995). On the other hand, in the United States, Shaunessy and colleagues found that high-ability students who chose to participate in International Baccalaureate programs had higher academic self-concept than high-ability students in general education classes. Rinn found that students choosing to participate in a university honors program had higher academic self-concept

than high-ability students who chose not to participate. The differences may be due to cultural differences between Australia and the United States, idiosyncratic differences between the schools that participated in each study, or differences in program designs. The Australian studies focused on classrooms that were specifically designed to meet the needs of gifted learners and were full-time and self-contained. The studies in the United States, on the other hand, focused on programs that were specific to only a few of the student's classes and designed to provide challenging curriculum rather than the full-spectrum of needs for gifted learners.

Another way to account for a rise in academic self-concept, rather than a drop as expected with the BFLPE, is the reflected glory effect. Researchers who study the reflected glory effect theorize that student self-concept is initially greater upon being accepted to, and participating in, a highly selective program. When combined with the BFLPE, the pattern of changes in self-concept is an initial increase after acceptance into the program (Marsh et al., 1995; Marsh et al., 2000). The IB students in Shaunessey and colleagues' study (2006), for example, may have higher academic self-concept because of their perceptions of being successful in a prestigious and academically rigorous program. The extent to which the reflected glory effect operates may be a function of the selectivity and reputation of the program, the emphasis of educational opportunities in the culture, and the age of the students (Manor-Bullock, 1995; Marsh et al., 2000). Marsh et al. (2000) found evidence of the reflected glory effect in Hong Kong, a culture that highly values acceptance into the selective schools for high-achieving students. Manor-Bullock's (1995) study of academically talented residential high school students also found initial increases in self-concept attributed to the reflected glory effect that were

then followed by decreases attributed to the BFLPE. The increases occurred upon acceptance to the residential program, but as the students continued through the semester, their academic self-concept decreased.

Researchers have also used large scale databases to investigate the relationship between academic self-concept of students and school-wide or classroom achievement, thus making an inference about the effect of the BFLPE (Ludtke et al., 2005; Marsh, 1987, 1991; Marsh et al., 2000; Marsh & Parker, 1984). In these studies, students' individual academic self-concept scores were considered with the school-level or classroom-level average achievement. The BFLPE would predict that students in classes with higher average achievement would have lower academic self-concept. These studies found a negative relationship between the academic self-concept of individual students and the classroom or school-wide achievement (Ludtke et al.; Marsh, 1987, 1991; Marsh et al., 2000; Marsh & Parker, 1984). This provides inferential support of the BFLPE. These studies give overall support for BFLPEs, but they lack the precision to document the differences of individual program designs and classroom or instructional techniques that may also affect academic self-concept.

Rather than compare groups of heterogeneously and homogeneously grouped students or analyze large-scale databases for achievement information, some researchers have chosen to examine social comparison on an individual student level (e.g., Froddy & Crundall, 1993; Jones & Regan, 1974; Smith & Sachs, 1997; Suls, Gastorf, & Lawhon, 1978). When researchers consider social comparison on an individual basis, they found that students tend to compare themselves with others who are of equal or higher ability levels than themselves (Froddy & Crundall, 1993; Jones & Regan, 1974; Smith & Sachs,

1997; Suls et al., 1978). Another study showed that after a failure, students were more likely to choose to compare themselves with someone of lesser abilities if they thought that there was not an opportunity to improve (e.g., that the test measured an innate characteristic) than if the students had the opportunity to improve their performance (Michinov & Montell, 1997). This may indicate that students do not use social comparison as a way to heighten their own self-concept, but rather as a way to improve their performance, if it occurs within a situation in which improvement is perceived as possible.

In addition, one study found that students with lower abilities within a peer group are more likely to use social comparisons than their higher ability counterparts (Ruble & Flett, 1988). This would indicate that high-ability students are less likely to use social comparisons to determine their academic self-concepts. However, this effect may be determined in part by how much a student uses self-protective strategies. In other words, students with lower relative abilities who use self-protective strategies are less likely to compare themselves to others (Gibbons et al., 1994; Strube & Roemmele, 1985). There is some evidence that the type of social comparison (to peers with higher, lower, or similar academic abilities) does not affect academic self-concept (Chiu et al., 2008). On the other hand, another study revealed that when a student's best friend had higher levels of achievement than the student, the student's academic self-concept was lower (Guay, Boivin, & Hodges, 1999). These two studies indicate the need to study social comparison not only on a broad level (by examining the relationship between self-concept and school-wide or classroom achievement levels) but also an individual level (by examining

who a student is comparing himself or herself to and to what extent he or she is comparing himself or herself to others).

Although the research that directly compares groups of heterogeneously and homogeneously grouped students has had mixed results (e.g., Craven et al., 2000; Marsh et al., 2001; Shaunessy et al., 2006; Shields, 1996), research using large-scale databases has documented a drop in academic self-concept for students in high-achieving environments (e.g., Ludtke et al., 2005; Marsh, 1987; Marsh et al., 2001). This social comparison appears to affect the academic self-concept of students, at least in some situations. Research into individuals shows that patterns of their use of social comparison may be a function of their achievement level and attributional style (e.g., Michinov & Michinov, 1997; Ruble & Flett, 1988;). Table 5 in Appendix A provides a summary of the research studying social comparison.

Difficulty of Coursework

When high-ability students are grouped together homogeneously, the level of difficulty and rigor of the curriculum is often increased. Thus, the drop in academic self-concept for high-ability students entering special programs that is often attributed to social comparison may also be due to an increase in the difficulty level of the coursework (Wilson, 2008a). However, there is little research concerning perceived difficulty, or the level of challenge that a student perceives in his or her coursework, and its relationship to academic self-concept. However, some conclusions can be drawn from related studies. For example, one study found a relationship between high academic self-efficacy, a construct closely related to academic self-concept, and high levels of optimal educational experiences (Bassi, Steca, Della Fave, & Caprara, 2007). Optimal experiences,

sometimes referred to as flow, are times in which a student is highly engaged in activities resulting in satisfaction; they occur when a student is both faced with a challenge level of work and has the self-efficacy to meet it (Csikszentmihalyi & Csikszentmihalyi, 1988). Another study documented a drop in academic self-concept during the course of difficult undergraduate curriculum in the medical sciences, with an increase following a break from coursework (Kell, 2007), indicating a negative relationship between self-concept and difficulty level of the curriculum. Finally, a study conducted in Greece indicated that students' perception of difficulty negatively influenced their academic self-concept, but students' perception of effort was less reliably linked to measures of academic self-concept (Efklides & Tsiora, 2002).

Achievement

Closely linked to ability, achievement also influences academic self-concept. Researchers have found significant relationships between academic self-concept and achievement in school (e.g., Altmann & Dupont, 1988; Kelly & Jordan, 1990; Marsh, 1992a; Marsh, Byrne, & Shavelson, 1988; Marsh et al., 1984; Rost et al., 2005; Wang & Xu, 2005; Xu, Shi, & Liu, 2008). Marsh and colleagues (1999) have investigated the nature of the relationship between academic self-concept and achievement and found evidence that supports the hypothesis of a reciprocal relationship. In other words, prior school achievement affects academic self-concept and academic self-concept affects subsequent school achievement (Guay, Marsh, & Boivin, 2003; Marsh et al., 1999; Marsh & O'Mara, 2008; Marsh & Yeung, 1997; Marsh & Yeung, 1998; Muijs, 1997). Finally, Van Boxel and Monks (1992) found that gifted students with high achievement had significantly higher academic self-concept than gifted students who underachieved.

As the relationship between ability and academic self-concept is well documented in the research, the additional mediating effect of achievement is dependent on the relationship between ability and achievement. In research, ability and achievement are distinguished by potential (ability) and outcome (achievement). Theoretically, these two constructs should be correlated; however, other factors such as socioeconomic status, personal characteristics, and school and home environment can mediate this relationship. Correlations between ability and achievement tend to be strong (e.g., Busato, Prins, Elshout, & Hamaker, 2000; Floyd, Evans, & McGrew, 2003; Keith, 1999; Marjoribanks, 2001; Naglieri & Ronning, 2000; Rohde & Thompson, 2007; Spinath, Spinath, Harlaar, & Plomin, 2006; Taub, Keith, Floyd, & McGrew, 2008), but when gaps exist they can be attributed to parental or family environment (e.g., Feldman, Guttfreund, & Yerushalmi, 1998; Marjoribanks, 2001), student motivation (e.g., Busato et al., 2000; Spinath et al., 2006), or personality traits (e.g., Gilles & Bailleux, 2001). Interestingly, one study found that poverty in early childhood has a negative correlation with children's ability, while poverty in adolescence is negatively correlated with achievement (Guo, 1998). Over time, the relationship between ability and achievement appears to remain stable, meaning that growth in achievement is fairly constant across multiple ability levels (Rescorla & Rosenthal, 2004). Given the research supporting both a positive relationship between achievement and academic self-concept (Altmann & Dupont, 1988; Kelly & Jordan, 1990; Marsh, 1992a; Marsh, et al., 1988; Marsh et al., 1984; Rost et al., 2005; Wang & Xu, 2005; Xu et al., 2008) and ability and achievement (Busato et al.; Floyd et al.; Keith; Marjoribanks; Naglieri & Ronning; Rohde & Thompson; Spinath et al.; Taub et al.), it is

reasonable to hypothesize that achievement has a mediating effect on the relationship between achievement and academic self-concept.

The research concerning various mediating variables for the relationship of ability and academic self-concept for high-ability students is dependent on various programming available. Specific research into the academic self-concept of accelerated students shows that they have various patterns of academic self-concept (Dixon et al., 2001; Manor-Bullock, 1995) and these patterns are different from other populations (Shi, Li, & Zhang, 2008). The research of Dixon, Cross, and Adams indicates that within the population of accelerated students at a residential school there were different patterns of self-concept. Specifically, within the residential school, several types of students were identified, including students focused on mathematics achievement, social development, verbal achievement, and students low on many measures (Dixon et al., 2001). Additionally, another study found that gifted students in China showed a different pattern of self-concept than average-ability students (Shi et al., 2008). Specifically, while average-ability students showed an increase in academic self-concept from the ages of 9 to 13, gifted students' academic self-concept decreased (Shi et al., 2008). Thus, among gifted and accelerated students, various patterns of academic self-concept emerge. Table 5 in Appendix A summarizes various studies of the academic self-concept of accelerated students.

This review of research about the academic self-concept of high ability students reveals that studies consistently show a strong positive relationship between ability and academic self-concept (e.g., Colangelo & Bower, 1987; Kelly & Jordan, 1990). This relationship is mediated by gender (e.g., Dai, 2001), subject area strengths (e.g., Nagy et

al., 2006), social comparison (e.g., Marsh, 1987) perceived difficulty of the coursework (e.g., Efklides & Tsiora, 2002), and achievement (e.g., Guay et al., 2003). Specifically, gender appears to be a factor when academic self-concept is considered with subject-area domains, with girls favoring verbal areas and boys rating mathematical areas higher (e.g., Plucker & Stocking, 2001). Advanced skills in one area can also cause the academic self-concept in other areas to be lower, as theorized in the I/E models (e.g., Skaalvik & Skaalvik, 2002). High-ability students grouped homogeneously may also have lower academic self-concept due to social comparisons (e.g., Marsh, 1987), although this is is not always the case (e.g., Shaunnessy et al., 2006). Achievement also appears to have a positive relationship with both ability (e.g., Altmann & Dupont, 1988) and academic self-concept (e.g., Marsh et al., 1999). Finally, there is less research on the perceived difficulty of coursework and the contribution to academic self-concept.

A variety of studies have considered the relationship between ability and academic self-concept (e.g., Colangelo & Bower, 1987; Kelly & Jordan, 1990; Pyryt & Mendaglio, 1994) and the additional effects of gender (e.g., Dai, 2001; Ziegler et al., 1996), subject area strengths (e.g., Nagy et al., 2006; Williams & Montgomery, 1995), social comparison (e.g., Marsh,1987; Ludtke et al., 2005), perceived difficulty of the coursework (e.g., Efklides & Tsiora, 2002), and achievement (e.g., Guay et al., 2003, Marsh & Yeung, 1998). A more comprehensive model of academic self-concept is needed in the research to combine these findings. This model should include variables such as ability, achievement, social comparison, and perceived difficulty as predictors of academic self-concept. These relationships are reviewed in the existing research and are used in creating a new model of academic self-concept. The development of this more

comprehensive model and the methodology of testing the model will be discussed in the next chapter.

Chapter 3

Methodology

Based on the extensive literature concerning academic self-concept, a model of self-concept was developed including the following variables: ability, achievement, perceived change in achievement, social comparison, perceived difficulty, ability comparison orientation, opinion comparison orientation, learner self-concept, student self-concept, and future academic goals. This chapter will explain the methodology of testing this model across the three populations of this study: International Baccalaureate students, Advanced Placement students, and students attending a residential high school located on a university campus. It will outline the samples, instrumentation, and methods used in the present study.

Sample

The participants for this study came from three distinct populations. The first population consisted of students who were enrolled in an International Baccalaureate program. The second population consisted of student enrolled in Advanced Placement courses in mathematics and the sciences. Finally, the third population consisted of students who attended a residential high school located on a college campus. These populations of students represent three unique methods of accelerating students through a high school and college curriculum. However, it should be noted that all comparisons made in this study are comparing the populations of students rather than the programs.

International Baccalaureate (IB)

International Baccalaureate is a rigorous program of curriculum for students across the globe; it includes three programs: primary, middle years, and diploma (International Baccalaureate Organization [IBO], 2009). The diploma program, for high school students, is most familiar to American educators. The mission statement for the IB program is as follows:

> The International Baccalaureate aims to develop inquiring, knowledgeable and caring young people who help to create a better and more peaceful world through intercultural understanding and respect.
>
> To this end the organization works with schools, governments and international organizations to develop challenging programmes of international education and rigorous assessment.
>
> These programmes encourage students across the world to become active, compassionate and lifelong learners who understand that other people, with their differences, can also be right. (International Baccalaureate Organization, 2009, pp. P 4-6)

The diploma program encourages students to think critically by asking challenging questions, think metacognitively about the learning process, develop identity, and increase their ability to communicate their learning (IBO, 2009). The curriculum consists of three core requirements (the extended essay; theory of knowledge course; and creativity, action, service program) and six academic areas (Language, Individuals and Societies, Mathematics and Computer Science, Arts, Experimental Sciences, and Second Language). To complete the program, students must complete the extended essay; participate in service through the creative, action, service program; and follow the theory of knowledge course (IBO, 2009). The theory of knowledge course is an interdisciplinary course that investigates the nature of knowledge across cultures and disciplines (IBO, 2009). In order for schools to offer the IB program, they must be authorized by the IB

organization, and all teachers instructing within the program must attend IB-approved professional development (IBO, 2009). Thus, the IB program is a comprehensive curriculum for high school students and is implemented according to rigorous standards that are overseen by the IB organization.

Recruitment. The schools for the IB population of students were recruited through coordinator of advanced academics at a Texas school district. This IB program has a reputation for excellence among surrounding districts and has been in operation for 5 years (personal communication, Advanced Academics/IB Coordinator, November 15, 2008). The schools used in the study also offer Advanced Placement courses in addition to the IB courses, although students must choose either the IB or AP track of studies. The coordinator agreed to participate in the study and granted permission for the investigator to survey IB students in 11th and 12th grades at both high schools within the school district. She then coordinated with the IB directors at each of the schools and the participating teachers to find scheduled times for the investigator to visit each school and survey students. She also facilitated the distribution of parental information and consent forms to each of the students for participation in the study.

Demographics. The school district with the IB schools used in this study is located in a north Texas in a suburban community outside a large urban center. The district includes 19 elementary schools, 5 junior high schools, and 2 high schools (Texas Education Agency, 2009). It includes 20,209 students, with 4,302 students at the high schools (grades 10-12; Texas Education Agency, 2009). In 2008, it was rated as a recognized school district by the Texas Education Agency, with 82% of students passing

the state accountability tests across all grade levels (Texas Education Agency, 2009). See Table 3.1 for district and school demographic information.

Table 3.1

Demographic Information about IB Schools and School District

	School "A" 11th graders		School "B" 11th graders		School District All grades	
	n	Percent	*n*	Percent	*n*	Percent
Ethnicity						
African American	180	15.0	157	13.0	1634	14.0
Hispanic	235	19.0	197	17.0	2437	21.0
White	634	52.0	732	63.0	6238	54.0
Economic Disadvantaged	391	32.0	319	27.0	4357	38.0
Passing Standards						
Reading	1189	97.0	1130	97.0	11057	96.0
Writing					2435	96.0
Social Studies	1207	98.0	1109	97.0	3590	97.0
Mathematics	1060	87.0	984	86.0	10358	90.0
Science	1043	85.0	995	87.0	4350	87.0
Total	1232		1164		11057	

Note: All information gathered from the Texas Educational Agency website (Texas Education Agency, 2009)

From these schools, students were recruited from IB classes, specifically through English, history, and 20th century topics courses. A total of 227 students participated, with an approximately equal numbers of males (*n*=97) and females (*n*=124) and juniors

(*n*=107) and seniors (*n*=111). Some students chose not to answer the demographic information, such as gender or classification, and therefore represent a small amount of missing data from the sample. Similar numbers of students participated from each school (School A, *n*=100; School B, *n*=127). Approximately half of the students were attending English classes (*n*=102), because English classes were used in both schools, while School A also incorporated history classes and School B incorporated 20th Century topics. Care was taken to ensure that students were not asked to complete the survey twice. Demographic information for the IB sample can be found in Table 3.2.

The IB participants reported relatively high achievement in the program (*M*=8.04; see Table 3.3) with slightly higher performance prior to beginning the program (*M*=8.79). A score of 8 in achievement represents a student reporting *More As than Bs*, while a score of 9 represents *Mostly As*. In addition, their perceived change in achievement (*M*=4.93) indicates that they also perceive their achievement to be somewhat better since beginning the program. Their mean SAT Composite score was 1810, with the maximum possible score a 2400. The mean of future academic plans (*M*=4.11) indicates that most students planned on pursuing a Masters or Doctoral level degree. They also planned on applying to selective schools, with the mean admissions at 41%. This measure is an average of the percent admitted at the colleges in which the students indicated that they chose for the college's prestige. Overall, IB students did not perceive their coursework to be challenging (*M*=2.49) and they had fairly high Student (*M*=5.94) and Learner (*M*=5.44) Self-Concepts. These three constructs were measured on a scale ranging from 1 to 7. They compared themselves to others at a moderate level (*M*=4.57) and participated

in behaviors associated with comparison orientation to a somewhat greater extent (*M*=5.17). These measures were also on a scale of 1 to 7.

Table 3.2

Demographics for IB Population

	n	Percentage
Gender		
Male	97	42.7
Female	124	54.6
Class		
Freshman	0	0
Sophomore	0	0
Junior	107	47.1
Senior	111	48.9
Subject Area		
English	102	44.9
History	48	21.1
20th Century		
Topics	77	33.9
School		
School "A"	100	44.1
School "B"	127	55.9
Total	227	100

Note. Percentages may not add up to 100 due to incomplete information provided by participants.

Table 3.3

Selected Means for IB Population

	n	Mean	*S.D.*
Achievement	226	8.04	1.55
Prior Achievement	226	8.79	1.26
Difference in Achievement	226	-.74	1.44
SAT Composite	114	1810	212.33
Perceived Change in Achievement	224	4.93	1.40
Future Academic Plans	219	4.11	.77
College Selectivity Index	133	.41	.21
Perceived Difficulty	224	2.49	.89
Student Self-Concept	223	5.94	.87
Learner Self-Concept	223	5.44	1.02
Ability Comparison Factor	227	4.57	1.28
Opinion Comparison Factor	223	5.17	1.04

Advanced Placement (AP)

The Advanced Placement program represents 37 possible courses offered to advanced students through their local high schools. Students have the opportunity to take the AP exam that is administered through the College Board (The College Board, 2009a). The material covered in the AP exams represents college-level work, and students with

high scores on these exams may receive college credit for their AP work (The College Board, 2009a). AP does not represent a comprehensive curriculum; rather, students may choose in which classes and subject areas to enroll. In most school districts, teachers do not have to be certified to teach AP courses, however, the College Board and other agencies offer various optional professional development opportunities to train AP teachers.

AP classes are designed to give students opportunities for college-level work while remaining in high school, to improve writing and critical thinking skills, and develop study habits (The College Board, 2009a). Of the over three million high school graduates in 2008, 757,932 students took an AP exam during high school, representing 25% of all students (The College Board, 2009a). Of students taking the exam, 461,537 students scored a 3 or higher on an exam, which is 15.2% of the total number of high school graduates across the country (The College Board, 2009a). The most popular exams are US History, English Literature and Composition, Calculus, U.S. Government and Politics, Biology, Psychology, Statistics, Spanish Language, and World History (The College Board, 2009a). The average school offers 10 AP courses to 93 students (The College Board, 2009a).

Recruitment. The initial recruitment for this study centered around School District C, located in a north Texas suburb with a reputation for excellence among its AP courses. After the researcher worked with the director of advanced academics and the principal at the high school, only one AP class was available to participate in the study. The teacher distributed parental information and consent forms prior to the researcher's distributing the surveys to the AP Biology class.

The researcher then contacted an additional school district (School District D) in the north Texas area, and working with the advanced academics coordinator at one of the high schools, additional teachers and participants were recruited to participate. The school coordinator distributed parental consent forms and information sheets to each of the teachers who distributed them to students before participation in the study. AP science and mathematics teachers distributed the surveys to the students during regular class time.

IB programs were also available at both schools, although the IB programs were not as well-established within the school culture as the AP course. For example, in School District C the IB program was in its first year.

Demographics. School District C is located in a north Texan suburban community outside of a large urban center. The district includes 10 elementary schools, 3 middle schools, 1 high school, and 2 alternate high schools (Texas Education Agency, 2009). It includes 9,930 students, with 2,959 students at the high school (grades 9-12) (Texas Education Agency, 2009). In 2008, it was rated as a recognized school district by the Texas Education Agency (Texas Education Agency, 2009). See Table 3.8 for district and school demographic information.

School District D is also located in a north Texan suburban community outside the same large urban center. The district includes 21 elementary schools, 5 intermediate schools, 5 middle schools, and 3 high schools (Texas Education Agency, 2009). In 2007, it was also rated as a recognized school district by the Texas Education Agency (Texas Education Agency, 2009). See Table 3.4 for district and school demographic information.

Table 3.4

Demographic Information about AP Schools and School Districts

	School C 11th graders		School District C All grades		School D 11th graders		School District D All grades	
	n	Percent	*n*	Percent	*n*	Percent	*n*	Percent
Ethnicity								
African-American	101	5.0	323	5.0	55	3.0	1398	8.0
Hispanic	216	10.0	658	10.0	137	7.0	2922	16.0
White	1424	67.0	4284	66.0	1766	86.0	12902	69.0
Economic Disadvantaged	125	6.0	452	7.0	83	4.0	2580	14.0
Passing Standards								
Reading	2079	98.0	6435	99.0	1960	96.0	17920	96.0
Writing			1407	99.0			4141	97.0
Social Studies	1384	99.0	2140	99.0	1245	98.0	5353	96.0
Mathematics	1981	94.0	6264	97.0	1774	87.0	16729	90.0
Science	1308	93.0	2762	94.0	1172	92.0	6893	88.0
Total	2127		6529		2043		18624	

Note: All information gathered from the Texas Educational Agency website (Texas Education Agency, 2009)

The majority of students in the AP population of this study came from School D (*n*=194; see Table 3.5). Approximately the same number of males (*n*=114) participated as females (*n*=96). The majority of students were seniors (*n*=180). All of the students were surveyed during mathematics or science classes.

Table 3.5

Demographics for AP Population

	n	Percentage
Gender		
Male	114	53.0
Female	96	44.7
Class		
Freshman	1	0.5
Sophomore	2	0.9
Junior	26	12.1
Senior	180	83.7
School		
School C	21	9.8
School D	194	90.2
Total	215	100.0

Note. Percentages may not add up to 100 due to incomplete information provided by participants.

The AP participants reported relatively high achievement in the program (M=7.94; see Table 3.6) with a higher performance prior to beginning the program (M=9.14). A score of 8 in achievement represents a student reporting *More As than Bs*, while a score of 9 represents *Mostly As*. In addition, their perceived change in achievement (M=4.46) indicates that they also perceive their achievement to be somewhat better since beginning the program. Their mean SAT Composite score was

1897, with the maximum possible score a 2100. The mean of future academic plans (*M*=4.15) indicates that a majority of students planned on pursuing a Master's or Doctoral level degree. They were also planning on applying to selective schools, with the mean admissions at 46.7%. The AP students in this study found their AP classes to be slightly unchallenging (*M*=3.14), and they had fairly high Student (*M*=5.73) and Learner (*M*=5.31) Self-Concepts. They compared themselves to others (*M*=4.26) and participated in behaviors associated with comparison orientation (*M*=4.75) at moderate levels.

Table 3.6

Selected Means for AP Population

	n	Mean	*S.D.*
Achievement	213	7.97	1.74
Prior Achievement	212	9.13	1.22
Difference in Achievement	212	-1.14	1.77
SAT Composite	175	1897	262.6
Perceived Change in Achievement	211	4.46	1.45
Future Academic Plans	205	4.15	0.88
College Selectivity Index	113	.47	21.2
Perceived Difficulty	205	3.14	1.31
Student Self-Concept	209	5.73	1.18
Learner Self-Concept	207	5.31	1.09
Ability Comparison Factor	209	4.26	1.26
Opinion Comparison Factor	209	4.75	1.20

Residential school

In addition to IB and AP courses, another alternative for acceleration at the secondary level is residential schools located on a college campus. In these programs, students enroll in advanced coursework at the university while living in dedicated residence halls for students in the program. These programs typically enroll students from diverse geographic locations, across the state, or in some cases, across the country. Thus, these institutions tend to be highly selective, recruiting academically talented students from a wide variety of schools.

Description. The residential school participating in this study is located in a southern state and focuses on students with talent in mathematics and science. It recruits students from across the state, encompassing diverse geographic regions, ethnic and cultural backgrounds, and socioeconomic status (school publicity materials, March 1, 2009). Approximately 377 students attend the school, with 55% male and 45% female populations (school publicity materials, March 1, 2009). Students at this residential school enroll exclusively in courses at the university and are required to take math classes through Calculus II and two semesters of each biology, chemistry, and physics, as well as fulfilling English, political science, and seminar requirements.

Recruitment. The school was initially contacted through the director of research at the school. Parental consent was gained for participation through email contacts with parents, and student assent was given through completion of the surveys. School faculty distributed the surveys during the monthly seminar for seniors. This seminar provides an opportunity for faculty and staff at the school to connect with students and to provide

information such as research opportunities, college admissions guidance, and graduation requirements.

Demographics. Due to the administration of the surveys during senior seminar, all of the residential school student participants were seniors in high school (*n*=110, see Table 3.7). Approximately the same number of males (*n*=58) and females (*n*=51) participated in the study.

Table 3.7

Demographics for Residential School Population

	n	Percentage
Gender		
Male	58	52.7
Female	51	46.4
Class		
Freshman	0	0.00
Sophomore	0	0.00
Junior	0	0.00
Senior	110	100.0
Total	110	100.0

Note. Percentages may not add up to 100 due to incomplete information provided by participants.

The residential school participants reported high achievement in the program (*M*=8.74; see Table 3.8) with a higher performance prior to beginning the program

(*M*=9.46). A score of 8 in achievement represents a student reporting *More As than Bs*, while a score of 9 represents *Mostly As* and a score of 10 represents *All As*. Their perceived change in achievement (*M*=4.52) indicates that they also perceive their achievement to be somewhat better since beginning the program, despite the dip in their grade point averages. Their mean SAT Composite score was 2074, with the maximum possible score a 2400, representing a population with very high ability. The mean of future academic plans (*M*=4.60) indicates that most students plan on pursuing a Doctoral level degree. They were also planning on applying to extremely selective schools, with the mean admissions rate at 26.68%. This measure is an average of the percent admitted at the colleges in which the students indicated that they chose for the college's prestige. The residential school students in this study did not find their college coursework to be challenging (*M*=2.47), and they had fairly high Student (*M*=5.73) and Learner (*M*=5.32) Self-Concepts. They compared themselves to others (*M*=4.21) and participated in behaviors associated with comparison orientation (*M*=4.94) at moderate levels.

Table 3.8

Selected Means for Residential School Population

	n	Mean	*S.D.*
Achievement	108	8.74	1.27
Prior Achievement	108	9.46	1.09
Difference in Achievement	108	-.72	1.12
SAT Composite	85	2074	306
Perceived Change in Achievement	107	4.52	1.47
Future Academic Plans	102	4.60	0.60
College Selectivity Index	69	.27	.16
Perceived Difficulty	107	2.47	1.03
Student Self-Concept	106	5.73	0.86
Learner Self-Concept	107	5.32	1.16
Ability Comparison Factor	102	4.21	1.34
Opinion Comparison Factor	101	4.94	1.14

Instrumentation

Several instruments were used in this study. Collectively, they were given to each of the students to measure each of the variables included in the model. See Table 3.9 for a summary of each of the instruments. Each of these instruments will be discussed in further detail in the following sections.

Table 3.9

Instruments

Instrument	Variables Measured	Range of Scores
Perceived Challenge and Academic Self-Concept Scale (PCSC)	Perceived Difficulty	1-7
	Student Self-Concept	1-7
	Learner Self-Concept	1-7
Iowa-Netherlands Comparison Orientation Scale (INCOM)	Ability Comparison Orientation	1-7
	Opinion Comparison Orientation	1-7
Composite SAT Score	Ability	600-2400
Program Grades	Achievement	1-10
Perceived Change in Achievement	Perceived Change in Achievement	1-7
Educational Aspirations	Future Goals	1-5
Interaction term between Achievement and Ability Comparison Orientation	Social Comparison	

Perceived Challenge and Academic Self-Concept Scale (PCSC)

The Perceived Challenge and Academic Self-Concept Scale (Wilson, 2007) measures a student's academic self-concept and perceived level of difficulty of his or her

current coursework. The scale used in the study contains 19 items, each measured on a 7-point Likert-type scale ranging from *strongly disagree* to *strongly agree*. It is composed of two theoretical constructs: perceived level of difficulty and academic self-concept. A high score on perceived level of difficulty indicates that a student finds his or her coursework highly challenging. A high score on the academic self-concept scale indicates that a student believes that he or she is good at academic endeavors. A content validation, an exploratory factor analysis, and a confirmatory factor analysis were previously conducted on this instrument, and the details of these analyses are discussed in the following sections.

Content validation. The first step in developing the instrument was to operationalize the constructs by writing items. Based on the literature about self-concept, particularly the social comparison theories, stems were written to minimize students' comparison to others or to past experiences, and focused on the actual difficulty in the current coursework. The items written included statements such as "I struggle with completing assignments" and "I am a good student" rather than items such as "I am a better student than most of my classmates." Although participants answering these items may be comparing themselves to others to make the ultimate judgment about their own self-concept, the items do not ask the students to directly compare themselves with others to make this judgment.

After the researcher initially wrote approximately 40 items, a group of researchers met to discuss the overall conception of the constructs, as well as individual items. Based on the recommendations of that group, some items were reworded or deleted. The rating scale was also adjusted for ease of use. A content validation survey was conducted to

evaluate the relevance of the items to the initial constructs. The survey was distributed to seven experts in the field, including two professors of gifted education, four graduate students in the field of education, and one advanced academics coordinator for a school district. The survey asked respondents first to decide the construct to which each item belonged, and to rate their confidence in this decision, and finally, to rate how relevant the item was to the construct. In addition, the experts were asked to answer qualitative questions about the instrument. Based on the accuracy of the respondents in identifying the construct for each item, as well as their confidence and relevance indicators and qualitative comments, the instrument was revised to include 30 items (Wilson, 2008a).

Exploratory factor analysis. The next step in the development of the instrument was an exploratory factor analysis of the 30-item instrument (Wilson, 2008a). The exploratory factor analysis was completed with a sample of undergraduate college students at a large university in the northeast (Wilson, 2008a). To complete the factor analysis, the researcher used a parallel analysis (Wilson, 2008a). The parallel analysis compares the Eigen-values for extracted factors to random data sets. The greatest number of factors extracted that yield Eigen-values greater than the random data set indicates the factor solution.

After the researcher completed the parallel analysis, a Principal Axis Factor (PAF) Analysis was chosen because it "uses the communality coefficients to replace the ones on the diagonal of the correlation matrix" (Thompson, 2004, p. 37). Therefore, the PAF only tries to explain the shared variance in the communalities. To give the data a simple structure, the researcher used a direct oblimin rotation (Wilson, 2008a). This rotation is oblique, meaning that it allows for correlation between factors. When the

researcher examined the pattern matrix, the criteria for dropping items was items with low coefficients, less than or approximately equal to an absolute value of .30 on any factor (Pett, Lackey, & Sullivan, 2003). The pattern matrix was also examined for multi-dimensional items, or items with high correlations with more than one factor (Wilson, 2008a). If a factor had more than .30 pattern coefficient, while controlling for the other factors, on more than one factor, that item was deleted (Wilson, 2008a). After examining the pattern matrix in which only the unique communalities between the factor and item are listed, the findings were substantiated through the structure matrix which includes the shared communalities between all factors and the items (Wilson, 2008a).

The final exploratory factor analysis indicated a four-factor solution, including the following factors: Perceived Level of Understanding, Perceived Level of Effort, Student Self-Concept, and Learner Self-Concept (Wilson, 2008a). The Perceived Level of Understanding subscale contained 7 items and had a reliability of .930, a mean of 3.92, and a standard deviation of 1.32 (Wilson, 2008a). A student with a high score on this scale would perceive him or herself as understanding the course material with ease. The Perceived Level of Effort subscale contained 2 items and had a correlation between those items of .646, a mean of 5.23, and the standard deviation of 1.40 (Wilson, 2008a). A student who scored high in this subscale would perceive that it takes considerable effort for him or her to be successful. Due to the low number of items in this subscale, three additional items were added to the instrument for further analysis. The Student Self-Concept subscale included 5 items and had a reliability of .831, a mean of 5.73, and a standard deviation of .762 (Wilson, 2008a). A student with a high score on this subscale would view himself or herself as a good student. The Learner Self-Concept subscale

included 2 items, with a correlation between the two items of .587, a mean of 5.11, and a standard deviation of .992 (Wilson, 2008a). A student who scored high on this subscale would view himself or herself as good at learning. Due to the low number of items on this subscale, further research on this instrument included an additional item. The results of the exploratory factor analysis were used to inform the subsequent confirmatory factor analysis (Wilson, 2008a).

Confirmatory factor analysis. The next step in the development of the instrument was a confirmatory factor analysis conducted with a different sample of undergraduate students at the same large university in the northeast (Wilson, 2008b). Structural equation modeling software (Amos 16.0) was used to analyze the data. The confirmatory factor analysis was conducted using maximum likelihood estimation (Wilson). The Tucker-Lewis index (TLI) and root-mean-square error of approximation (RMSEA) were used to measure goodness-of-fit, although the chi-square degrees of freedom ratio was also reported (Wilson). The TLI was chosen because it is an incremental fit index that compares the baseline model to specified model and accounts for the addition of parameters (Brown, 2006). The RMSEA was chosen because it is based on a non-centrality parameter and estimates how well the model will do at reproducing the population covariances (Thompson, 2004). The chi-square test provides an overall measure of fit for the model, but it is dependent on sample size, and thus with a large sample may tend to reject the null hypothesis even when "the substantive significance of the difference may be negligible" (Bollen, 1989, p. 268). In addition, the variance-covariance matrix, the standardized residual covariance matrix, and parameters of the model were examined to determine if any additional paths should not be constrained and

if any items should be eliminated. Finally, a respecified model was tested and goodness-of-fit measures reported (Wilson, 2008b).

The final model of the confirmatory factor analysis included 19 items, with 3 to 7 items corresponding with each of the four subscales (Wilson, 2008b). Each of the subscales was correlated with each other subscale, and there were additional covariances between error terms. The paths coefficients range from .590 to .909, indicating that each of the items was correlated with the corresponding factor. The goodness-of-fit indices also indicated that this model had adequate fit with the observed data. The TLI (TLI=.966) was greater than .95, indicating a reasonably good fit (Brown, 2006; Wilson). In addition, the RMSEA was .052, with the 90% confidence interval ranging from 041 to .063, also indicating a reasonably good fit (Brown, 2006; Wilson). In this model, the chi-square test was statistically significant (2243.98, df=142); however, this was most likely due to the sample size (N=264). Therefore, this factor structure held for the population of undergraduate students sampled (Wilson, 2008b).

The Perceived Level of Understanding factor had 7 items and an internal reliability, as measured by Cronbach's alpha, of .939, indicating the scores had a high reliability. It had a mean of 4.50 and a standard deviation of 1.40 across all participants (Wilson, 2008b). The Perceived Level of Effort factor had 5 items and an internal reliability, as measured by Cronbach's alpha, of .886, indicating the scores good reliability. This factor had a mean of 5.33 and a standard deviation of 1.23 (Wilson, 2008b). The Learner Self-Concept factor had 3 items and an internal reliability, as measured by Cronbach's alpha, of .880, indicating good reliability. The Learner Self-Concept factor had a mean of 5.17 and a standard deviation of 1.14 (Wilson, 2008b).

Finally, the Student Self-Concept factor had 4 items and an internal reliability, as measured by Cronbach's alpha, of .848, indicating good reliability. The mean was 5.64 with a standard deviation of .95 across the sample (Wilson, 2008b). Based on the model fit indices and the examination of the standardized residual covariance matrix, the final model appears to exhibited adequate fit. The Perceived Challenge and Academic Self-Concept Scale includes four subscales: Perceived Level of Understanding, Perceived Level of Effort, Learner Self-Concept, and Student Self-Concept, when used with undergraduate students (Wilson, 2008b).

Current instrument. In the current study, the 19-item instrument from the confirmatory factor analysis was given to participants. The complete instruments are available in Appendix B, C, and D. However, when the researcher considered the measurement model through structural equation modeling, a slightly different factor structure emerged and indicated that 7 items be eliminated from the scale. The total number analyzed, therefore, was reduced to 12 items. This change is most likely due to the differences between the samples (e.g., advanced high school students in the current study versus undergraduate college students in the confirmatory factor analysis). A complete discussion of the development of the measurement model appears in Chapter 4.

The final Perceived Difficulty scale consisted of 6 items: 1, 6, 7, 9, 11, and 15. Across the samples, the internal reliability as measured by Cronbach's alpha was .902, which represents high reliability (Cronbach, 1951). The mean score, across all samples, was 2.73 with a standard deviation of 1.14, indicating that students felt a low level of difficulty. See Table 3.10 for scale statistics and Table 3.11 for reliabilities across groups for each subscale.

Table 3.10

Scale Statistics for PCSC

	Number of Items	Cronbach's Alpha	Mean	Standard Deviation
Perceived Difficulty	6	.902	2.73	1.14
1. I am often confused by the content of this class.			2.57	1.34
6. I am often confused while doing the out of class assignments.			3.06	1.47
7. It is difficult for me to complete the assignments for this class.			2.69	1.42
9. I struggle with completing the assignments for this class.			2.68	1.44
11. I find it difficult to understand the assignments for this class.			2.66	1.35
15. I struggle with completing the out of class assignments for this class.			2.77	1.43
Learner Self-Concept	3	.881	5.82	1.01
10. Learning new things is difficult for me. *Reverse Scored*			5.28	1.25
12. I am good at learning new things.			5.48	1.13
14. I learn things quickly.			5.31	1.24
Student Self-Concept	3	.835	5.37	1.08
3. I am a good student.			5.72	1.28
8. I do well in school.			5.96	1.06
16. I make good grades in school.			5.77	1.13

The Learner Self-Concept scale consists of 3 items: 10, 12, and 14. Across the samples, the internal reliability as measured by Cronbach's alpha was .881, which represents an adequate reliability (Cronbach, 1951). The mean score, across all samples was 5.37 with a standard deviation of 1.08, indicating a moderately high learner self-concept among all participants.

The Student Self-Concept scale consists of 3 items: 3, 8, and 16. Across the samples, the internal reliability as measured by Cronbach's alpha is .841, which represents adequate reliability (Cronbach, 1951). The mean score, across each sample, was 5.82 with a standard deviation of 1.01, indicating a moderately high student self-concept among all participants.

Thus, the final PCSC used in the analysis included 12 items with three factors. The factors had internal reliabilities ranging from .835 to .902. The factors measure the perceived level of difficulty students experience in their coursework, the student's learner self-concept, and the student's student self-concept.

Table 3.11

Scale Reliabilities Across Groups for PCSC

	Number of Items	Cronbach's Alpha IB Population	Cronbach's Alpha AP Population	Cronbach's Alpha Residential School Population
Perceived Difficulty	6	.846	.914	.906
Learner Self-Concept	3	.869	.874	.913
Student Self-Concept	3	.839	.864	.713

Iowa-Netherlands Comparison Orientation Scale (INCOM)

The Iowa-Netherlands Comparison Orientation Measure was designed to measure participants' tendency to compare themselves with others (Gibbons & Buunk, 1999). In other words, it is a measure of social comparison. It was initially tested with samples of adults, college students, and high school students in the Netherlands and the United States (*N*=3,115) using both exploratory and confirmatory factor analyses (Gibbons & Buunk, 1999). The exploratory factor analysis used principal-components analysis with a varimax rotation (Gibbons & Buunk, 1999).

In the analysis of the 11-item instrument conducted by the authors, two factors emerged (Gibbons & Buunk, 1999). The first factor, labeled "Ability Comparison Orientation" included 6 items: 1, 2, 3, 4, 5, and 6. These items can be found in Appendix B, C, and D. The pattern coefficients for each of these items ranged from .54 to .78 (Gibbons & Buunk, 1999). The second factor, labeled "Opinion Comparison Orientation" by the authors of the study included 5 items: 7, 8, 9, 10, and 11. The pattern coefficients for these items ranged from .51 to .76 (Gibbons & Buunk, 1999). This factor structure remained consistent between samples of Dutch and American adults and students and through the exploratory and confirmatory factor analyses (Gibbons & Buunk, 1999). The internal reliability for the entire scale ranged from .77 to .85 among the samples tested (Gibbons & Buunk, 1999).

The INCOM was developed to measure social comparison orientation, based on the rich research literature on motivation and use of comparisons to develop sense of self (Gibbons & Buunk, 1999). Using a cross-cultural sample, the 11-item instrument contains two factors with moderate internal reliabilities.

Current study. The current study used the 11-item INCOM to measure students' comparison orientation. It was used to get an indication of each student's tendency to compare himself or herself to others. In the analysis of the measurement model for the current study, 3 items were deleted and the remaining items fell into the two theorized factors from Gibbons and Buunk (1999). See Table 3.12 and 3.13 for details, and Chapter 4 for a complete description of the development of the measurement model.

The Ability Comparison Factor measures a student's tendency to compare with others on ability in a variety of settings. It represents internal processes of comparison in which participants gather information from the environment and others' performance and compares with their own self-assessments. It contains 4 items: 2, 3, 4, and 5. The internal reliability is .820 across the entire sample, which represents adequate reliability (Cronbach, 1951). The mean was 4.38, with a standard deviation of 1.29, indicating that students compare themselves to others internally at a moderate level.

The Opinion Comparison Factor measures a student's tendency to compare with others through active gathering of information about others' performance. These items, as opposed to all items in the Ability Comparison Factor, do not contain the word "compare." When the researcher examined the measurement model, this factor included 4 items: 7, 8, 9, and 10. The internal reliability for this sample was .810, indicating an adequate level of reliability (Cronbach, 1951). The mean was 4.96 with a standard deviation of 1.14, indicating that students used active means of social comparison slightly more than ability comparison.

Table 3.12

Scale Statistics for INCOM

	Number of Items	Cronbach's Alpha	Mean	Standard Deviation
Ability Comparison Factor	4	.820	4.38	1.29
2. I always pay a lot of attention to how I do things compared to others.			4.47	1.64
3. If I want to find out how well I have done something, I compare what I have done with how others have done.			4.70	1.61
4. I often compare how I am doing socially with other people.			3.79	1.65
5. I am not the type of person who compares themselves [sic] with others. *(Reverse Scored)*			3.70	1.58
Opinion Comparison Factor	4	.810	4.96	1.14
7. I often like to talk to others about mutual opinions and experiences.			5.38	1.29
8. I often try to find out what others think who face similar problems I face.			5.07	1.44
9. I always try to like to know what others in a similar situation would do.			4.81	1.46
10. If I want to learn more about something, I try to find out what others think of it.			4.58	1.45

Table 3.13

Scale Reliabilities Across Groups for INCOM

	Number of Items	Cronbach's Alpha for AP Population	Cronbach's Alpha for AP Population	Cronbach's Alpha for AP Population
Ability Comparison Factor	4	.822	.783	.821
Opinion Comparison Factor	4	.790	.839	.816

The INCOM measures a student's tendency towards social comparison on two factors, including ability comparison and opinion comparison. In the current study, each factor had 4 items with adequate internal reliability and moderate means.

Ability

In this study, ability was measured with self-reported composite scores on the SAT Reasoning test. The SAT is the most widely accepted college admissions test in the United States (The College Board, 2009b). It tests critical thinking and skills in reading, writing, and mathematics (The College Board, 2009b). Each of the three subtests is scored on a scale from 200 to 800 points, leaving a composite score maximum of 2400 (The College Board, 2009b).

While the self-reported nature of SAT scores is a limitation of this study, research indicates a high correlation between self-reported scores and actual scores (Beaujean et al., 2006; Mayer et al., 2007). In addition, another study showed that there was no difference between the actual SAT scores of students who reported their scores when compared to students who did not report their scores (Flake & Goldman, 1991).

In addition, SAT scores have been shown to be highly correlated to general cognitive ability (Beaujean et al., 2006; Frey & Detterman, 2004; Koenig, Frey, & Detterman, 2008). SAT scores have been used as indicators of general cognitive ability in many research studies (Hall, Bolen, & Gupton, 1995; Jackson & Rushton, 2006; Kean & Glynn, 1987; Lubinski & Benbow, 1992). The SAT is generally used as a predictor of college success (The College Board, 2009b), but it also measures critical reasoning and is used as a measure of general cognitive ability.

In the survey, students were asked to report their Composite SAT scores, as well as their Critical Reading, Mathematics, and Writing SAT subscores. However, due to a large amount of missing data (see Table 3.14), only the Composite SAT score was used for the analyses. There were no students who reported subscores of the SAT without also reporting the Composite score.

Table 3.14

Students Reporting SAT Scores

	IB Population *N*=226		AP Population *N*=213		Residential school Population *N*=108	
	n	Percent of total	n	Percent of total	*n*	Percent of total
SAT Composite	114	50.4	175	82.2	85	78.7
SAT Math	79	39.5	140	65.7	74	68.5
SAT Reading	77	34.1	140	65.7	74	68.5
SAT Writing	77	34.1	140	65.7	73	67.6

Achievement

Student achievement in their respective programs (Advanced Placement, International Baccalaureate, and residential schools) is measured by the students' self-reported grade point averages. Students reported their grade point averages on a 10-point scale with the following options: *All As; Mostly As; More As than Bs; More Bs than As; Mostly Bs, some As and Cs; More Bs than Cs, More Cs than Bs, More Cs than Ds, More Ds than Cs,* and *Mostly Ds and Fs*. This method was used over having students report their grade point average in numerical form, as it was designed to gather data from students from diverse academic programs as to their achievement. Each school and school program has different ways to calculate weighted grade point averages, so this scale was used in favor of asking students to report their grade point average.

Perceived Change in Achievement

Students' perceived change in achievement was measured by the question, "How has your academic achievement changed since beginning to take AP/IB/residential school courses?" Participants answered the question on a 7-point scale ranging from *much worse* (1) to *much better* (7). Across all three populations in the study, the mean was 5.0 with a standard deviation of 1.0. This indicates that students generally felt that their academically achievement had improved somewhat since beginning the academic acceleration program.

Based on the internal social comparison theory, it was decided that the student's own determination of his or her own academic achievement was more theoretically relevant than a measure of the change in self-reported grade point average. In other words, a student's perception of his or her change in achievement would theoretically

have more influence on his or her academic self-concept, also a self-reflection measure, than a more objective measure, such as a change in grades.

It is important to note that this measure is the perceived level of change in academic achievement. Thus, each student's interpretation of academic achievement will influence how he or she answers the question. Some students may be more inclined to measure their academic achievement in terms of concrete measures (such as grades), while other students may tend to perceive their academic achievement in more abstract terms (such as how much they learned).

Social Comparison

Social Comparison is an interaction term between achievement and the ability comparison orientation factor. This interaction was theorized between these two variables due to the specifications of social comparison theories. According to the theory, it is not only how much students compare themselves to others that makes a difference in their self-concept, but also their achievement when compared with others in their peer group. For example, a student with grades higher than his or her peer group who compares himself or herself with others to a greater extent will have a higher academic self-concept. A student with lower achievement than his or her peer group who compares himself or herself to a great degree with others will have a lower academic self-concept. This is also true for a student who has higher grades than his or her peer group who does not compare himself or herself to others to a large extent. Finally, a student with lower grades than his or her peer group, but does not compare himself or herself to others would have a higher academic self-concept. See Table 3.15 for an illustration of this interaction.

Table 3.15

Social Comparison Interaction

Achievement	Comparison Orientation	Social Comparison Interaction
High	High	Positive
High	Low	Negative
Low	High	Negative
Low	Low	Positive

The ability comparison orientation factor was chosen to create this interaction term because of theoretical considerations. Social comparison theories are concerned primarily with the internal thought processes and construction of self-concept, thus, the internal processes of comparison are more relevant to the model than the behaviors that are considered in the opinions comparison factor. In addition, when used in the model, the ability comparison orientation factor produced a better model fit.

The interaction term was calculated by using group mean centered achievement (self-reported grade point average) and group mean centered ability comparison orientation factor score (a latent variable in the model). The group mean centered data were created by taking a student's individual score and subtracting the mean of the group (AP, IB, or residential school). Thus, a score of zero would indicate that the student scored at the mean for his or her group, a negative score indicates that the student was below the mean, and a positive score indicates that the student scored above the mean.

Finally, to create the interaction, the two scores (group mean centered achievement and group mean centered ability comparison orientation) were multiplied.

There is considerable research and debate concerning the creation of interaction terms within a structural equation modeling context. Among the first procedures theorized, it was suggested that among two latent variables, the cross-products of each indicator in the two variables should be used as indicators for the new interaction variable (Kenny & Judd, 1984). Thus, if the two latent variables each had four indicators, the interaction term would have 16 indicators. However, this approach requires many nonlinear constraints (Kenny & Judd; Marsh, Wen, & Hau, 2006).

In subsequent modeling and methodological investigation, it was determined that an unconstrained approach produces models that are more efficacious (Marsh, Wen, & Hau, 2004; Marsh et al., 2006). In this approach, indicators are paired from each latent variable and multiplied to create the interaction term (Marsh et al., 2004). For example, if each latent variable has four indicators, then the first variables of each are paired, and then the second, continuing to the fourth variable. Thus, the interaction term has four indicators. This approach does not require the use of nonlinear constraints (Marsh et al., 2004, 2006).

This approach is straightforward when the two latent variables have the same number of indicators, however, if there are different number of indicators, then two guidelines should be followed (Marsh et al., 2006). The first guideline is that the same indicator should not be used more than once, to reduce issues of multicollinearity (Marsh et al. , 2006). The second guideline is that all information should be used, e.g., all indicators of a variable should be used in creation of the interaction term (Marsh et al. ,

2006). To reconcile these two guidelines in the case of differing number of indicators, a parceling technique is recommended (Marsh et al., 2004, 2006). In parceling, indicators are "parceled" together to form one indicator to be matched with an indicator from the other latent variable. The parcel is created by taking the mean of the indicators (Marsh et al., 2004, 2006).

In the case of the creation of the social comparison variable, the achievement variable is an observed variable with no indicators and the ability comparison orientation factor variable is a latent variable with four indicators. According to the guidelines (Marsh et al., 2006), the mean of the four indicators was calculated, group mean centered, and then multiplied by the observed variable to create the interaction term, social comparison.

Future Academic Goals

The future academic goals variable was measured through one observed variable. Students were asked to indicate the highest level of education that they plan on pursuing. The answer choices were as follows: *High school diploma/GED* (1); *Associates Degree* (2); *Bachelors Degree* (3); *Master's Degree* (4); and *Doctoral Degree* (5). The mean across all groups was 4.22, with a standard deviation of 0.81. This indicates that, in general, students in this study plan to pursue either a Master's or a Doctoral level degree.

The survey also asked students to report colleges to which they plan to pursue; however, a large percentage of students did not report that information or did not indicate that they were applying to colleges because of the highly selective nature of that institution (see Table 3.15), so this measure was not used in the model. However, it does

provide some useful information about the demographics of each population, which was detailed in previous sections of this chapter.

Table 3.15

Students reporting Level of Higher Education and College Plans

	IB Population *N*=226		AP Population *N*=213		Residential School Population *N*=108	
	n	Percent of total	*n*	Percent of total	*n*	Percent of total
Level of Higher Education	219	96.9	205	96.2	102	94.4
Mean College Selectivity Index	133	58.8	113	53.1	69	63.9

Note: College selectivity only calculated for colleges that students indicated they chose because they were prestigious or highly selective.

Methods

Students completed the instruments as part of a packet. The PCSC scale was first in the packet, followed by the INCOM, and finally, questions concerning demographic information, including self-reported GPA and SAT scores and future goals. See Appendix B, C, and D for complete surveys. The surveys were anonymous. They were distributed by the classroom teachers or researcher during class, in the case of the AP and IB; and by program administration during monthly seminar, in the case of the residential high school group. The surveys were collected upon completion and mailed back to the researcher. The data collection phase took place in November for the IB group and part of the AP group and in January for the rest of the AP group and the residential high school

group. By concentrating data collection towards the middle of the school year, the researcher allowed time for students to be acclimated to the programs and heavily involved in coursework.

Across the three groups, the data were analyzed to determine the best fitting structural equation model. The first step was to determine a measurement model with good fit across the three groups. This was accomplished by creating latent variables for each of the theorized factors and creating paths from each of the items as indicators, then creating covariances between each of the latent variables. Next the modification indices and the other statistics were examined to improve model fit. Finally the model was respecified so that it was a good fit with the data for each group.

The next step was to specify the structural model, by creating paths between the observed and latent variables. The first step in this process was to test the saturated model, which includes all possible paths between the variables. This model was analyzed for invariance across the groups. Then a model that included the hypothesized paths along with any of the omitted paths that were statistically significant in the saturated model was tested. Again, this model was analyzed for invariance across groups. Finally, a trimmed model that did not include any nonsignificant paths from the previous model was estimated. This model was analyzed for invariance across groups, and the standardized path estimates were reported. Detailed descriptions of these models are presented in Chapter 4. To answer the first research question, I used an ANOVA to analyze within group comparisons; these results are also presented in Chapter 4.

Conclusion

This chapter outlined the details of the methodology of this research study. The statistical information of the instrumentation was detailed, including reliability estimates for the PSCS and the INCOM. Each of the observed variables collected was also outlined, and the methodology for computing the interaction term was described. Information about each of the populations was provided, including demographic and recruitment details. Finally, the methods for data collection and analysis were described.

The next chapter will report the results from these procedures. Each of the models will be described, along with the path estimates and group means. In addition, results of the tests of invariance across groups for each model will be reported, and differences in path estimates will be detailed.

Chapter 4

Results

While previous chapters have discussed the purpose, background, and methodology of the study, this chapter focuses on the results of the study. First, an initial analysis of the data and the first research question are presented. Then, the results from the development of the models are presented and the Research Questions 2 through 7 are addressed. The results are summarized in tables and figures.

The model developed for this study includes 10 latent and observed variables: Ability, Achievement, Perceived Change in Achievement, Social Comparison, Perceived Difficulty, Ability Comparison Orientation, Opinion Comparison Orientation, Student Self-Concept, Learner Self-Concept, and Future Goals. Ability is an observed variable in which students reported their SAT Composite scores. Achievement is also an observed variable in which students reported their grades in their academic program on a scale ranging from *All As* to *Mostly Ds and Fs*. The Perceived Change in Achievement variable is based on the student's response to an item asking them to rate their change in achievement since entering the program on a 7-point scale. Social Comparison is an interaction term using the group mean centered Achievement and Ability Comparison Orientation factor scores. Perceived Difficulty is a latent variable on a 7-point scale that measures how difficult a student perceives his or her coursework. Ability Comparison Orientation is a latent variable on a 7-point scale that measures how a student compares his or her abilities with others. Opinion Comparison Orientation is a latent variable on a 7-point scale that measures how much a student considers others' opinions. Student Self-

Concept is a latent variable on a 7-point scale that measures how a student feels about himself or herself as a student. Learner Self-Concept is a latent variable on a 7-point scale that measures how a student feels about himself or herself as a learner. The Future Goals variable is an observed variable in which the student indicated the highest level of education that he or she plans to obtain. These variables are discussed in more detail in Chapter 3.

The bivariate correlations between the variables for each population (IB students, AP students, and residential school students) are reported in Tables 4.1, 4.2, and 4.3. The means for each group on each variable are listed in Table 4.4. The correlations reveal some interesting patterns in the data. Predictably, the subscales for the various constructs are statistically significantly correlated for all groups. For example, Learner and Student Self-Concept are correlated at .244 for the IB students, .271 for the AP students, and .415 for the Residential School students. The Ability Comparison Orientation and the Opinion Comparison Orientation are correlated at .283 for the IB students, .384 for the AP students, and .400 for the Residential School students. Student Self-Concept was statistically significantly correlated with Achievement (IB=.391, AP=.554, RS=.294), Perceived Change in Achievement (IB=.158, AP=.403, RS=.207), and Perceived Difficulty (IB=-.300, AP=-.255, RS=-.402) for all three groups, indicating the importance of these variables in the construct of academic self-concept. Only the IB students had a statistically significant correlation between Ability and Student Self-Concept (.194) and Ability and Learner Self-Concept (.337). Residential school students' Ability was not statistically significantly related to any of the other variables, possibly due to the larger overall mean of their scores (*M*=2074). Overall, the patterns of statistically significant

correlations varied between the groups, which has implications for the development of a model to represent academic self-concept. This will be discussed in subsequent sections of this chapter.

Table 4.1

Bivariate Correlations for IB Students

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Ability	1.00									
2. Achievement	.426*	1.00								
3. Change in Achievement	.006	.263*	1.00							
4. Social Comparison	.059	-.065	.026	1.00						
5. Perceived Difficulty	-.260*	-.305*	-.129	.058	1.00					
6. Ability Comparison Orientation	-.076	.129	-.038	.015	.017	1.00				
7. Opinion Comparison Orientation	.095	-.017	.052	.024	-.032	.283*	1.00			
8. Student Self-Concept	.194*	.391*	.158*	.021	-.300*	.203*	.185*	1.00		
9. Learner Self-Concept	.337*	.233*	.122	-.100	-.410*	-.077	.062	.244*	1.00	
10. Future Goals	.123	.104	.114	.077	-.018	.080	.096	.181*	.029	1.00

* indicates statistically significant correlation at the $p<.05$ level.

The patterns of correlations and means emphasize the differences between the populations studied. The next section of this chapter will address how the groups differed on each of the measured variables, as addressed in Research Question 1. After this question has been answered, the development of the model will be considered, followed by a discussion of the results of the remaining research questions.

Table 4.2

Bivariate Correlations for AP students

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Ability	1.00									
2. Achievement	.214*	1.00								
3. Change in Achievement	.048	.415*	1.00							
4. Social Comparison	.021	-.116	-.056	1.00						
5. Perceived Difficulty	-.094	-.356*	-.304*	.033	1.00					
6. Ability Comparison Orientation	.029	.029	.039	-.019	.115	1.00				
7. Opinion Comparison Orientation	-.022	.135	.140*	-.082	.073	.384*	1.00			
8. Student Self-Concept	.037	.554*	.403*	.075	-.255*	.083	.242*	1.00		
9. Learner Self-Concept	.115	.373*	.241*	-.047	-.402*	-.128	-.048	.271*	1.00	
10. Future Goals	.093	.126	.112	.086	-.235*	.061	.061	.107	.161*	1.00

* indicates statistically significant correlation at the $p<.05$ level.

Research Question 1

1. Are there mean group differences between the groups on the measures of Ability, Achievement, Perceived Change in Achievement, Social Comparison, Perceived Difficulty, Ability Comparison Orientation, Opinion Comparison Orientation, Student Self-Concept, Learner Self-Concept, and Future Goals?

   The means and standard deviations are reported for each variable in Table 4.4. Due to varying amounts of missing data for the factors, the number of participants included in the analysis for each variable is also included in the table.

Table 4.3

Bivariate Correlations for Residential School Students

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Ability	1.00									
2. Achievement	.146	1.00								
3. Change in Achievement	.095	.353*	1.00							
4. Social Comparison	-.338*	-.409*	-.149	1.00						
5. Perceived Difficulty	-.089	-.156	-.130	.050	1.00					
6. Ability Comparison Orientation	.075	-.205*	-.141	-.139	.231*	1.00				
7. Opinion Comparison Orientation	-.012	-.138	-.086	.048	-.007	.400*	1.00			
8. Student Self-Concept	.102	.294*	.207*	-.045	-.402*	-.073	.168	1.00		
9. Learner Self-Concept	.006	.112	.170	.057	-.579*	-.068	.226*	.415*	1.00	
10. Future Goals	.167	.215*	-.044	-.099	.092	-.013	.057	.093	.092	1.00

* indicates statistically significant correlation at the $p<.05$ level.

These means were analyzed using a one-way ANOVA to test which differences in means were statistically significantly different from zero across the three groups (see Table 4.5). A Bonferroni adjustment was made when testing these differences for significance, due to the number of tests made. In this case the adjusted alpha was .005. Post hoc comparisons on the significant differences were conducted using the Scheffé method. See Table 4.6 for the results of the post-hoc tests.

Differences in Ability were statistically significant across groups ($F_{(2, 371)}=25.72$, $p<.0001$), with the students at the residential school having the highest ability scores ($M=2074$), which was statistically significantly different from the IB and AP groups. The

IB and AP groups were also statistically significantly different on ability measures (i.e., self-reported SAT scores).

Table 4.4

Means of Variables Included in Model

	IB Population *n*=226			AP Population *n*=213			Residential School Population *n*=108		
	Mean	*SD*	*n*	Mean	*SD*	*n*	Mean	*SD*	*n*
Ability	1810	212.3	114	1896	262.6	175	2074	306.1	85
Achievement	8.04	1.55	226	7.98	1.74	213	8.74	1.27	108
Perceived Change in Achievement	4.93	1.40	224	4.45	1.45	211	4.52	1.47	107
Social Comparison	-.25	1.66	225	-.03	2.03	215	.31	1.31	110
Perceived Difficulty	2.49	.89	224	3.14	1.31	205	2.47	1.03	107
Student Self-Concept	5.94	.87	223	5.73	1.18	209	5.73	.86	106
Learner Self-Concept	5.44	1.03	223	5.31	1.09	207	5.32	1.16	107
Ability Comparison Orientation	4.49	1.16	225	4.14	1.19	207	4.13	1.29	99
Opinion Comparison Orientation	5.17	1.04	223	4.75	1.20	209	4.94	1.14	101
Future Goals	4.11	.767	219	4.15	.875	205	4.59	.601	102

Table 4.5

One-way ANOVA

Variable		Sum of Squares	*df*	Mean Square	*F*	*p*
Ability	Between Groups	3461103	2	1730552	25.72	<.0001*
	Within Groups	2.496E7	371	67287		
	Total	2.842E7	373			
Achievement	Between Groups	46.61	2	23.31	9.37	<.0001*
	Within Groups	1353.18	544	2.49		
	Total	1399.79	546			
Perceived Change in Achievement	Between Groups	27.34	2	13.67	6.64	.001*
	Within Groups	1109.80	539	2.06		
	Total	1137.14	541			
Social Comparison	Between Groups	23.41	2	11.71	3.80	.023
	Within Groups	1698.64	549	3.08		
	Total	1713.05	551			
Perceived Difficulty	Between Groups	55.49	2	27.75	23.02	<.0001*
	Within Groups	642.34	533	1.21		
	Total	697.84	535			
Student Self-Concept	Between Groups	5.68	2	2.84	2.83	.060
	Within Groups	537.56	535	1.01		
	Total	543.24	537			
Learner Self-Concept	Between Groups	1.98	5	.99	.85	.429
	Within Groups	622.00	534	1.17		
	Total	623.98	536			
Ability Comparison Orientation	Between Groups	15.89	2	7.94	5.54	.004*
	Within Groups	757.73	528	1.44		
	Total	773.62	530			
Opinion Comparison Orientation	Between Groups	18.39	2	9.19	7.28	.001*
	Within Groups	669.78	530	1.26		
	Total	688.17	532			
Future Goals	Between Groups	17.99	2	8.99	14.66	<.0001*
	Within Groups	320.98	523	.614		
	Total	338.98	525			

Note: * indicates statistically significant at .005 level, using a Bonferroni adjustment for a .05 level.

Table 4.6

Scheffé Test for Post hoc Comparisons

Variable	Groups	Mean Difference	*SE*	*p*
Ability	IB and AP	-86.24	31.22	.023*
	IB and Res. School	-264.07	37.17	<.0001*
	AP and Res. School	-177.83	34.29	<.0001*
Achievement	IB and AP	.067	.151	.904
	IB and Res. School	-.697	.184	.001*
	AP and Res. School	-.764	.186	<.0001*
Perceived Change in Achievement	IB and AP	.476	.137	.003*
	IB and Res. School	.410	.170	.053
	AP and Res. School	-.067	.169	.928
Perceived Difficulty	IB and AP	-.654	.106	<.0001*
	IB and Res. School	.024	.129	.983
	AP and Res. School	.678	.131	<.0001*
Ability Comparison Orientation	IB and AP	.348	.115	.011*
	IB and Res. School	.354	.144	.050*
	AP and Res. School	.006	.146	.999
Opinion Comparison Orientation	IB and AP	.412	.108	.001*
	IB and Res. School	.222	.134	.256
	AP and Res. School	-.189	.136	.381
Future Goals	IB and AP	-.037	.076	.888
	IB and Res. School	-.484	.094	<.0001*
	AP and Res. School	-.447	.095	<.0001*

*Note: * indicates statistically significant at .05 level.*

This was also the case for Achievement ($F_{(2, 544)}$=9.37, p<.0001), with residential school students having the highest self-reported Achievement (M=8.74). A mean Achievement score of 8.74 was between *Mostly As* and *More As than Bs*. Again, the residential school students had statistically significantly higher Achievement than the other groups, with no differences between AP and IB students.

Differences between the groups on Perceived Change in Achievement were also statistically significant ($F_{(2, 539)}$=6.64, p=.001), with IB students having the highest perception of change in Achievement (M=4.93). The IB students' scores were statistically significantly different from those of the residential school students, but not different from the AP students. In addition, the AP and residential school students did not differ statistically significantly on their Perceived Change in Achievement scores.

The groups also differed in their Perceived Level of Difficulty ($F_{(2, 533)}$=23.02, p<.0001), with AP students reporting the highest levels (M=3.14). The AP students' scores were statistically significantly different from both the IB and residential school students' scores. The other two groups did not differ statistically significantly from each other.

There were differences between the groups detected for both Ability Comparison Orientation ($F_{(2, 528)}$=5.54, p=.004) and Opinion Comparison Orientation ($F_{(2,530)}$=7.28, p=.001). The IB population had statistically significantly higher Ability Comparison Orientation than the other two populations. The Opinion Comparison Orientation factor was statistically significantly different only between the IB and AP students. The IB students had statistically significantly higher opinion comparison orientation than the AP students.

Finally, the groups differed in their Future Goals ($F_{(2, 523)}$=14.66, p<.0001), with students attending the residential school having the highest goals (M=4.59). The residential school students had statistically significantly higher Future Goals than the IB or AP students, who did not differ from each other on their Future Goals score.

Differences between groups were not detected for Social Comparison ($F_{(2, 549)}$=3.80, p=.023), Student Self-Concept ($F_{(2,535)}$=2.83, p=.060), and Learner Self-Concept ($F_{(2, 534)}$=.83, p=.429). Indicating that the populations had similar levels of interaction between achievement and self-concept, student self-concept, and learner self-concept.

Overall, the residential school students had significantly higher ability, achievement, and future goals than the other two groups. AP students had statistically significantly higher levels of perceived difficulty in their coursework. IB students had statistically significantly higher Ability Comparison Orientation. Finally, AP and IB students differed statistically significantly on measures of Opinion Comparison Orientation and Perceived Change in Achievement. These differences in means further illustrate the differences between the population samples in this study, which has implications for the development of the models of academic self-concept. The next section will discuss the development of the models, followed by a discussion of each of the remaining research questions.

Development of Models

Following the research detailing how to construct and develop structural equation models for hybrid models, the models (measurement, saturated, trimmed, and final) were specified in order, before proceeding to the next step (Kline, 2005). A hybrid model is a model that contains both a confirmatory factor analysis component (the measurement model) and a structural equation model (Kline, 2005). This section will detail the development of the measurement and structural models for this study. This is followed by the results for Research Questions 2-7.

Measurement Model

The measurement model consisted of each of the scales in the study and the observed indicators that theoretically correspond to the scales. For this model, the scales included Student Self-Concept, Learner Self-Concept, and Perceived Difficulty from the Perceived Difficulty and Academic Self-Concept (PCSC) instrument (Wilson, 2007) and the Ability Comparison Orientation factor and the Opinion Comparison Orientation factor from the Iowa-Netherlands Comparison Orientation Scale (INCOM; Gibbons & Buunk, 1999).

The original measurement model (See Figure 4.1) included all indicator variables for three scales: Comparison Orientation, Perceived Difficulty, and Academic Self-Concept. Items 5, 8, 10, 12, 14, and 16 from the PCSC were associated with the Academic Self-Concept factor; Items 1, 2, 4, 6, 7, 9, 11, 13, 15, 17, 18, and 19 from the PCSC were associated with the Perceived Difficulty factor; and all of the items from the INCOM were associated with the comparison orientation factor. However, this model did not prove to be a good fit with the data (See Table 4.7). The chi-square test was statistically significant, indicating that the predicted values from the model were statistically significantly different from the actual data. However, this test tends to be statistically significant, even with good fitting models, with large sample sizes (Thompson, 2004). The Comparative Fit Index (CFI) also indicated a poor fitting model (CFI=.689). It is based on the non-centrality measure and is the ratio of the difference between the chi-square and degrees of freedom of the null model (the model in which all measures have variance but no correlation) subtracting the difference between the chi-square and degrees of freedom of the proposed model and the difference of the chi-square

and degrees of freedom of the null model (Bollen, 1989). A CFI above .95 is considered a good-fitting model, while a model above .90 is considered acceptable. Any model below .90 is considered a poor-fitting model (Brown, 2006). Finally, the Root Mean Square Error of Approximation (RMSEA) also indicated that the original measurement model was not a good fit (RMSEA=.065). The RMSEA is also based on the non-centrality parameter (Brown, 2006). The RMSEA is the square root of the product the chi-square divided by one less than the degrees of freedom and one less than the sample size (Brown). A model with an RMSEA of .05 or less is considered a good fitting model, and a model with an RMSEA of .10 is considered a poor fitting model (Brown, 2006).

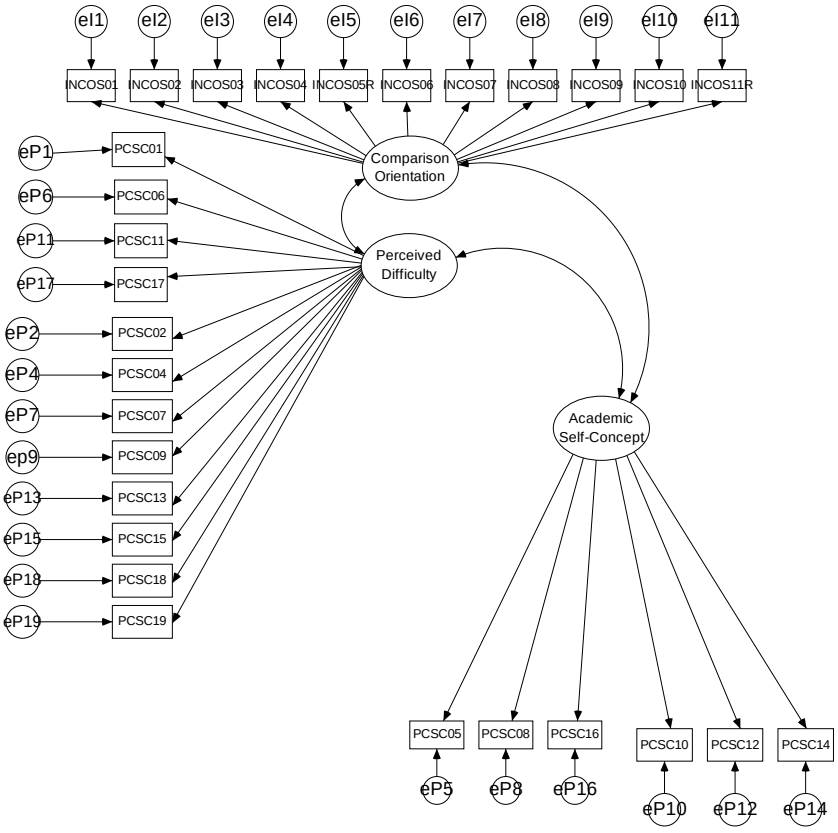

Figure 4.1. Original Measurement Model

Table 4.7

Development of Measurement Models

	Chi-Square	*df*	*p*	RMSEA	CFI	AIC
Original Measurement Model (Three factors)	3707.95	1122	<.001*	.065	.689	4247.95
Five Factor Measurement Model	3256.07	1191	<.001*	.056	.763	3844.07
Modified Five Factor Measurement Model (Final Model)	788.77	477	<.001*	.035	.941	1193.92

Examination of the model showed that there might be a need for a greater number of factors. An exploratory factor analysis was conducted using Principal Axis Factoring and a direct oblimin rotation. This analysis indicated that both the Comparison Orientation and Academic Self-Concept factors actually constituted 2 different factors, making for a total of 5 factors in the measurement model: Ability Comparison Orientation, Opinion Comparison Orientation, Learner Self-Concept, Student Self-Concept, and Perceived Difficulty (See Figure 4.2). The Ability Comparison Orientation factor included Items 1 through 5 on the INCOM, and the Opinion Comparison Orientation factor included Items 6 through 11 of the INCOM. Student Self-Concept included Items 3, 5, 8, 16 of the PCSC, and Learner Self-Concept included Items 10, 12, and 14 of the PCSC, see Appendices B, C, and D for complete instruments. The Perceived Difficulty scale remained the same.

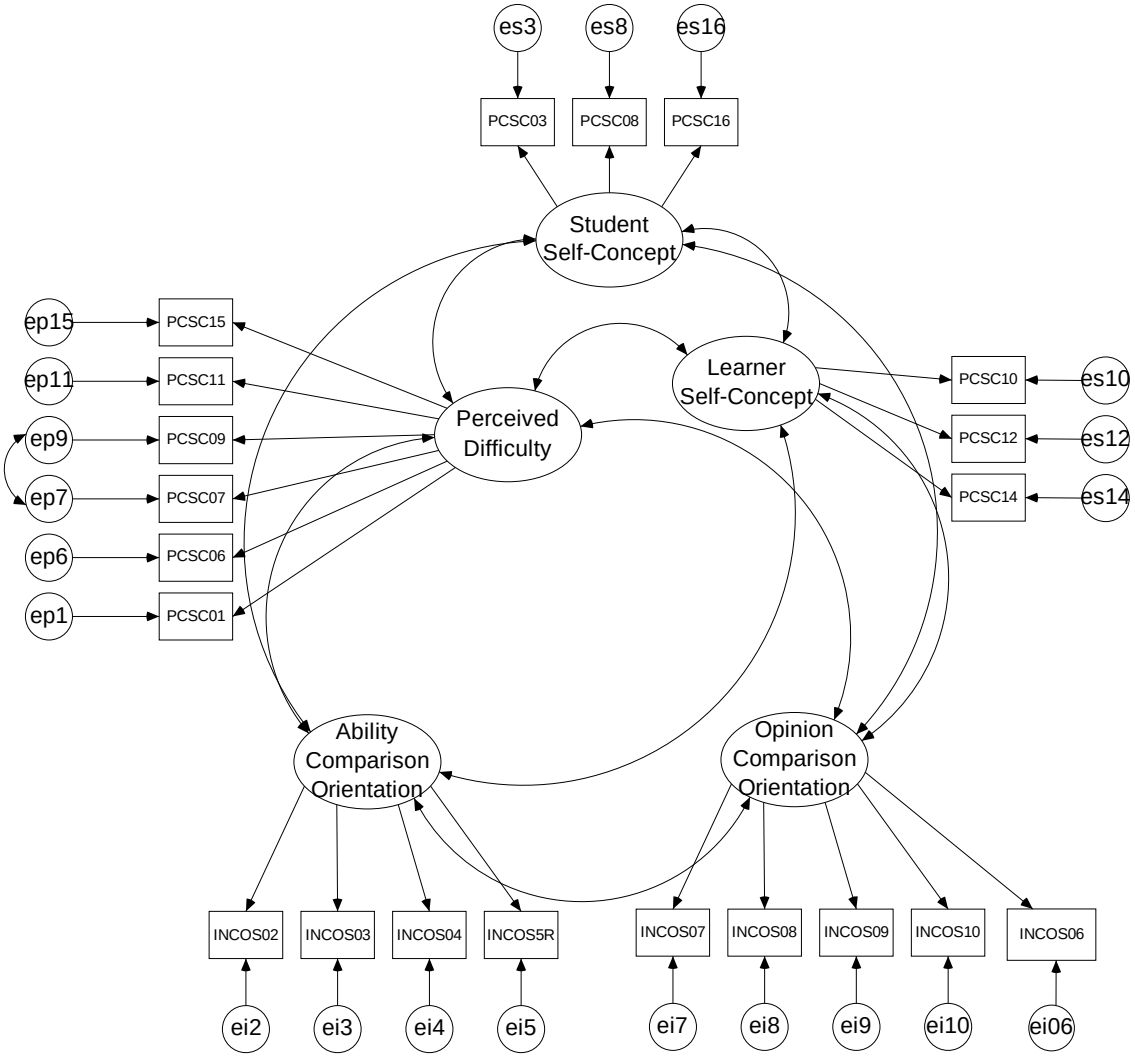

Figure 4.2. Five-Factor Measurement Model

While the model fit for this five-factor model was better than the original model, it did not have good model fit. The chi-square was statistically significant, the CFI was .763, and the RMSEA was .056. See Table 4.7.

Based on the modification indices, 10 items were deleted from the model. This action was chosen due to the large number of indicator variables for each factor and to

aid in the interpretation and development of the instruments. In addition to examining modification indices, correlations between items and path coefficients for items were also investigated. Using this data, the following items were eliminated from the model: Items 2, 4, 5, 13, 17, 18, and 19 from the PSCS; and Items 1, 6, and 11 from the INCOM. In addition, Items 7 and 9 on the PSCS were correlated.

In the PCSC scale Item 2 ("I need to try hard to be successful in my classes"), Item 4 ("It takes a lot of effort for me to be successful in my classes"), and Item 18 ("I must work hard to be successful in my classes") had high correlations with each other. These three items were dropped from the scale. In addition, Item 13 ("The work for my classes is overwhelming") and Item 19 ("The level of effort for my classes is overwhelming") had high correlations with Item 9 ("I struggle with completing the assignments for this class"), and Items 13 and 19 were deleted from the final model. Finally, Item 5 ("I will be successful in my classes in the future") had high correlation with Item 18 ("I must work hard to be successful in my classes") and was deleted from the final model.

On the INCOM, Item 1 ("I often compare how my loved ones [boy or girl friend, family members, etc.] are doing with how others are doing") and Item 11 ("I never consider my situation in life relative to other people") had low path coefficients to the latent variable, and were deleted from the model. In addition, Item 6 ("I often compare myself with others with respect to what I have accomplished in life") had a high correlation with Item 2 ("I always pay a lot of attention to how I do things compared with how others do them"), and was deleted from the model.

The final Measurement Model has 5 latent variables with 20 observed variables, as seen in Figure 4.3 and Table 4.8. The Student Self-Concept scale has 3 items and the overall population's scores had a reliability of .835, as measured by Cronbach's alpha. The Learner Self-Concept scale has 3 items and the overall population's scores had a reliability of .881, as measured by Cronbach's alpha. The Perceived Difficulty scale has 6 items and the overall population's scores had a reliability of .902, as measured by Cronbach's alpha. The Opinion Comparison Orientation scale has 4 items and the overall population's scores had a reliability of .810, as measured by Cronbach's alpha. The Ability Comparison Orientation scale has 4 items and the overall population's scores had a reliability of .820, as measured by Cronbach's alpha. Although a large number of items were removed from each scale, the reliabilities remained acceptable.

This model represents a better fit than the previous models. Although the chi-square test was statistically significant, the RMSEA (.034) indicated good fit (see Table 4.7), and the CFI (.939) indicated an adequate model. Thus, this model was kept as the Measurement Model for subsequent analyses.

The next step after specifying the Measurement Model was to test whether this model was invariant across groups (AP students, IB students, and residential school students). In other words, the next test determines if this model represented the same patterns of pattern coefficients, intercepts, covariances, and residuals for each group. By constraining each of the models to have these variables to be equal across groups and examining the chi-square difference, the researcher can explore if the groups are statistically significantly different.

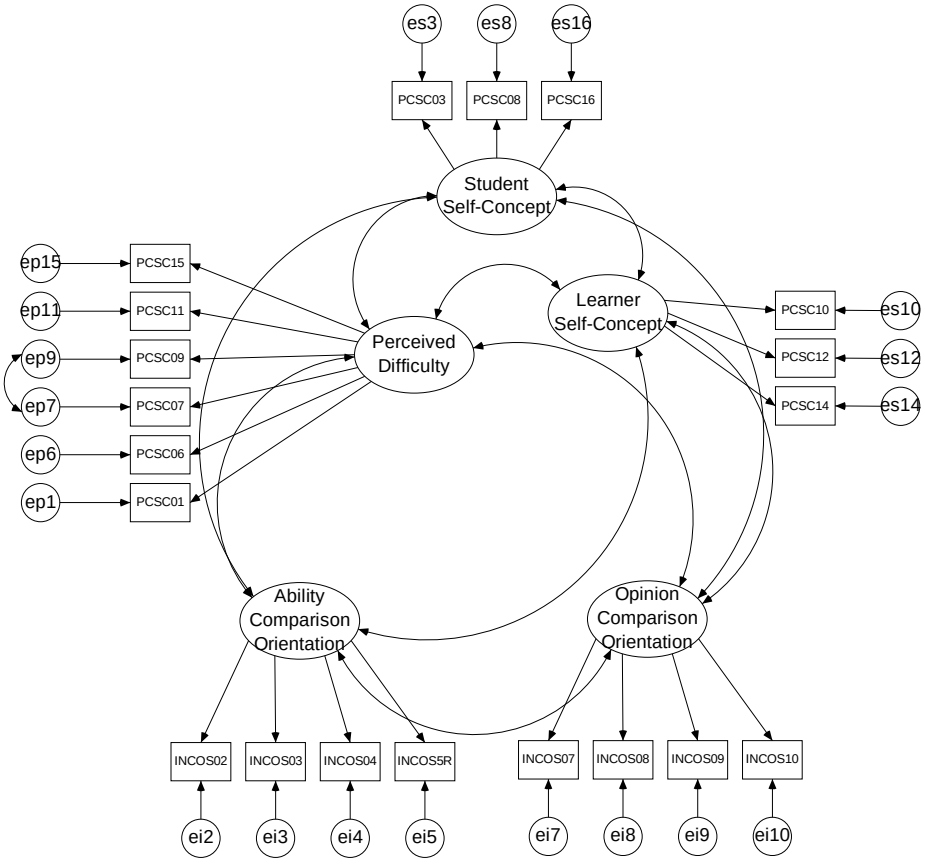

Figure 4.3. Modified Five-Factor Measurement Model

The results of these tests are shown in Table 4.9. The Unconstrained Model represents the model in which the estimates were allowed to vary across groups. This model was statistically significantly different from the model in which the pattern coefficients were constrained to be equal (p=.030), indicating that the pattern coefficients across each group were different. Subsequent tests of invariance were also statistically significant, indicating that the other estimates for each group were statistically significantly different as well. However, in examining the model fit indices for the model indicating invariance of pattern coefficients, the RMSEA (.035) and CFI (.935) indicated

the same level of model fit as the unconstrained model. This model was not invariant across groups for pattern coefficients or path estimates.

Table 4.8

Modified Five-Factor Measurement Model Scale Statistics

Scale	Number of Items	Cronbach's Alpha Overall	Cronbach's Alpha IB Population	Cronbach's Alpha AP Populaton	Cronbach's Alpha Residential School Population
Student Self-Concept	3	.835	.839	.864	.713
Learner Self-Concept	3	.881	.869	.874	.913
Perceived Difficulty	6	.902	.846	.914	.906
Ability Comparison Orientation	4	.820	.822	.783	.821
Opinion Comparison Orientation	4	.810	.790	.839	.816

The final measurement model did not show invariance of factor loadings, so tests of partial invariance were run, according to the guidelines outlines by Byrne (2001). When the chi-square difference tests were examined, it was determined that the path from Ability Comparison Orientation to Item 2 on the INCOM and the path from Perceived Difficulty to Item 15 on the PCSC were not invariant across the groups. Therefore, these paths were unconstrained in the Partial Invariance of Factor Loadings Model. While the chi-square test (832.56, *df*=503) remained statistically significant, the other tests of this model indicated good (RMSEA=.035) and adequate (CFI=.938) fit (Brown, 2006). The chi-square difference test indicates that the path coefficients for the measurement model

are invariant across groups, aside from the two paths that are left unconstrained in the Partial Invariance Measurement Model. Therefore, these paths were left unconstrained in subsequent analyses of the models. As long as at least one indicator for each latent variable is constrained across groups and not used as the marker variable for identification purposes, as many as necessary of the other measures can be left unconstrained and still establish invariance (Byrne, 2001; Byrne, Shavelson, Muthen, 1989; Muthen & Christofferson, 1981). Thus, it is justifiable to continue with further analysis of this model, assuming invariance of the path coefficients in the Measurement Model.

A similar procedure was conducted to establish partial invariance of the intercepts (Byrne, 2001). However, none of the indicators for the Perceived Difficulty latent variable had invariant intercepts across the three groups. Therefore, partial invariance of intercepts was only established for the indicators of Student Self-Concept, Learner Self-Concept, Opinion Comparison Orientation, and Ability Comparison Orientation. For each of these subscales, at least one indicator was invariant across all three groups, and partial invariance was established. The intercepts of the following indicators were constrained to be equal across the three groups: Items 8, 10, 12, 14, and 16 on the PCSC scale and Items 4, 5, 7, and 10 on the INCOM scale. The intercepts of the other indicators of the model were left unconstrained.

Saturated Model

The next step in specifying the structural equation model was to create a saturated model including all of the possible directional paths between the variables included in the model, including both observed and latent variables (Kline, 2005). In this case, there

were paths from Ability to Achievement, Perceived Change in Achievement, Social Comparison, Perceived Difficulty, Ability Comparison Orientation, Opinion Comparison Orientation, Student Self-Concept, Learner Self-Concept, and Future Goals. In addition, there were paths specified from each of Achievement, Perceived Change in Achievement, Social Comparison, Perceived Difficulty, Ability Comparison Orientation, and Opinion Comparison Orientation to Student Self-Concept, Learner Self-Concept, and Future Goals. Finally, there were directional paths specified from Student Self-Concept and Learner Self-Concept to Future Goals. In addition, covariances were specified between Achievement and Perceived Change in Achievement, Achievement and Social Comparison, Ability Comparison Orientation and Social Comparison, and Ability Comparison Orientation and Opinion Comparison Orientation (See Figure 4.4).

An examination of the goodness-of-fit for this model shows that, if the estimates were unconstrained across groups, the chi-square test was statistically significant, but the RMSEA (.034) indicated a good fitting model (see Table 4.10). The CFI (.919) indicated an adequate fit. In tests of invariance across groups, the chi-square difference test was statistically significant (p=.018) between the unconstrained model and the model in which the pattern coefficients of each group are constrained to be equal. However, for the model in which the pattern coefficients were equal across groups, the RMSEA (.034) indicated a good fit and the CFI (.916) indicated adequate fit. Similarly, the invariance of path estimates model had a statistically significant chi-square difference test (p<.001) when compared with the invariance of pattern coefficients model, but the invariance of path estimates model had reasonably good fit (CFI=.908; RMSEA=.034).

Table 4.9

Measurement Model Tests of Invariance

	Chi-Square	df	Chi-Square Difference	*df* Difference	Chi-Square Difference *p*-value	RMSEA [95% *CI*]	CFI
Model 1: Unconstrained Model	788.77	477				.035 [.030, .039]	.941
Model 2: Invariance of Pattern Coefficients	832.67	507	43.90	30	.049*	.034 [.030, .038]	.938
Model 3: Partial Invariance of Pattern Coefficients	819.61	503	30.84	24	.234	.034 [.030, .038]	.940
Model 4: Invariance of Intercepts	931.95	543	143.18	66	<.001*	.036 [.032, .040]	.926
Model 5: Partial Invariance of Intercepts	841.51	521	52.76	44	.172	.033 [.029, .038]	.939
Model 6: Invariance of Variances and Covariances	1030.97	573	242.20	96	<.001*	.038 [.034, .042]	.913
Model 7: Invariance of Residuals	1207.86	615	419.09	138	<.001*	.042 [.038, .045]	.888

* indicates statistically significant at the $p<.05$ level

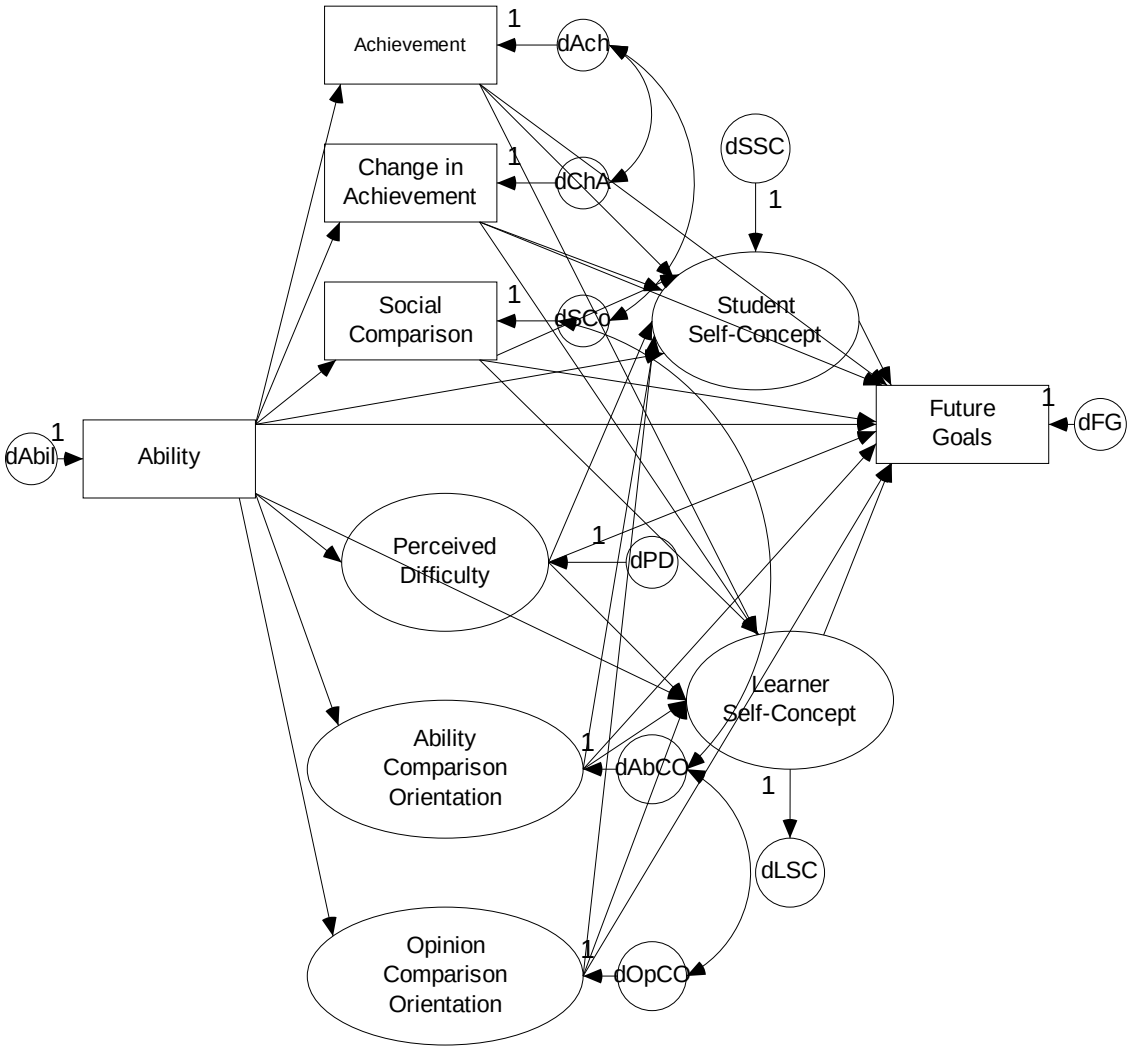

Figure 4.4. Saturated Model

When examining the path estimates, it was evident that the groups display different patterns (see Table 4.11 and 4.12). In determining which paths were statistically significant, a path that was statistically significant for any of the three groups was retained. Thus, the following paths were not statistically significant for any of the groups: Ability to Perceived Change in Achievement, Ability to Social Comparison, Ability to Comparison Orientation, Ability to Opinion Comparison Orientation, Ability to Student

Self-Concept, Perceived Change in Achievement to Learner Self-Concept, Ability Comparison Orientation to Student Self-Concept, Ability Comparison Orientation to Learner Self-Concept, Perceived Change in Achievement to Future Goals, Perceived Difficulty to Future Goals, Ability Comparison Orientation to Future Goals, Opinion Comparison Orientation to Future Goals, Student Self-Concept to Future Goals, and Learner Self-Concept to Future Goals.

Table 4.10

Saturated Model Tests of Invariance

	Chi-Square	df	Chi-Square Difference	*df* Difference	Chi-Square Difference *p*-value	RMSEA [95% *CI*]	CFI
Model 1: Unconstrained Model	1195.6	738				.034 [.030, .037]	.919
Model 2: Invariance of Pattern Coefficients	1241.4	766	45.8	28	.018*	.034 [.030, .037]	.916
Model 3: Partial Invariance of Pattern Coefficients	1230.3	766	144.9	84	<.001*	.033 [.030, .037]	.918
Model 4: Invariance of Path Estimates	1340.5	822	34.7	28	.179	.034 [.031, .037]	.908
Model 6: Invariance of Endogenous Intercepts	1474.9	864	279.3	126	<.001*	.036 [.033, .039]	.892

	Chi-Square	df	Chi-Square Difference	*df* Difference	Chi-Square Difference *p*-value	RMSEA [95% *CI*]	CFI
Model 7: Invariance of Exogenous Intercepts	1571.9	872	376.3	134	<.001*	.038 [.035, .041]	.876
Model 8: Invariance of Error Variances	1758.1	916	562.5	178	<.001*	.041 [.038, .044]	.851
Model 9: Invariance of Disturbance Variances	1882.9	944	687.3	206	<.001*	.043 [.040, .045]	.834

* indicates statistically significant at the $p<.05$ level.

The proposed covariances between variables were also examined. For the saturated model, the covariances between Achievement and Perceived Change in Achievement and the covariances between Ability Comparison Orientation and Opinion Comparison Orientation were statistically significant for all three groups. In addition, the covariance between Achievement and Social Comparison was statistically significant for the residential school population, and the covariance between Student Self-Concept and Learner Self-Concept was statistically significant for the IB population.

Trimmed Model

The next step in specifying the model was to create a trimmed model from the saturated model. This involved retaining all of the paths in the theoretical model plus any additional omitted paths from the saturated model that were statistically significant (Kline, 2005). The paths included in this model were Ability to Achievement, Perceived

Change in Achievement, Social Comparison, Perceived Difficulty, Ability Comparison Orientation, and Opinion Comparison Orientation; Achievement, Perceived Change in Achievement, Social Comparison, Perceived Difficulty, Ability Comparison Orientation, and Opinion Comparison Orientation to Student Self-Concept and Learner Self-Concept; and Student Self-Concept and Learner Self-Concept to Future Goals (see Figure 4.5). I also included the following nonhypothesized paths: Ability to Future Goals, Achievement to Future Goals, Ability to Learner Self-Concept. Finally, all of the covariances from the Saturated Model were also retained as part of the model. See Table 4.12.

Table 4.11

Unstandardized Path Estimates for the Saturated Model

	IB Population			AP Population			Residential school Population		
	Path	*SE*	*p*	Path	*SE*	*p*	Path	*SE*	*p*
Ability to Achievement	-.004	<.001	<.001*	-.002	<.001	<.001*	-.001	<.001	.183
Ability to Perceived Change in Achievement	<.001	.001	.453	<.001	<.001	.336	<.001	.001	.370
Ability to Social Comparison	<.001	.001	.656	<.001	.001	.839	-.001	<.001	.002*
Ability to Perceived Difficulty	-.001	<.001	<.001*	-.001	<.001	.089	<.001	<.001	.558
Ability to Ability Comparison Orientation	<.001	.001	.596	<.001	<.001	.823	<.001	.001	.452
Ability to Opinion Comparison	<.001	<.001	.497	<.001	<.001	.532	<.001	<.001	.599

	IB Population			AP Population			Residential school Population		
	Path	*SE*	*p*	Path	*SE*	*p*	Path	*SE*	*p*
Orientation									
Ability to Student Self-Concept	<.001	<.001	.899	<.001	<.001	.161	<.001	<.001	.271
Ability to Learner Self-Concept	.001	.001	.041*	<.001	<.001	.711	<.001	<.001	.963
Achievement to Student Self-Concept	-.165	.042	<.001*	-.297	.041	<.001*	-.199	.057	<.001*
Achievement to Learner Self-Concept	-.012	.057	.839	-.164	.047	<.001*	-.040	.089	.654
Perceived Change in Achievement to Student Self-Concept	.031	.035	.382	.129	.045	.004*	.091	.044	.038*
Perceived Change in Achievement to Learner Self-Concept	.060	.050	.231	.026	.055	.638	.120	.070	.085
Social Comparison to Student Self-Concept	.011	.029	.693	.075	.029	.011*	.072	.055	.188
Social Comparison to Learner Self-Concept	-.080	.040	.048*	.003	.035	.935	.116	.087	.181
Perceived Difficulty to Student Self-Concept	-.288	.084	<.001*	-.107	.058	.065	-.352	.082	<.001*
Perceived Difficulty to Learner Self-	-.556	.118	<.001*	-.331	.071	<.001*	-.891	.133	<.001*

	IB Population			AP Population			Residential school Population		
	Path	*SE*	*p*	Path	*SE*	*p*	Path	*SE*	*p*
Concept									
Ability Comparison Orientation to Student Self-Concept	.078	.043	.074	.022	.055	.684	.006	.057	.917
Ability Comparison Orientation to Learner Self-Concept	-.104	.061	.088	-.039	.067	.560	-.022	.090	.807
Opinion Comparison Orientation to Student Self-Concept	.143	.075	.058	.195	.084	.021*	.166	.095	.080
Opinion Comparison Orientation to Learner Self-Concept	.085	.105	.419	-.061	.101	.545	.333	.150	.027*
Ability to Future Goals	<.001	<.001	.658	<.001	<.001	.336	<.001	<.001	.149
Achievement to Future Goals	<.001	.047	.994	.005	.048	.920	.122	.058	.034*
Perceived Change in Achievement to Future Goals	.050	.038	.188	.009	.046	.837	-.073	.043	.090
Social Comparison to Future Goals	.028	.031	.381	.045	.030	.136	.008	.052	.882
Perceived Difficulty to Future Goals	.083	.098	.840	-.164	.063	.009*	.180	.106	.089
Ability Comparison Orientation to	.020	.048	.423	.032	.055	.564	-.010	.053	.853

	IB Population			AP Population			Residential school Population		
	Path	*SE*	*p*	Path	*SE*	*p*	Path	*SE*	*p*
Future Goals									
Opinion Comparison Orientation to Future Goals	.020	.082	.248	.077	.086	.373	.052	.093	.580
Student Self-Concept to Future Goals	.175	.091	.054	-.012	.089	.896	.036	.126	.771
Learner Self-Concept to Future Goals	-.020	.067	.762	.067	.066	.307	.100	.071	.157

* indicates statistically significant at the $p<.05$ level.

Table 4.12

Covariances and Correlations for the Saturated Model

	Covariance *(S.D.)*			Correlation		
	IB	AP	RS	IB	AP	RS
Achievement and Perceived Change in Achievement	.511* (.140)	.987* (.181)	.521* (.168)	-.275	-.407	-.293
Social Comparison and Ability Comparison Orientation	.239 (.155)	.309 (.215)	.570* (.151)	.109	.091	.373
Ability Comparison Orientation and Opinion Comparison Orientation	.313* (.083)	.641* (.117)	.618* (.157)	.325	.502	.499
Student Self-Concept and Learner Self-Concept	.132* (.048)	.054 (.061)	.089 (.060)	.235	.075	.188

* indicates statistically significant at the $p<.05$ level.

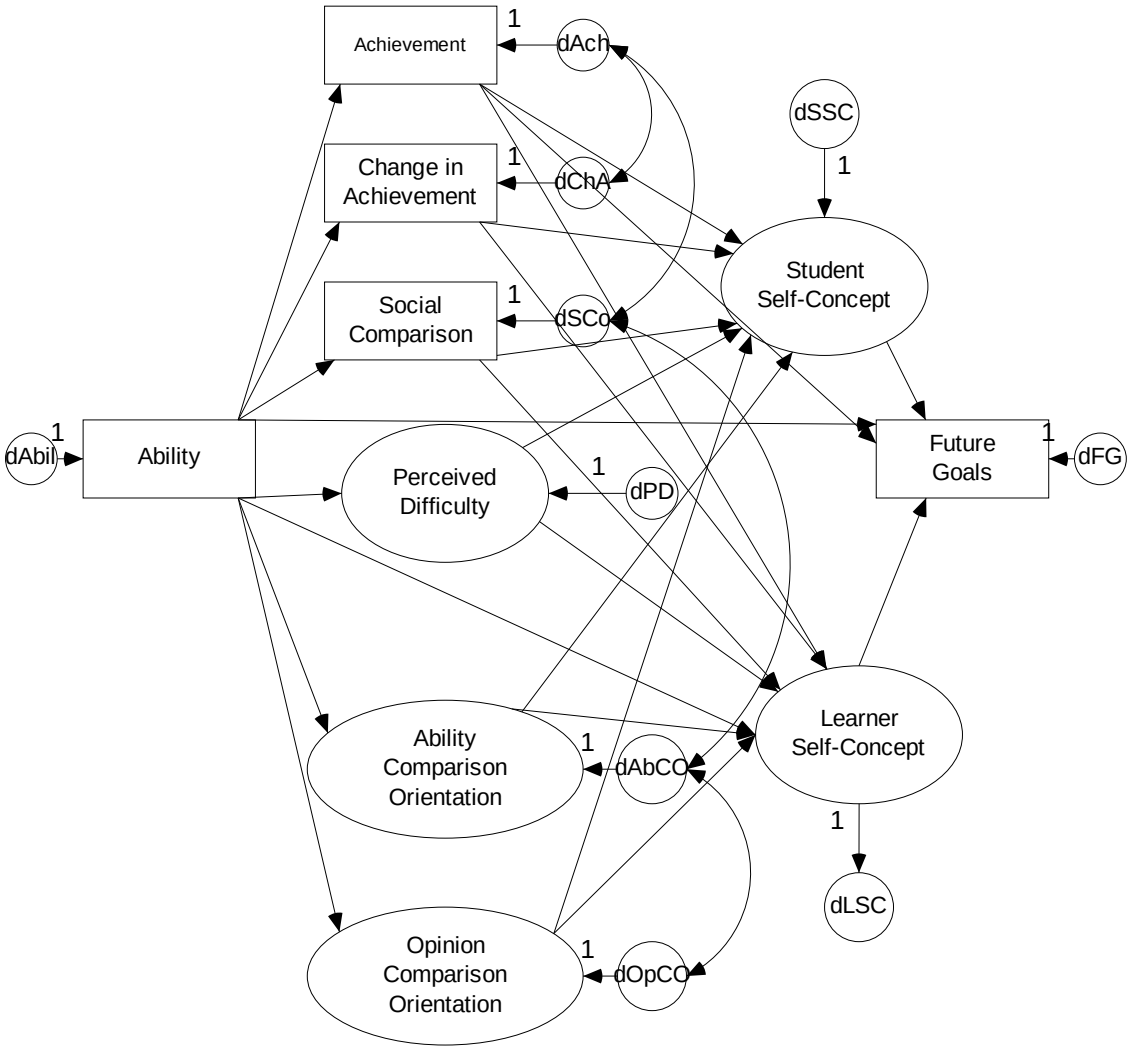

Figure 4.5. Trimmed Model

An examination of the goodness of fit indices for the unconstrained trimmed model showed that the chi-square test was statistically significant (see Table 4.13), the RMSEA (.033) indicated a good fit, and the CFI (.922) indicated an adequate fit (Brown, 2006). The model with invariance of pattern coefficients across groups was statistically significantly different from the unconstrained model (p=.020), however, the RMSEA

(.032) indicated a good fitting model. The partial invariance of pattern coefficients model (Byrne, 2001), however, indicated an improved model fit, as it had a non-significant chi-square difference (26.198, *df*=26). The measures of model fit also indicated a good fit (RMSEA=.032) and adequate fit (CFI=.922; Brown, 2006).

Table 4.13

Trimmed Model Tests of Invariance

	Chi-Square	df	Chi-Square Difference	*df* Difference	Chi-Square Difference *p*-value	RMSEA [95% *CI*]	CFI
Model 1: Unconstrained Model	1192.0	297				.033 [.029, .036]	.922
Model 2: Invariance of Pattern Coefficients	1235.9	267	43.8	30	.049*	.032 [.029, .036]	.920
Model 3: Partial Invariance of Pattern Coefficients	1218.2	271	26.2	26	.452	.032 [.029, .035]	.922
Model 4: Invariance of Path Estimates	1311.8	225	119.8	72	<.001*	.033 [.029, .036]	.914
Model 6: Invariance of Endogenous Intercepts	11457.5	183	265.5	114	<.001*	.035 [.032, .038]	.896
Model 7: Invariance of Exogenous Intercepts	1555.9	175	363.9	122	<.001*	.038 [.035, .041]	.880

	Chi-Square	df	Chi-Square Difference	*df* Difference	Chi-Square Difference *p*-value	RMSEA [95% *CI*]	CFI
Model 8: Invariance of Error Variances	1741.8	131	549.8	166	<.001*	.040 [.037, .043]	.855
Model 9: Invariance of Disturbance Variances	1868.2	103	676.2	194	<.001*	.042 [.039, .045]	.837

* indicates statistically significant at the $p<.05$ level.

In examining the path estimates for each group, several paths were statistically significant for one or more groups, but not the other groups (see Table 4.14, Table 4.15). Several paths, on the other hand, were not statistically significant in any group: Ability to Perceived Change in Achievement, Ability to Ability Comparison Orientation, Ability to Opinion Comparison Orientation, Perceived Change in Achievement to Learner Self-Concept, Ability to Perceived Change in Achievement to Student Self-Concept, Ability Comparison Orientation to Learner Self-Concept, Ability to Future Goals, Learner Self-Concept to Future Goals, and Achievement to Future Goals.

Final Model

The final model was specified by only using the paths from the Trimmed Model that were statistically significant for any group (see Figure 4.6). Therefore, the following paths were included in the model: Ability to Achievement, Ability to Social Comparison, Ability to Perceived Difficulty, Ability to Learner Self-Concept, Achievement to Student Self-Concept, Achievement to Learner Self-Concept, Perceived Change in Achievement to Student Self-Concept, Social Comparison to Student Self-Concept and Learner Self-

Concept, Perceived Difficulty to Student Self-Concept, Perceived Difficulty to Learner Self-Concept, Opinion Comparison Orientation to Student Self-Concept, Opinion Comparison Orientation to Learner Self-Concept, and Student Self-Concept to Future Goals.

Table 4.14

Unstandardized Path Estimates for the Trimmed Model

	IB Population			AP Population			Residential school Population		
	Path	*SE*	*p*	Path	*SE*	*p*	Path	*SE*	*p*
Ability to Achievement	.004	<.001	<.001*	.002	<.001	.001*	.001	<.001	.157
Ability to Perceived Change in Achievement	<.001	.001	.430	<.001	<.001	.384	.001	.001	.309
Ability to Social Comparison	<.001	.001	.663	<.001	.001	.903	-.001	<.001	.001*
Ability to Perceived Difficulty	-.001	<.001	<.001*	-.001	<.001	.108	<.001	<.001	.593
Ability to Ability Comparison Orientation	<.001	.001	.592	<.001	<.001	.846	<.001	.001	.398
Ability to Opinion Comparison Orientation	<.001	<.001	.500	<.001	<.001	.517	<.001	<.001	.691
Ability to Learner Self-Concept	.001	<.001	.032	<.001	<.001	.663	<.001	<.001	.952
Achievement to Student Self-Concept	.161	.033	<.001*	.284	.040	<.001*	.198	.057	<.001*
Achievement to	.010	.056	.855	.163	.047	<.001*	.041	.089	.643

	IB Population			AP Population			Residential school Population		
	Path	*SE*	*p*	Path	*SE*	*p*	Path	*SE*	*p*
Learner Self-Concept									
Perceived Change in Achievement to Student Self-Concept	.033	.035	.342	.131	.045	.004*	.095	.044	.032*
Perceived Change in Achievement to Learner Self-Concept	.058	.050	.240	.026	.054	.631	.120	.070	.086
Social Comparison to Student Self-Concept	.011	.028	.691	.075	.030	.012*	.056	.052	.287
Social Comparison to Learner Self-Concept	-.080	.040	.047	.003	.035	.925	.114	.087	.189
Perceived Difficulty to Student Self-Concept	-.282	.075	<.001*	-.104	.057	.069	-.362	.083	<.001*
Perceived Difficulty to Learner Self-Concept	-.556	.118	<.001*	-.334	.072	<.001*	-.892	.134	<.001*
Ability Comparison Orientation to Student Self-Concept	.078	.043	.072	.022	.055	.692	.013	.057	.812
Ability Comparison Orientation to Learner Self-Concept	-.103	.061	.088	-.038	.067	.571	-.022	.090	.808
Opinion	.142	.075	.058	.205	.085	.016*	.153	.095	.106

	IB Population			AP Population			Residential school Population		
	Path	*SE*	*p*	Path	*SE*	*p*	Path	*SE*	*p*
Comparison Orientation to Student Self-Concept									
Opinion Comparison Orientation to Learner Self-Concept	.083	.105	.427	-.061	.101	.547	.335	.150	.026
Ability to Future Goals	<.001	<.001	.826	<.001	<.001	.264	<.001	<.001	.224
Student Self-Concept to Future Goals	.191	.085	.024*	.085	.081	.293	-.034	.117	.771
Learner Self-Concept to Future Goals	-.048	.061	.433	.107	.062	.085	.044	.059	.457
Achievement to Future Goals	.010	.044	.815	<.001	.045	.996	.094	.053	.072

* indicates statistically significant at the $p<.05$ level.

An examination of the goodness of fit tests showed that the unconstrained model had a statistically significant chi-square test (see Table 4.16). However, the RMSEA (.032) indicated a good fit, and the CFI (.922) indicated an adequate fit (Brown, 2006). In the final model, the partial invariance as well as the complete invariance of pattern coefficients models had non-significant chi-square difference tests. The RMSEA of the invariance of pattern coefficients model was .032 and indicated good fit (Brown, 2006). The CFI (.920) indicated adequate fit as well (Brown, 2006).

Table 4.15

Covariances for the Trimmed Model

Covariance	Covariance *(SD)*			Correlation		
	IB	AP	RS	IB	AP	RS
Achievement and Perceived Change in Achievement	.507* (.140)	.992* (.182)	.521* (.168)	.273	.408	.292
Social Comparison and Ability Comparison Orientation	.059 (.150)	-.093 (.191)	-.306 (.164)	.027	-.033	-.170
Ability Comparison Orientation and Opinion Comparison Orientation	.313* (.083)	.643* (.117)	.619* (.157)	.325	.503	.499
Student Self-Concept and Learner Self-Concept	.132* (.048)	.053 (.061)	.091 (.061)	.235	.072	.189

* indicates statistically significant at the $p<.05$ level.

The path estimates for the final model also showed different patterns of significance across groups (see Table 4.17 and Figures 4.7, 4.8, 4.9, and 4.10). For example, the path from Ability to Achievement was statistically significant for the IB and AP populations, but not the residential school population. Proposed reasons for these differences will be discussed in Chapter 5. The standardized path estimates are listed in Table 4.18, and the covariances between variables in the model are listed in Table 4.19.

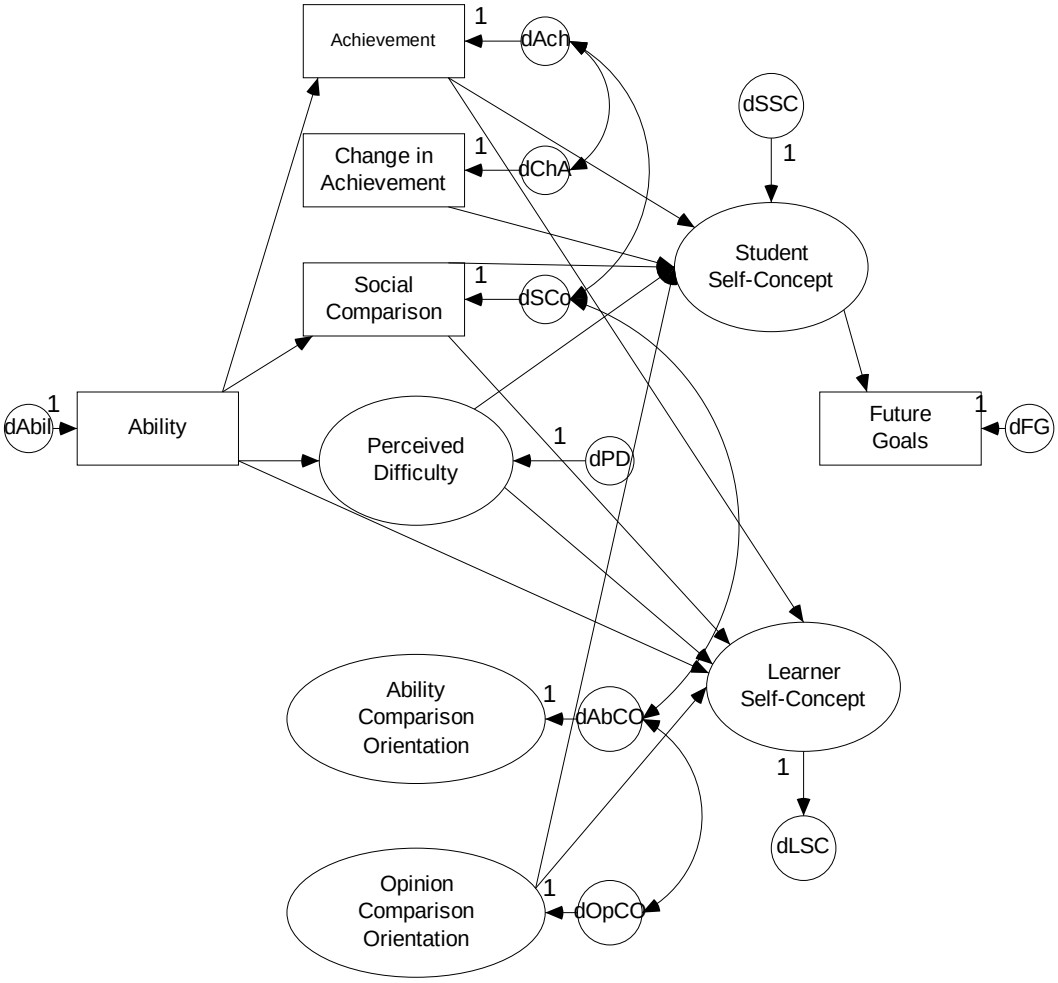

Figure 4.6. Final Structural Model

Research Question 2

2. Are the models of the relationships of Ability, Achievement, Perceived Change in Achievement, Social Comparison, Perceived Difficulty, Ability Comparison Orientation, Opinion Comparison Orientation, Student Self-Concept, Learner Self-Concept, and Future Goals for each of these populations invariant across the following populations of 11^{th}- and 12^{th}-grade high school students:
    a. students in residential high schools at college campuses;

b. students in Advanced Placement (AP) classes; and

c. students in International Baccalaureate (IB) classes?

To answer this question, tests of invariance were run (see Table 4.16). For the final specified model, the pattern coefficients were invariant across groups. The chi-square difference test between the unconstrained model and the model in which the pattern coefficients were constrained to be equal across groups was non-significant (p=.084). In other words, across the three populations of students, the paths between indicators for each factor (latent variable) and the factors were not statistically significantly different across the groups.

Table 4.16

Final Model Tests of Invariance

	Chi-Square	df	Chi-Square Difference	*df* Difference	Chi-Square Difference *p*-value	RMSEA [95% *CI*]	CFI
Model 1: Unconstrained Model	1220.6	780				.032 [.029, .035]	.922
Model 2: Invariance of Pattern Coefficients	1263.7	810	43.7	30	.058	.032 [.029, .035]	.920
Model 3: Partial Invariance of Pattern Coefficients	1246.6	975	106.6	54	.466	032 [.029, .035]	.922
Model 4: Invariance of Path Estimates	1326.9	834	25.9	26	<.001*	.033 [.029, .036]	.913

	Chi-Square	df	Chi-Square Difference	*df* Difference	Chi-Square Difference *p*-value	RMSEA [95% *CI*]	CFI
Model 6: Invariance of Endogenous Intercepts	1490.2	876	269.2	96	<.001*	.036 [.033, .039]	.891
Model 7: Invariance of Exogenous Intercepts	1581.8	884	361.8	104	<.001*	.038 [.035, .041]	.877
Model 8: Invariance of Error Variances	1763.8	928	543.8	148	<.001*	.041 [.038, .043]	.852
Model 9: Invariance of Disturbance Variances	1888.9	956	668.9	176	<.001*	.042 [.039, .045]	.835

* indicates statistically significant at the $p<.05$ level.

The path estimates, means of latent and observed variables, and error variances were statistically significantly different across groups. This was indicated by the statistically significant chi-square difference tests (see Table 4.16). However, there was partial invariance of the path estimates across the groups. The specific differences between each path estimate can be seen in Tables 4.17 and 4.18. The following research questions address differences in path estimates between the groups.

Table 4.17

Unstandardized Path Estimates for the Final Model

	IB Population			AP Population			Residential school Population		
	Path	*SE*	*p*	Path	*SE*	*p*	Path	*SE*	*p*
Ability to Achievement	.003	<.001	<.001*	.001	<.001	.002*	<.001	<.001	.260
Ability to Social Comparison	<.001	.001	.686	<.001	.001	.962	-.001	<.001	.002*
Ability to Perceived Difficulty	-.001	<.001	<.001*	<.001	<.001	.158	<.001	<.001	.415
Ability to Learner Self-Concept	.001	<.001	.045*	<.001	<.001	.632	<.001	<.001	.986
Achievement to Student Self-Concept	.173	.034	<.001*	.284	.040	<.001*	.205	.057	<.001*
Achievement to Learner Self-Concept	.018	.054	.746	.170	.043	<.001*	.093	.085	.274
Perceived Change in Achievement to Student Self-Concept	.019	.034	.585	.129	.045	.004*	.077	.043	.074
Social Comparison to Student Self-Concept	.013	.029	.656	.074	.029	.012*	.051	.050	.308
Social Comparison to Learner Self-Concept	-.079	.041	.053	.003	.035	.931	.120	.084	.154
Perceived Difficulty to Student Self-Concept	-.277	.075	<.001*	-.105	.057	.065	-.354	.083	<.001*

	IB Population			AP Population			Residential school Population		
	Path	*SE*	*p*	Path	*SE*	*p*	Path	*SE*	*p*
Perceived Difficulty to Learner Self-Concept	-.579	.119	<.001*	-.341	.072	<.001*	-.908	.136	<.001*
Opinion Comparison Orientation to Student Self-Concept	.198	.071	.005*	.224	.071	.002*	.169	.078	.031*
Opinion Comparison Orientation to Learner Self-Concept	.023	.097	.816	-.092	.084	.276	.311	.125	.013*
Student Self-Concept to Future Goals	.182	.072	.012*	.131	.066	.045*	.117	.093	.208

Research Question 3

3. What is the effect of Ability on Achievement, Perceived Change in Achievement, Social Comparison, Perceived Difficulty, Ability Comparison Orientation, and Opinion Comparison Orientation for the following populations of 11th- and 12th-grade high school students:
    a. students in residential high schools at college campuses;
    b. students in Advanced Placement (AP) classes; and
    c. students in International Baccalaureate (IB) classes?

The unstandardized path coefficients, indicating the effect of one variable on another variable while holding all other variables in the model constants, are listed in Table 4.17. Both of the path estimates of Ability to Achievement for the IB (.003) and AP students

(.001) were statistically significant, but the estimate for the residential school population (<.001) was not statistically significantly different than zero. For the IB students, this indicated that for every 300 point increase on the Composite SAT, an approximate 1 point increase in achievement would be predicted (e.g., a student would move from *Mostly As* to *All As* on the scale), if all other variables in the model were held constant. For AP students this indicated that for every 100 point increase in SAT scores, an approximate 1 point increase in achievement would be predicted if all other variables in the model remained constant. For the residential school population, no change in achievement would be expected from an increase in ability (as measured by the SAT).

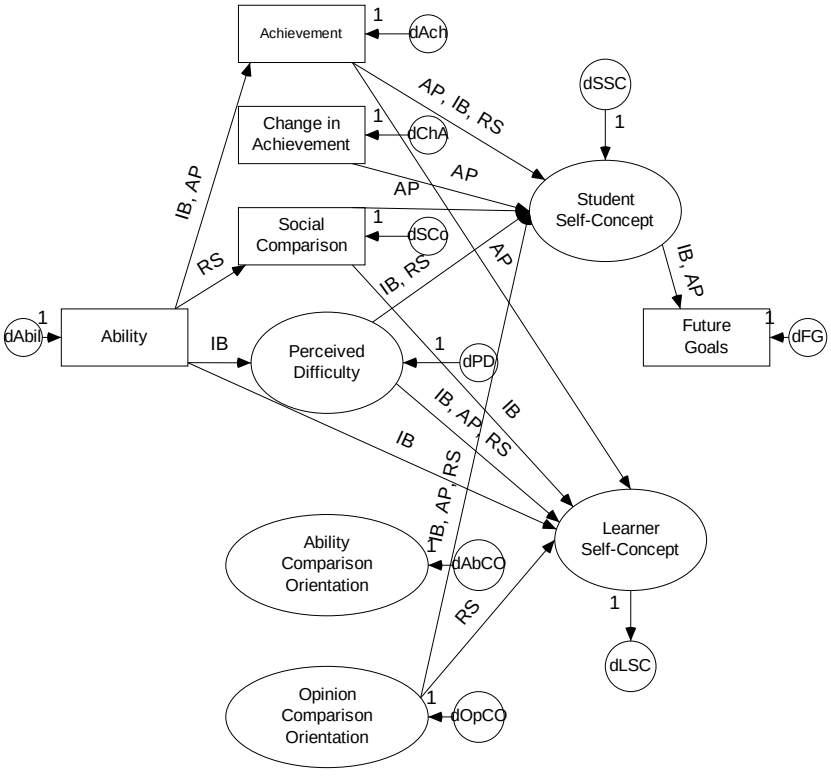

Figure 4.7. Final Structural Model with Path Estimates for Each Group

Note. IB indicates statistically significant path for IB students, AP indicates statistically significant path for AP students, and RS indicates statistically significant path for residential school students.

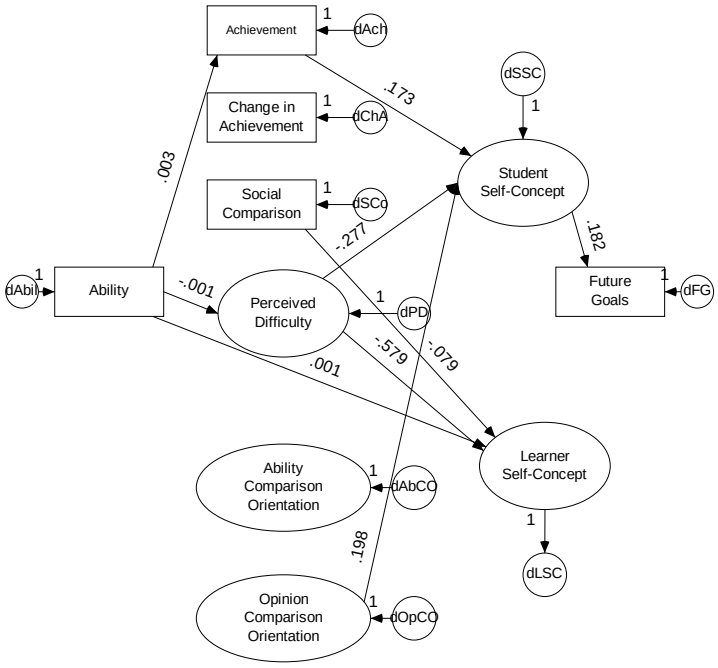

Figure 4.8. Final Structural Model for IB Population

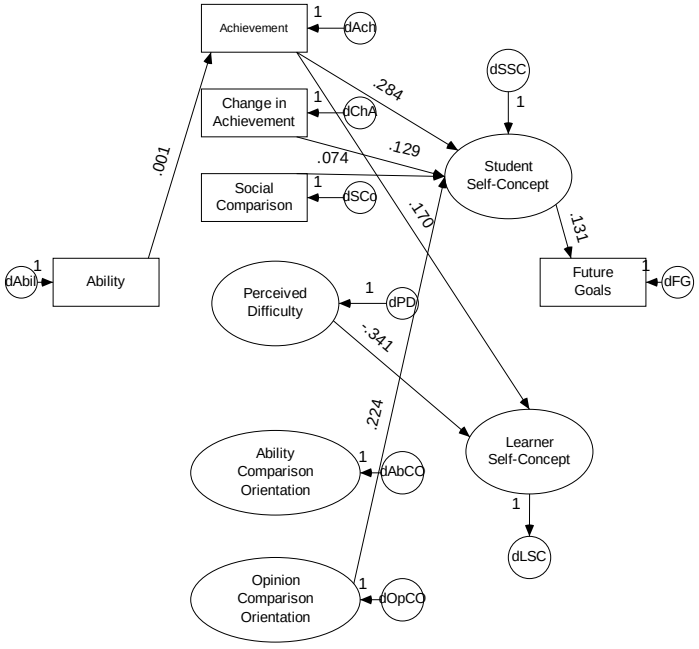

Figure 4.9. Final Structural Model for AP Population

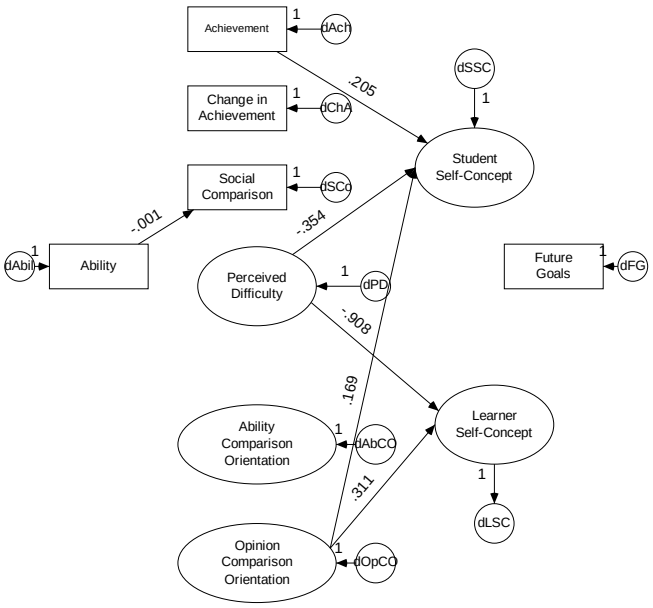

Figure 4.10. Final Structural Model for Residential School Population

For all three populations of students, the path from Ability to Perceived Change in Achievement was not statistically significantly different from zero. This indicated that the model does not predict any change to the Perceived Change in Achievement score when there was an increase in Ability, if all other variables in the model were held constant. In other words, as ability increased, students did not perceive their grades changed in their new learning environment. These paths were trimmed from the final model.

The path estimate from Ability to Social Comparison was statistically significant for the residential school population (-.001), but was not statistically significantly different from zero for IB (<.001) or AP (<.001) populations of students. When all of the other variables in this model for residential school students were held constant, this indicated that the higher the ability of the students, as measured by SAT scores, the interaction between Achievement and Ability Comparison Orientation became more

negative. In other words, residential school students with high SAT scores and high achievement, tend to compare themselves with others less. On the other hand, students with high SAT scores and low achievement, tend to compare themselves with others more.

Table 4.18

Standardized Path Estimates Between Groups Final Model

	IB Population	AP Population	Residential School Population
Ability to Achievement	.492	.204	-.115
Ability to Social Comparison	.034	-.004	-.303
Ability to Perceived Difficulty	-.398	-.112	-.092
Ability to Learner Self-Concept	.208	.036	-.002
Achievement to Student Self-Concept	.351	.494	-.3668
Achievement to Learner Self-Concept	.025	.271	-.095
Perceived Change in Achievement to Student Self-Concept	.035	.188	.163
Social Comparison to Student Self-Concept	.028	.151	.097
Social Comparison to Learner Self-Concept	-.123	.006	.131
Perceived Difficulty to Student Self-Concept	-.266	-.116	-.412
Perceived Difficulty to Learner Self-Concept	-.398	-.343	-.606
Opinion Comparison Orientation to Student Self-Concept	.195	.206	.210

	IB Population	AP Population	Residential School Population
Opinion Comparison Orientation to Learner			
Self-Concept	.016	-.077	.221
Student Self-Concept to Future Goals	.180	.149	.135

Table 4.19

Covariances Between Groups Final Model

Covariance	Covariance *(SD)*			Correlation		
	IB	AP	RS	IB	AP	RS
Achievement and Perceived Change in Achievement	.524* (.136)	1.00* (.182)	.528* (.169)	.280	.410	.294
Social Comparison and Ability Comparison Orientation	.062 (.150)	-.092 (.191)	-.328* (.165)	.029	-.033	-.181
Ability Comparison Orientation and Opinion Comparison Orientation	.326* (.083)	.645* (.117)	.610* (.157)	.337	.506	.492
Student Self-Concept and Learner Self-Concept	.122* (.049)	.055 (.061)	.094 (.062)	.212	.076	.192

* indicates statistically significant at the $p<.05$ level.

The path from Ability to Perceived Difficulty was statistically significant for the IB population (-.001), but not for the AP (<.001) or residential school (<.001)

populations. For the IB students, for every 100 point increase in SAT score, there was a 1 point decrease in perceived difficulty (on a scale ranging from 1 to 7), if all other variables remained constant. IB students who scored higher on the SAT perceived school as less challenging. For the other groups, there was no predicted change in perceived difficulty with an increase in ability, if all other variables in the model remained constant.

The paths from Ability to Ability Comparison Orientation and Ability to Opinion Comparison Orientation were not statistically significantly different from zero for any of the three groups. These paths were trimmed from the final model.

An additional path, not originally hypothesized, from Ability to Learner Self-Concept was also included in the final model. This path was only statistically significant for the IB student population (.001). If all of the variables remained constant, this path indicated that for every 100 point increase in an IB student's SAT score, there was a 1 point increase in their Learner Self-Concept (on a scale ranging from 1 to 7). As IB students' SAT scores increased, their perception of themselves as learners also increased. For the other populations of students, no change was predicted in Learner Self-Concept with an increase in Ability and all other variables in the model held constant.

In summary, Ability had a positive effect on achievement (for IB and AP students) and Learner Self-Concept (for the IB students). Ability had a negative effect on Perceived Difficulty (for the IB students) and Social Comparison (for the residential school students). Ability had no effect on Perceived Change in Achievement, Opinion Comparison Orientation, Ability Comparison Orientation, Student Self-Concept, and Future Goals for all groups of students.

Research Question 4

4. What are the effects of Achievement, Perceived Change in Achievement, Social Comparison, Perceived Difficulty, Ability Comparison Orientation, and Opinion Comparison Orientation on Student Self-Concept and Learner Self-Concept for the following populations of 11th- and 12th-grade high school students:
    a. students in residential high schools at college campuses;
    b. students in Advanced Placement (AP) classes; and
    c. students in International Baccalaureate (IB) classes?

The path between Achievement and Student Self-Concept was statistically significant for the IB population (.173), the AP population (.284), and the residential school population (.205). This indicates that, if all other variables in the model were held constant, a 1 point increase in achievement (e.g., from *Mostly As* to *All As*) predicted a .174 increase in Student Self-Concept (on a 7-point scale) for the IB population, a .285 increase in Student Self-Concept for the AP population, and a .205 increase in Student Self-Concept for the residential school population. For all students included in the study, as their grades increased, so did their perception of themselves as students.

The path between Achievement and Learner Self-Concept was statistically significant for only the AP population (.170). This predicted a .170 increase in Learner Self-Concept (on a 7-point scale) for every 1 point increase in Achievement for the AP population when all other variables in the model were held constant. In other words, as an AP student's grades increased, so did his or her self-concept as a learner. For the IB and the residential school populations, an increase in Achievement did not predict a change in Learner Self-Concept, if all of the other variables in the model were held constant.

The path between Perceived Change in Achievement and Student Self-Concept was statistically significant for only the AP population of students (.129). This predicted a .129 change in the Student Self-Concept measure for every 1 point increase in the Perceived Change in Achievement scale (on a 7-point scale) for AP students when all the other variables in the model were held constant. In other words, as students' perception of their change in achievement since beginning to take AP classes became more positive, there was an increase in their Student Self-Concept. For the IB and residential school populations, there was no predicted change in Student Self-Concept with an increase in Perceived Change in Achievement if all other variables in the model were held constant.

The path between Perceived Change in Achievement and Learner Self-Concept was not statistically significantly different from zero for any of the three groups. This indicated that there was no predicted change in Learner Self-Concept for any group, with an increase in the Perceived Change in Achievement variable. This path was not retained in the final model.

The path between Social Comparison and Student Self-Concept was statistically significant only for the AP population of students (.074). This indicated that for every 1 point increase in the interaction between Ability Comparison Orientation and Achievement, a .074 point increase was predicted in the Student Self-Concept score for the AP population when all the other variables in the model were held constant. As the interaction between AP students' grades and their tendency to compare themselves with others increased, so did their student self-concept. The model did not predict a change in Student Self-Concept with an increase in the interaction term for the IB or residential school populations when all of the other variables in the model were held constant.

The path between Social Comparison and Learner Self-Concept was not statistically significantly different from zero for any of the populations of students. This indicates that no change for any group was predicted in Learner Self-Concept with a change in the interaction of Ability Comparison Orientation and Achievement, when all of the other variables in the model were held constant. In other words, for all students in the study, there was no predicted change in Learner Self-Concept as the interaction of grades and tendency to compare themselves to others increased.

The path between Perceived Difficulty and Student Self-Concept was statistically significant for the IB (-.277) and residential school (-.354) populations. A decrease of .277 of Student Self-Concept was predicted for every 1 point increase in Perceived Difficulty for the IB students, when all of the other variables in the model were held constant. A decrease of .339 points in Student Self-Concept was predicted for every 1 point increase in Perceived Difficulty for the residential school population, when all of the other variables in the model were held constant. As a student viewed his or her IB classes or residential school courses as being more challenging, then there was a decrease in his or her self-concept as a student. There was no predicted change in Student Self-Concept for a change in Perceived Difficulty for the AP students when all of the other variables in the model were held constant.

The path between Perceived Difficulty and Learner Self-Concept was statistically significant for the IB (-.579), AP (-.341), and residential school (-.908) populations. This predicted a .579 decrease in Learner Self-Concept for IB students, a .341 decrease in Learner Self-Concept for AP students, and a .908 decrease in Learner Self-Concept for residential students for every 1 point increase in Perceived Difficulty when all other

variables in the model were held constant. As students from all three programs viewed their coursework as more challenging, their self-concepts as learners decreased.

The paths between Ability Comparison Orientation and both Student Self-Concept and Learner Self-Concept were not statistically significantly different from zero for any of three populations of students. This indicated that there is no predicted change in Student Self-Concept or Learner Self-Concept for any of the populations of students with an increase in Ability Comparison Orientation (measured on a 7-point scale) if all of the other variables in the model were held constant. In other words, there was no change in either measure of academic self-concept for students with increases in how much they compare their abilities with others. These paths were not retained in the final model.

The path from Opinion Comparison Orientation to Student Self-Concept was statistically significant for the IB (.198), AP (.224), and residential school (.169) populations. This predicted a .198 increase in Student Self-Concept for the IB students, a .224 increase in Student Self-Concept for AP students, and a .169 increase in Student Self-Concept for residential school students for every 1 point increase in Opinion Comparison Orientation (measured on a 7-point scale), when all of the other variables in the model were held constant.

The path between Opinion Comparison Orientation and Learner Self-Concept was only statistically significant for the residential school population (.311). This indicates that for every 1 point increase in the Opinion Comparison Orientation scale, the model predicted a .311 increase in Learner Self-Concept for residential school students when all other variables in the model were held constant. As students in the residential school have more tendency to compare their opinions with others, they increase in their self-concepts

as learners. For the IB and AP students, no change was predicted in Learner Self-Concept with changes in the Opinion Comparison Orientation when all of the other variables in the model were held constant.

To summarize, Achievement and Opinion Comparison Orientation had a positive effect on Student Self-Concept for all three groups. Perceived Change in Achievement and Social Comparison had a positive effect on Student Self-Concept for the AP students, and Perceived Difficulty had a negative effect on Student Self-Concept for the IB and residential school students. Perceived Difficulty also had a negative effect on Learner Self-Concept for all three groups. Achievement had a positive effect on Learner Self-Concept for AP students, and Opinion Comparison Orientation had a positive effect on Learner Self-Concept for the residential school students.

Research Question 5

5. What are the effects of Student Self-Concept and Learner Self-Concept on the Future Goals for the following populations of 11th- and 12th-grade high school students:
    a. students in residential high schools at college campuses;
    b. students in Advanced Placement (AP) classes; and
    c. students in International Baccalaureate (IB) classes?

The path between Student Self-Concept and Future Goals was statistically significant for the IB (.182) and the AP (.131) populations. It was not statistically significant for the residential school populations. This indicated that for every 5 point increase in Student Self-Concept there was an approximate 1 point increase in Future Goals (e.g., from *Master's Degree* to *Doctoral Level Degree*) for IB students when all

other variables in the model were held constant. For the AP students for every 4 point increase in Student Self-Concept there was an approximate .5 point increase in Future Goals when all other variables in the model were held constant. In other words, as IB and AP students increased in their perceptions of themselves as students, there was an increase in their future educational aspirations. The model did not predict any change in Future Goals with increases in Student Self-Concept for residential school students.

The path between Learner Self-Concept and Future Goals was not statistically significant for any of the populations of students. In other words, this model did not predict any change in Future Goals with any change in Learner Self-Concept for any of the groups of students if all of the other variables in the model were held constant.

To summarize, only Student Self-Concept had an effect on Future Goals, and only among the AP and IB students. This effect was positive. No effect of academic self-concept on future goals was detected for the residential school students in this study.

Research Question 6

6. Do Achievement, Perceived Change in Achievement, Social Comparison, Perceived Difficulty, Ability Comparison Orientation, and Opinion Comparison Orientation mediate the relationship between Ability and Student Self-Concept for the following populations of 11th- and 12th-grade high school students:
    a. students in residential high schools at college campuses;
    b. students in Advanced Placement (AP) classes; and
    c. students in International Baccalaureate (IB) classes?

Mediation refers to the idea that one or more variables can account for a relationship between two previously correlated variables (Kenny, 2006). The process of

testing a mediational process involves four steps: demonstrate the correlation between the two original factors; demonstrate that the initial variable is correlated with the mediating variables; demonstrate the mediator variables predict the outcome variable; and demonstrate that the path between the two original variables is zero after accounting for the mediational variables (Baron & Kenny, 1986). However, the first step is often implied by the second and third steps of the process and is often eliminated from the analysis (Kenny, 2006).

For the IB students, the paths between Ability and Achievement and Ability and Perceived Difficulty were statistically different from zero, when all of the other variables in the model were held constant (see Figure 4.11 and Table 4.20). The paths between Achievement and Student Self-Concept and between Perceived Difficulty and Student Self-Concept were also nonzero. The path between Ability and Student Self-Concept for IB students was not statistically different from zero. This indicates that for the IB population of students in this study and within the context of the model as a whole, Achievement and Perceived Difficulty mediated the relationship between Ability and Student Self-Concept. For IB students, their grades and perceived level of difficulty explained the relationship between their SAT scores and their perception of themselves as students. The standardized indirect effects of Achievement and Perceived Difficulty on the relationship between Ability and Student Self-Concept was .282, which also constitutes the total effect, when all of the other variables in the model were held constant.

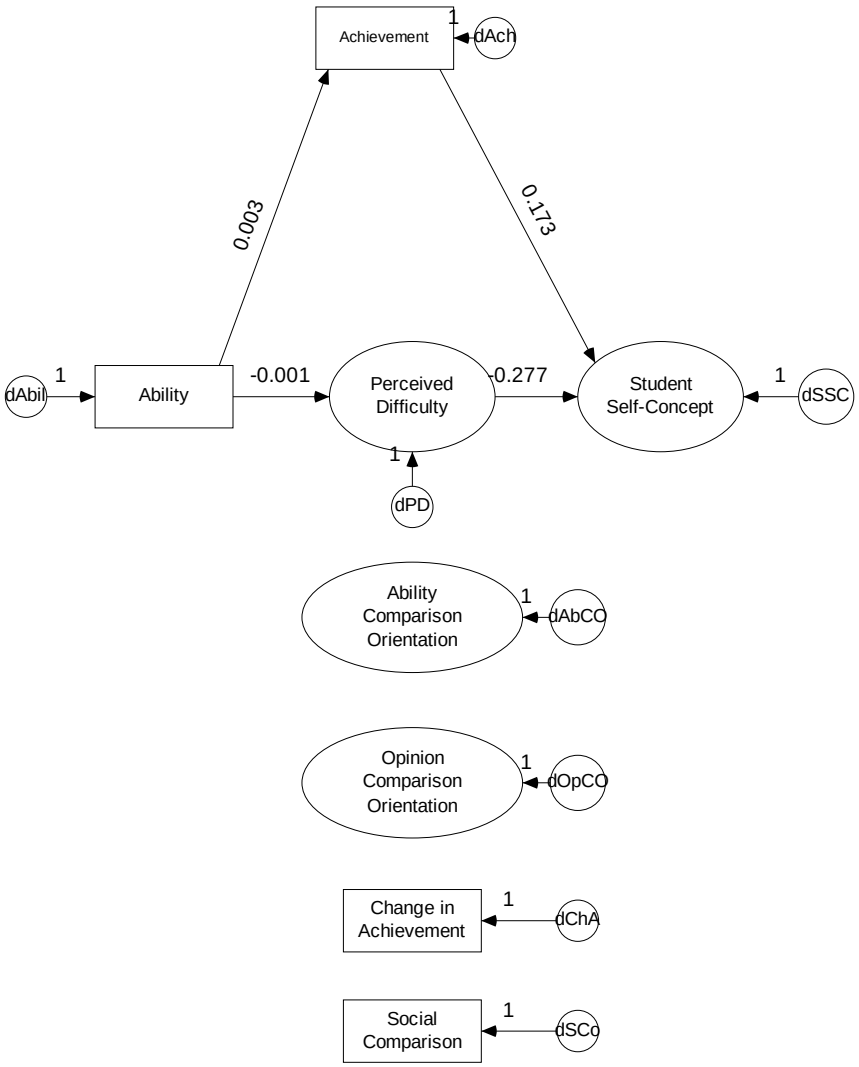

Figure 4.11. Mediational Model of Ability and Student Self-Concept

For AP and residential school students, the correlation between Ability and Student Self-Concept was not statistically significantly different from zero (See Table 4.2 and 4.3). In this case, there was no mediation from the other variables in the model, because there was no direct relationship between the dependent and independent variables.

Table 4.20

Standardized Direct, Indirect, and Total Effects for the Mediation of Ability and Student Self-Concept

	Direct Effect	Indirect Effect	Total Effect
IB Students	<.001	.282	.282
AP Students	<.001	.112	.112
Residential school Students	<.001	.047	.047

Note: These estimates are true after controlling for all of the variables in the model.

In summary, this research question was supported with the IB population. The relationship between Ability and Student Self-Concept is mediated by Achievement and Perceived Difficulty.

Research Question 7

7. Do Achievement, Perceived Change in Achievement, Social Comparison, Perceived Difficulty, Ability Comparison Orientation, and Opinion Comparison Orientation mediate the relationship between Ability and Learner Self-Concept for the following populations of 11th- and 12th-grade high school students:
    a. students in residential high schools at college campuses;
    b. students in Advanced Placement (AP) classes; and
    c. students in International Baccalaureate (IB) classes?

For the IB population, the path between Ability and Learner Self-Concept was statistically significant, after controlling for the other variables in the model (see Figure 4.12 and Table 4.21). In addition, the paths from the independent variable (Ability) and

the mediator variables (Achievement and Perceived Difficulty) were statistically significant. Finally, the paths between the mediator variables and the dependent variable (Learner Self-Concept) were also statistically significant. This indicated a partial mediation of the relationship between Ability and Learner Self-Concept by Perceived Difficulty when all of the other variables in the model were held constant. In other words, for IB students, the relationship between their SAT scores and their perception of themselves as learners was partially explained by the perceived difficulty in their coursework. The direct effect of Ability on Learner Self-Concept was .213 (see Table 4.22). The indirect effect of Achievement and Perceived Difficulty on the relationship between Ability and Learner Self-Concept was .163, and the total effect was .376 (see Table 4.21).

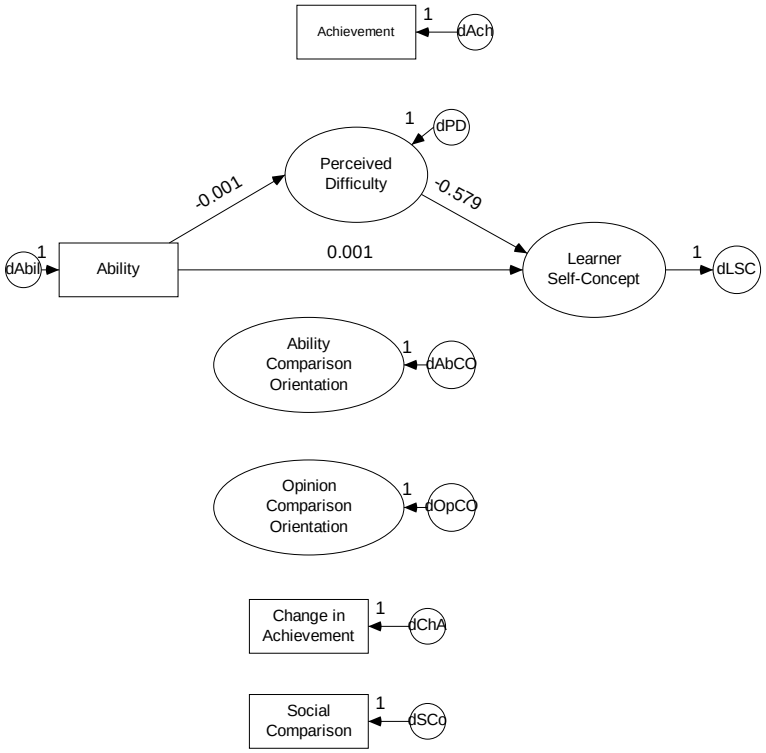

Figure 4.12. Mediational Model for Ability and Learner Self-Concept

Table 4.22

Standardized Direct, Indirect, and Total Effects for the Mediation of Ability and Learner Self-Concept

	Direct Effect	Indirect Effect	Total Effect
IB Students	.213	.163	.376
AP Students	.033	.094	.126
Residential school Students	-.044	.019	.015

Note: These estimates are true after controlling for all of the variables in the model.

For AP and residential school students, the correlation between Ability and Learner Self-Concept was not statistically significantly different from zero (See Table 4.2 and 4.3). In this case, there was no mediation from the other variables in the model, because there was no direct relationship between the dependent and independent variables.

In summary, this research question was partially supported. The relationship between Ability and Learner Self-Concept is partially mediated by Perceived Challenge for IB students.

Conclusion

Through the Structural Equation Modeling analysis, the final model was invariant across groups for the measurement indicators. In other words, the indicators for each factor were similar for each group (IB, AP, and residential school students). However, the paths between these factors were not invariant, and the groups had different patterns of

relationships between the factors. The factors (Achievement and Perceived Difficulty) proved to be partial mediators between Ability and Student Self-Concept and Learner Self-Concept for only the IB population. In the other populations, there was no statistically significant correlation between Ability and Self-Concept.

In the next chapter, the results that are presented here will be discussed. In addition, implications of these results will be presented.

Chapter 5

Discussion

This study analyzed a structural equation model that attempted to explain some of the influences on, and outcomes of, academic self-concept in academically accelerated high school students. Specifically, the effects of social comparisons and perceived difficulty of the coursework and achievement was studied on the relationship of achievement and ability. It also investigated the contributing factors to future educational attainment goals. This chapter will discuss these findings, as well as implications for educational practice and further research.

The Model

While the groups studied represent high-ability students in academically rigorous programs, each population exhibited a different pattern of academic self-concept. The students in the various programs (AP, IB, and a residential school) did not fit the same model of academic self-concept using structural equation modeling. These differences existed in both the group means of the variables and the relationships between the variables. This implies that high-ability students do not represent a homogeneous population across programs. Therefore, generalizations about academic self-concept for high-ability students must be made carefully. Further research should continue to investigate the differences between high-ability students to further distinguish if the differences between the groups can be attributed to the various instructional and curricular characteristics of the programs, or if the differences exist between the students themselves.

Academic Self-Concept, Future Goals, and Perceived Difficulty

In examining the means of the variables, several descriptive characteristics of the populations can be observed across all three groups. All of the participants had high academic self-concept scores and future goals. Despite, or perhaps because of, their participation in an academically rigorous program, the students reported high levels of both student self-concept (*M*=5.94-5.73) and learner self-concept (*M*=5.44-5.31). In general, these students feel competent both as learners and at being successful students in school. This is consistent with the research that indicates that high-ability students have high academic self-concept (e.g., Colangelo et al., 1987; Hotulainen & Shofield, 2003; Kelly & Colangelo, 1984; Kelly & Jordan, 1990; McCoach & Siegle, 2002). Due to the tendency of this population of students to have high academic self-concept, when a student with high levels of ability exhibits low academic self-concept, educators should view this as a sign of concern for this student and follow-up with additional support.

The students in this study also reported high future educational aspirations. The means for all three groups fell between obtaining a Masters Degree and a doctoral level degree. This implies that the students in this study, who are from predominately suburban schools, had high aspirations for their future educational careers. Future research should investigate if the future goals of high-ability students from urban or rural areas exhibit the same pattern or show more variability.

In addition, the students in the groups showed low levels of perceived difficulty in their coursework (*M*=2.47-3.14), indicating that they did not view their work to be overwhelming or confusing. Given the low means of this construct for the population, a student with a high score on perceived difficulty might be inappropriately placed in a

rigorous program. Educators can use this construct as a diagnostic tool to identify students who may be overwhelmed by the coursework and at risk for lower academic self-concept as a result.

The perceived difficulty construct does not measure the level of challenge of the coursework, in the sense that it is not sensitive to coursework that might not be enough challenge for students. Since the means of perceived challenge were low for the groups, it may be that these students, or at least some portion of them, are not adequately challenged by their classes. Future research should investigate the challenge level that students in academically rigorous programs experience to determine if the curriculum reaches levels of optimal educational experiences (Bassi et al., 2007) or flow (Csikzentmihalyi & Csikzentmihalyi, 1988).

Given the high levels of academic self-concept and future goals, and the low levels of perceived difficulty, the students in this study feel confident in their success within the academically rigorous programs. This is good news for educators and researchers who may be concerned about the detrimental effects of homogenous grouping and rigorous curriculum for high ability students (Marsh, 1991; Marsh et al., 1995; Marsh & Parker, 1984). Overall, the students in this study feel that they are good students who are not overwhelmed by the content of their classes and plan to reach high levels of educational attainment. As these conclusions are based on the average of all student responses, educators should be aware of students who do not display this pattern of responses. It is this minority of students who may not have high academic self-concept that the implications of this research may be most valuable, as it can guide the

development of interventions to raise future goals and/or find a more appropriate level of challenge within the curriculum.

Given the significant and positive relationship between student self-concept and future goals for two of the three populations, feelings of success in school are important. The students in the IB and AP classes with higher student self-concept also had higher future educational goals. While the relationship between student self-concept and future goals for students at the residential school was not statistically significant, this may have been due to a lack of power to detect a relationship because of low sample size, or because there was less variability in this population's future goals. Given that all three groups reported high levels on this scale, equivalent to an education above a Master's Degree, future research should investigate this relationship in populations with greater variability in educational aspirations. However, the results of this study are consistent with the work of previous researchers (e.g., Marsh, 1991; Rinn, 2007). How students perceived themselves as students affects the level of educational aspirations they report Practitioners in the field of education should be aware of this relationship, and to that end, work to raise adolescents' student self-concept through interventions and counseling.

Ability and Academic Self-Concept

Another interesting finding in this study is the lack of relationship between academic self-concept and ability for two of the three populations. Although this relationship is widely documented in the research (e.g., Ludtke et al., 2005; Marsh, 2004; Ziegler et al., 1996), there was no significant correlation for students in AP classes or at the residential school in this study. There are several possible reasons for this unexpected result. One explanation is that, for these populations of students, there is no correlation

between ability and academic self-concept. Because this research only investigated academically talented students, there is a restriction of range in the ability scores that may limit the correlation. It may be that among students with high abilities there is less correlation with academic self-concept. Another explanation is that there is a correlation between these two constructs, but the instrumentation used in this study did not measure it. Because of the limitations of using self-reported SAT scores as a measure of ability, future research should use a standardized test of ability given to all participants. This would determine if, among the population of academically talented students, there is a correlation between ability and academic self-concept.

Student and Learner Self-Concept

In the research, general academic self-concept is typically subdivided into subject-area domains (e.g., Brunner, Ludtke, & Trautwein, 2008; Mui et al., 2000; Nagy et al., 2006; Plucker & Stocking, 2001; Williams & Montgomery, 1995). However, in this study using the PCSC (Wilson, 2007), the two factors of academic self-concept were student and learner self-concept. Student self-concept measures how students feel about their abilities at school-related tasks, while learner self-concept is more concerned with success at learning. Although these two constructs are parts of academic self-concept, they are distinct from each other having correlations ranging from .214 to .415 among the populations in this study. This distinction is one that has not been widely made in the research about academic self-concept, but should be investigated further.

If students are indeed distinguishing between how they perform in school and how easily they learn new things, practitioners in the field of education should pay attention to both areas of student affect. Student self-concept was more closely linked to

the future educational aspirations of students in this study which implies a need for the development of skills to help students be successful in school-related tasks, such as organization, time management, and study skills, in addition to the regular curriculum. Learner self-concept was more closely linked to ability among the IB student which may indicate that the ability to learn is considered by students to be a more innate quality, such as general ability, than linked to skills for success in a specifically school environment. Student self-concept, on the other hand, was more closely linked to achievement all three populations. Learner self-concept may be a measure that is more closely tied to how a student views his or her innate ability to learn, while student self-concept may be a measure of how a student views his or her skills at being successful in school. Since student self-concept was more closely linked with future goals, if practitioners are concerned about the educational attainment of high ability students, they should focus on ways to increase students' confidence in their ability to be successful in school. Teachers might include instruction on specific study skills and the tacit knowledge that contributes to school success. Administrators might develop specific programs for at-risk high ability students, and school counselors could work with these students in a more intense fashion. Finally, researchers could develop specific interventions to improve student self-concept and test the effects on future educational attainment.

Social Comparison and Perceived Difficulty

Perhaps the most interesting and important finding of this research is the relative path estimates of social comparison and perceived difficulty. The meditational analysis found that perceived difficulty and achievement mediated the relationship between ability

and academic self-concept, with no significant paths from any of the measures of social comparison. Additionally, when the unstandardized path estimates are compared, perceived difficulty has a greater contribution to both subscales of academic self-concept than any of the social comparison measures. Thus, the perceived level of difficulty is a greater predictor of both student and learner self-concept than social comparison.

These results have important implications for educational psychology research. Previous research about the academic self-concept of high-ability students has focused on social comparison (e.g., Cheung & Rudowicz, 2003; Chui et al., 2008; Craven et al., 2000; Froddy & Crundall, 1993; Gibbons et al., 1994; Guay et al., 1999; Jones & Regan, 1974; Ludtke et al., 2005; Marsh, 1987; Marsh, 1991; Marsh & Parker, 1984; Marsh et al., 1995; Marsh et al., 1991; Michinov & Montell, 1997; Shaunessy et al., 2006; Sheilds, 1996; Smith & Sachs, 1997; Strube & Roemmele, 1985; Suls et al., 1978; Wright & Leroux, 1997; Yan & Haihui, 2005; Ziedner & Schleyer, 1999a, 1999b, 1999c, 1999d). However, the additional component of perceived difficulty of the coursework had more influence on academic self-concept than social comparison in this study. Perhaps when high-ability students are grouped together in educational situations, the documented drop in academic self-concept as a student participates in a specialized program for the gifted is not due as much to the students' new peer group as the increased rigor of their coursework. Future research should continue to investigate and distinguish between coursework difficulty and peer group ability level as factors contributing to academic self-concept. This new focus represents a shift in the research concerning academic self-concept.

Researchers who study the BFLPE often recommend against homogeneous ability grouping for high-ability students due to their documented drop in academic self-concept that is attributed to social comparisons (e.g., Marsh, 1991; Marsh, 2004; Marsh et al., 1995). If, however, this drop in academic self-concept is due to the increased academic expectations and rigor of the curriculum, rather than, or in addition to, the increased ability of the referential peer group, then grouping the high-ability together is not the sole cause of the drop. This study suggests that what students are expected to do in a class is more important than how they are grouped. Although these two elements are often implemented together, academic self-concept is influenced by the curriculum.

Instrument Development

The instrument used to measure perceived difficulty and academic self-concept, the PCSC (Wilson, 2007), was further validated within this new population of students. Previous research conducted with this instrument used samples of undergraduate students (Wilson, 2008a, 2008b), so this current study represents a sample from a new population of students. The final model had invariance of pattern coefficients across the three groups of high ability students, indicating that the instruments measured the subscales in similar ways. This finding gives support for the use of the PCSC among academically talented secondary students.

Further research in validating this instrument should consider adding more items to the Learner Self-Concept and Student Self-Concept subscales to increase their reliabilities. In addition, administering the PCSC along with other more widely used measures of academic self-concept would test for concurrent validity. Finally, the PCSC should be administered to other populations of students, including high-ability students

with greater diversity of geography, socioeconomic status, and ethnicity. The PCSC should also be tested with secondary students of various ability levels to determine if they have the same pattern of responses.

Limitations

When making generalizations from this study, it is important to consider the limitations. These limitations include internal, external, and construct validity, restriction of range, and mean scores.

Internal Validity

This study uses a nonrandomized sample, as the students self-selected to be a part of each of the accelerated curricula. Therefore, differences in the observations could be due to differences in the types of students in each group, rather than the types of accelerated programs. However, the differences between these groups is the interest of the study, in that the research is investigating the differing structures of academic self-concept, perceived difficulty, and achievement among different groups of students, which may be influenced by the sample of convenience.

Construct Validity

There may be an issue of construct validity in the use of global academic self-concept, rather than domain specific academic self-concept. The research suggests that global measures of academic self-concept mask differences in verbal and mathematical self-concepts (Marsh & Hau, 2004; Marsh & Yeung, 2001; Mui et al., 2000; Rost et al., 2005; Skaalvik & Skaalvik, 2002); however, other studies have shown a correlation between multiple areas of domain-specific academic self-concept and more global measures of academic self-concept (Marsh, 1990). In a study conducted by Marsh (1990),

the General School Self-Concept subscale of the Academic Self-Descriptive Questionnaire was correlated with core academic area self-concept (such as mathematics, spelling, reading, science, and social studies) ranging in value from .568 to .732, with a median of .619. Thus, a global measure of academic self-concept is associated with domain-specific components and gives a measure of how a student views him or herself as a student, rather than his or her abilities limited to a specific area.

As perceived difficulty of coursework is a little researched construct to the field of education, then it is possible that this construct is not fully defined by the current instrument. Further use and validation of this instrument, as this study is attempting, will contribute to defining this construct.

In addition, all of the instruments and data collection in this study are self-report. In this case, it must be noted that self-report of achievement is being used as a measure of true achievement. Finally, there is mono-operation bias, as each variable is only measured by one instrument, which may under-represent the complete construct (Shadish, Cook, & Campbell, 2002).

External Validity

For each population of students, the sample is taken from one or two schools. This limits the amount of generalizability of this study. The results within each population, (e.g., students in Advanced Placement classes) may only pertain to those students at those schools. Also, the schools in this study were all located in a similar geographic location, also limiting the generalizability of the study to other areas. In addition, it is not possible to make causal inferences about the patterns of mediation and group membership, as the

membership of groups is not randomly assigned, and it is likely that these groups differ on unmeasured variables.

Restriction of Range

The populations of students participating in this study were high-achieving students pursuing academic accelerated programs. Thus, for every group, the achievement and ability measures did not have a full range of values that might be expected from a general sample of high school students. However, it is important to study this population of students in particular, especially in regard to the consequences of homogeneous grouping on self-concept.

Mean Comparisons

The mean comparisons were computed using an ANOVA using factor scores of the latent variables, calculated by taking the mean of the observed indicators. This procedure assumes that each indicator makes an equal contribution to the latent variable, which is not necessarily the case, based on the structural equation model. Thus, the calculation of the mean scores for each group may not be accurate.

Big Fish Little Pond Effect

Another limitation of this research is that this study did not measure variables over time. Therefore, the Big Fish Little Pond Effect was not measured, and it is not known if the students in the study did, in fact, have a drop in self-concept upon entering rigorous academic programs. In fact, the students reported an increase in academic achievement over this period of time. Future research should consider a longitudinal approach in which academic self-concept and the influence of perceived difficulty can be measured over time.

Implications

The results of this study provide many implications for self-concept theory, educational policy, and future research. There are many components to the study, and therefore, a wide variety of implications. These implications apply to many types of practitioners and researchers in the field of education, and specifically gifted education.

Implications for Research

This study has implications for researchers in educational psychology concerning academic self-concept. This research indicates that an additional dimension of academic self-concept is the distinction between learner self-concept and student self-concept. This represents a new theory of academic self-concept, and the interaction of these constructs with the more traditional subdivisions of subject-area domains. For example, is there a difference between science learner self-concept and science student self-concept? This also has implications for future research concerning how academic self-concept interacts with motivational theory, since learner self-concept is more linked to internal rewards, while student self-concept is more linked to external rewards (i.e., achievement and grades).

The model proposed in this study represents a more comprehensive structure of academic self-concept, introducing achievement, social comparison, and perceived difficulty as components of academic self-concept. A comprehensive model of this construct is important to develop as researchers work to better understand academic self-concept. By considering several variables at once within the model, the relative contributions of each variable can be examined.

Finally, the use of the PCSC shows further validity to be used in future research into the academic self-concept and perceived difficulty of students. It can be used with academically talented secondary students in research situations to measure academic self-concept with the subscales of learner self-concept and student self-concept. It also measures the perceived level of difficulty that the students experience in their coursework. Research into program and curricular evaluations, as well as academic self-concept, can utilize this instrument. It provides a new measurement that does not emphasize the social comparison aspect of academic self-concept.

Implications for Practice

In addition to the implications for research, there are also many implications for the practice of educators, teachers, administrators, counselors, and policy makers. First, the importance of perceived difficulty to academic self-concept indicates that school personnel should be concerned about matching the rigor of the curriculum to the readiness level of the student. When students feel overwhelmed by their coursework, then their student self-concept is lowered, and this can have an adverse effect on their future goals. Therefore, teachers and counselors should be sensitive to how students are feeling about success in their coursework. The PCSC can be used to diagnose when students are feeling overwhelmed or confused in class.

The relative lower path estimates for the social comparison variables indicates that grouping is less of a factor for lower academic self-concept among homogeneously grouped high-ability students. In fact, the academic self-concept of the students in this study was high. The implication for administrators and policy makers is that ability

grouping, per say, does not have a detrimental effect on the academic self-concept of high ability learners.

The relatively high academic self-concept scores and future educational goals, as well as the low perceived level of difficulty, for the majority of the participants in this study indicates that educators should be aware of students that do not fit this pattern. While most high-ability students have positive perceptions of themselves, if a student does not feel this way, then teachers and counselors should be ready to intervene. It is for the students that had lower scores for academic self-concept and future goals that this research can have the most influence. If a student is feeling overwhelmed by their coursework, the model predicts that they will have a lower self-concept, and therefore, lower their educational aspirations. This sequence of behaviors can have long-term detrimental effects on the student's life. Therefore, teachers and counselors should be aware of students who do not feel successful in their coursework.

Directions for Future Research

The results of this study lead to several future directions of research. This study should be expanded to include more diverse populations to determine if a comprehensive model of academic self-concept can be developed. This population should include students from across the country representing a diversity of cultural backgrounds, economic status, and programming options. In addition, it should be determined if there is a difference between how students of average abilities and students with high abilities have the same patterns of academic self-concept.

In addition to a cross-sectional analysis of academic self-concept, a longitudinal analysis could determine how academic self-concept develops. By assessing academic

self-concept and the factors contributing to it before a student enters a program and throughout the program, researchers could model academic self-concept longitudinally. Since the perceived level of difficulty was low for these students who were in academically accelerated programs, future research should also follow these students into their postsecondary educational careers. If they are not overwhelmed by the college-level work that is presented in their IB or AP classes, or at the residential school, it would be interesting to study if they experience challenge in their undergraduate studies.

To further investigate the relationship of achievement and ability to academic self-concept in this population, future research should use direct measures of ability and achievement with the participants. A direct measure, rather than a self-reported measure, is more accurate to the true construct. Future research could also document the differences in self-reported versus direct measures among this population of high ability secondary students in accelerated programs.

Finally, there is limited information that can be gained through quantitative measures and survey research. Interviews and observations of student behavior could bring insights into how students are constructing their academic self-concept. In addition, interviews with alumni from the various programs might also provide reflective information about the influence of the programs on the students' educational attainment and self-concepts.

Summary

This research study investigated the academic self-concept of academically accelerated secondary students in IB, AP, and residential school programs. The variables of ability, achievement, social comparison, perceived difficulty, and future goals were

considered. A structural equation model was developed using the PCSC and the INCOM scales, as well as several descriptive questions. This model had invariance among the measurement model, indicating that the scales measured IB, AP, and residential school students similarly. However, there was not invariance of the path estimates, indicating that the three populations were heterogeneous in their construction of academic self-concept.

In the research model, however, perceived difficulty of coursework had a greater influence on academic self-concept than social comparison for all three groups. This indicates that although previous research has focused on social comparison theories, the difficulty level of the curriculum may be more important to the development of academic self-concept among high-ability secondary students. Practitioners in the field should be aware of this relationship as it has implications for program and curriculum development.

In addition, the distinction between learner self-concept and student self-concept, and the relative relationships between ability, achievement, and future goals, indicates that feelings of success in school are more closely related to grades and ultimately the future educational goals of the student.

This model of academic self-concept, including achievement, social comparison, and perceived difficulty, has many practical implications for both practice and research. It is important, as the field of educational psychology progresses, to further develop comprehensive models of academic self-concept that can clearly link the contributing factors to the construct, as well as delineate the outcomes for students.

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Appendix A

Table 1

Instruments Used to Measure Academic Self-Concept

Author	Instrument	Subscales/Factors (Number of Items)	Theoretical Framework
Bracken, 1992; Bracken & Howell, 1991; Bracken, Bunch, Keith, & Keith, 2000	Multidimensional Self-Concept Scale	Social (25) Competence (25) Affect (25) Academic (25) Family (25) Physical (25) (total=150)	Hierarchical and multidimensional model of self-concept, self-concept as a "behavioral construct, not part of a larger cognitive 'self-system'" (Bracken et al., 2000, p. 322)
Brookover et al., 1962; Brookover, Thomas, & Paterson, 1964	Academic Self-Concept Scales	General Self-Concept (8) With reference changes can measure Arithmetic, English, Social Studies, and Science with parallel structure	Uses Guttman Scales Interactional model of Self-Concept
Boersma & Chapman, 1992; Chapman, 1989	Perception of Ability Scale for Students	Perception of General Ability (12) Perception of Math Ability (12) Perception of Reading and Spelling Ability (12) Perception of Penmanship and Neatness Skills (12) School Satisfaction (12) Confidence in Academic Ability (12) (total=70)	Developed for research on non-academic characteristics of learning disabled students in the 1970s

Author	Instrument	Subscales/Factors (Number of Items)	Theoretical Framework
Dolan, 1983; Dolan & Enos, 1980	School Attitude Measure	School Motivation Student Control Over Performance Student Instructional Mastery Performance-Based Academic Self-Concept Reference-Based Academic Self-Concept (total=85)	Measures student's responses regarding school achievement
Feldhusen & Kolloff, 1981; Feldhusen & Willard-Holt, 1992	ME: Self-Concept Scale for Children Scale	Academic Self-Concept (total=50)	Agree or disagree with each statement
Fitts, 1980	Tennessee Self-Concept Scale	Total Positive Identity Self-Satisfaction Behavior Physical Self Moral-Ethical Self Personal Self Family Self Social Self (total=95)	Does not measure academic self-concept directly
Harter, 1983	Perceived Competence Scale for Children, Revised	Scholastic Competence (6) Social Acceptance (6) Athletic Competence (6) Physical Appearance (6) Behavior Conduct (6) Global Self-Worth (6) (total=36)	Social comparison that increases during middle childhood and adolescence

Author	Instrument	Subscales/Factors (Number of Items)	Theoretical Framework
Harter, 1985	Self-Perception Profile for Adolescents	Scholastic Competence (5) Job Competence (5) Behavioral Conduct (5) Social Acceptance (5) Close Friendships (5) Romantic Appeal (5) Physical Appearance (5) Athletic Competence (5) (total=45)	Social comparison that increases during middle childhood and adolescence Paired dichotomous statements that the subject chooses from and then rates how much the statement is like them
Marsh, 1990	Academic Self Description Questionnaire I	Computer Studies Spelling Reading Handwriting Mathematics Social Studies Science Art Music Religious Studies Health Physical Studies Physical Education Self Esteem School Subjects (total=86)	Pre-adolescents Big-Fish-Little-Pond Effect/ social comparison theory

Author	Instrument	Subscales/Factors (Number of Items)	Theoretical Framework
Marsh, 1990; Marsh, 1992c	Academic Self Description Questionnaire II	Computer Studies English Language History Mathematics English Literature Science Commerce Geography Foreign Languages Physical Education Art Music Industrial Art Religious Studies Health Physical School Subjects (total=136)	Adolescents Big-Fish-Little-Pond Effect/ social comparison theory
Marsh, 1992b	Self-Descriptive Questionnaire I	Physical Abilities Physical Appearance Reading Mathematics Peer Relations Parent Relations General-Self General-School (total=76)	Pre-adolescents Big-Fish-Little-Pond Effect/ social comparison theory

Author	Instrument	Subscales/Factors (Number of Items)	Theoretical Framework
Marsh, 1992c	Self-Descriptive Questionnaire II	Math Physical Appearance General Honesty/Trustworthiness Physical Abilities Verbal Emotional Stability Parent Relationships School Same-Sex Relationships Opposite-Sex Relationships (total=102)	Adolescents to adults Big-Fish-Little-Pond Effect/ social comparison theory
Marsh, 1992d	Self-Descriptive Questionnaire III	Math Physical Appearance General Esteem Honesty/Trustworthiness Physical Abilities Verbal Emotional Stability Parent Relationships Academic (General) Same-Sex Relationships Opposite-Sex Relationships Spiritual Values/Religion Problem-Solving (total=136)	Late adolescents to adults Big-Fish-Little-Pond Effect/ social comparison theory

Author	Instrument	Subscales/Factors (Number of Items)	Theoretical Framework
McCoach & Siegle, 2003	School Attitude Assessment Survey-Revised	Academic Self-Perceptions (8) Attitudes Toward Teachers (7) Attitudes Toward School (5) Goal Valuation (6) Motivation/Self-Regulation (10) (total=35)	Designed to measure attitudes and perceptions of gifted underachievers
Meltzer, 1993	Student Self Report System	General Academic Competence (9) Self-Perception of Mathematics Competence (10) (total=19)	Designed for use with students with learning disabilities
Muris, 2001	Self-Efficacy Questionnaire for Children	Social Self-Efficacy Academic Self-Efficacy Emotional Self-Efficacy (total=21)	Correlates with depression, anxiety, and neuroticism
Peirs, 1984	Piers-Harris Children's Self-Concept Scale	Behavior Intellectual and School Status Physical Appearance Anxiety Popularity Happiness and Satisfaction (total=86)	Items overlap on more than one dimension
Pintrich, & de Groot, 1990	Motivated Strategies for Learning Questionnaire	Self-Efficacy (9) Intrinsic Value (9) Test Anxiety (4) Cognitive Strategy Use (13) Self-Regulation (9) (total=56)	Focus on motivational and self-regulated learning

Author	Instrument	Subscales/Factors (Number of Items)	Theoretical Framework
Pyryt & Mendaglio, 1994	Pyryt-Mendaglio Self-Perception Survey	*Dimensions:* Academic (6) Social (6) Athletic (6) Evaluative (6) *Perspectives:* Reflected Appraisal (16) mother (4) father (4) favorite teacher (4) best friend (4) Social Comparison (4) Attribution (4) (total=24)	Combines reflected appraisal, social comparison, and attribution theories
Rosenberg, 1979; Russell & Shoare, 1994	Rosenberg Perceived Self-Concept Scale	How I See Myself Now (10) How I Would Like to See Myself (10) (total=20)	Global self-concept measure
Sears, 1966	Sears Self-Concept Scale (Winne et al., 1982)	Physical Ability (4) Physical Appearance (4) Social Relations (4) Convergent Mental Abilities (4) Divergent Mental Abilities (4) School Subjects (8) Work Habits (4) (total=48)	Multi-dimensional self-concept

Author	Instrument	Subscales/Factors (Number of Items)	Theoretical Framework
Siegle & Reis, 1993	Academic Achievement Survey	Quality of Student's Work Student's Effort Student's Ability Subject Importance *Domains* Mathematics Science Language Arts Social Studies	Teacher and Student Versions, unpublished
Utah Department of Education	Educational Process Questionnaire (Shields, 1996)	Academic Self-Concept Autonomy Career Preparation Classroom Participation English/Language Arts Enjoyment of School Independent Development Individualization of Instruction Peer Relations Reading Reinforcement of Self-Concept Self-Acceptance Teacher Expectations	Originally used in Utah as part of the statewide assessment program (1975-1990)

Author	Instrument	Subscales/Factors (Number of Items)	Theoretical Framework
Wunsche & Schneewind, 1989	Questionnaire for the Assessment of Self- and Competence-Ratings of Children (*Fragebogen zur Erfassung von Selbst- und Kompetenzein-schätzungen bei Kindern*)	General Self-Assessment of Self-Confident Behavior Self-Perception of Competencies in Domain Areas	Limited information because scale is in German

Note: Surveys developed solely for the research study were not reported

Table 2

Summary of Studies of Academic Self-Concept and Ability

Author	Sample(s)	Comparison Group	Identification for High Ability	Research Design	Program	Instrument	Instrument Type	Results
Akande, 1997	Nigeria Zimbabwe 11-13 y.o. *N*=204	Average Ability	>85th percentile Achievement Test	Intact Groups	No	Perception of Ability Scale for Students (Boersma & Chapman, 1992)	Academic Self-Concept Scale with domain-specific and general subscales	High ability students more academic self-concept than average ability students
Boersma & Chapman, 1981	Canada 7-12 y.o. *N*=162	Learning Disabled and Average Ability	n/a	Intact Groups	n/a	Perception of Ability Scale for Students (Boersma & Chapman, 1992)	Academic Self-Concept Scale with domain-specific and general subscales	Lower abilities lower academic self-concept than general education population
Bouffard & Couture, 2003	Canada 12-18 y.o. *N*=226	Average Ability at the same school	School identification, grades, and teacher recommend-ation	Intact Groups	Yes, Math	11-item questions	Measures "Perceived Academic Competence"	No difference between average ability and high ability students

Author	Sample(s)	Comparison Group	Identification for High Ability	Research Design	Program	Instrument	Instrument Type	Results
Colangelo & Brower, 1987	U.S. *N*=50	Average Ability Sibling Pairs	School identification, Ability and Achievement Scores	Intact Groups	Yes	Academic Self-Concept Scales (Brook-over, Paterson, & Thomas, 1962, 1964)	Academic Self-Concept Scale	High ability students more academic self-concept than average ability students
Colangelo et al., 1987; Kelly & Colangelo, 1984	U.S. 11-14 y.o. *N*=243	Average Ability	School identification, Ability and Achievement Scores, 35% of the population identified as gifted	Intact Groups	Yes	School Attitude Measure (Dolan & Enos, 1980)	Academic Self-Concept Subscale	High ability students more academic self-concept than average ability students
Cosden & McNamara, 1997	U.S. 18-30 y.o. *N*=100	Learning Disabled and Average Ability (at University)	n/a	Intact Groups	n/a	Self-Perception for College Students	Scholastic Competence Subscale	Lower abilities lower academic self-concept than general education population

Author	Sample(s)	Comparison Group	Identification for High Ability	Research Design	Program	Instrument	Instrument Type	Results
Hotulainen & Schofield, 2003	Finland 13-14 y.o. *N*=141	Average Ability in preschool	Preschool identification with Ability Test	Longitud -inal	No	Perceived Compet-ence for Children, Revised (Harter, 1983)	Scholastic Competence Subscale	High ability students more academic self-concept than average ability students
Kelly& Jordan, 1990	U.S. 12-14 y.o. *N*=90	Average Ability (45th – 65th percentile)	Highly Gifted (>95th percentile) Moderately Gifted (90th – 95th percentile) Achievement Test	Intact Groups	Yes	Perceived Compet-ence for Children, Revised (Harter, 1983)	Scholastic Competence Subscale	High ability students more academic self-concept than average ability students
Ludtke et al., 2005	Germany 11-15 y.o. *N*=1,841	n/a	n/a	Large Scale Database	n/a	4-item scale	Math Self-Concept	High ability students more academic self-concept than average ability students

Author	Sample(s)	Comparison Group	Identification for High Ability	Research Design	Program	Instrument	Instrument Type	Results
Marsh, 2004	Australia 14-16 y.o. *N*=4,916	n/a	n/a	Large Scale Database	n/a	Adapted from Self-Descrip-tive Question-naire II (Marsh, 1992c)	Academic Self-Concept Scale with subject-area domain subscales	High ability students more academic self-concept than average ability students
McCoach & Siegle, 2002	U.S. 13-16 y.o. *N*=370	Average Ability at one school	92nd percentile on Achievement or Ability Test	Intact Groups	Yes	School Attitude Assess-ment Survey-Revised (McCoach & Siegle, 2003)	Academic Self-Perception Subscale	High ability students more academic self-concept than average ability students
Meltzer et al., 1988	U.S. 8-16 y.o. *N*=663	Learning Disabled and Average Ability	n/a	Intact Groups	n/a	Student Self-Report Measure (Meltzer, 1993)	Academic Self-Concept and Math Self-Concept Subscales	Lower abilities lower academic self-concept than general education population

Author	Sample(s)	Comparison Group	Identification for High Ability	Research Design	Program	Instrument	Instrument Type	Results
Montague & Garderen, 2003	U. S. *N*=135	Average Ability at the same school	School Identification, 98th percentile on Ability Test	Intact Groups	Yes	Student Self-Report System (Meltzer, 1993)	General and Math Self-Concept Subscales	High ability students more academic self-concept than average ability students
Pajares & Graham, 1999	U. S. 11-13 y.o. *N*=273	Average Ability at the same school	98th percentile on Ability Test	Intact Groups	Yes, Math	Academic Self-Concept Question-naire II (Marsh, 1992c)	Math Subscale	High ability students more academic self-concept than average ability students
Pyryt & Mendaglio, 1994	Canada 11-15 y.o. *N*=98	Average Ability	School identification	Intact Groups	Yes	Pyryt-Mendaglio Self-Perception Survey (Pyryt & Mendaglio 1994)	Academic Self-Concept Subscale	High ability students more academic self-concept than average ability students

Author	Sample(s)	Comparison Group	Identification for High Ability	Research Design	Program	Instrument	Instrument Type	Results
Vlahovic-Stetic, et al., 1999	Croatia 4-11 y.o. *N*=147	Average Ability at the same school	84th percentile on Ability and Math Achievement Test	Intact Groups	Yes	Rosenberg Perceived Self-Concept Scale (Rosen-berg, 1979)	Global Self-Concept with no Academic Self-Concept Subscale	No difference between average ability and high ability students
Winne, et al., 1982	Canada 8-14 y.o. *N*=170	Average Ability at the same school	91st percentile on Ability and Achievement Tests	Intact Groups	Yes	Sears Self-Concept Scale (Sears, 1966)	Academic Self-Concept Subscale	No difference between average ability and high ability students
Zeleke, 2004	U.S. *N*=488	Low (<25th percentile) Average (35th-65th percentile)	High (70th-95th percentile) Math Achievement	Intact Groups	n/a	Culture-Free Self-Esteem Inventor-ies (Battle, 1992)	Academic Self-Concept Subscale	Lower abilities lower academic self-concept than general education population

Author	Sample(s)	Comparison Group	Identification for High Ability	Research Design	Program	Instrument	Instrument Type	Results
Ziegler et al., 1996	Germany 11-13 y.o. *N*=547	Average Ability (16th – 82nd percentile)	Highly Gifted (>98th percentile) Moderately Gifted (98th - 84th percentile) Ability Test	Large Scale Database	Yes, Physics	Question-naire for the Assess-ment of Self- and Compet-ence Ratings of Children (Wunsche & Schnee-wind, 1989)	Academic Self-Concept Subscale	High ability students more academic self-concept than average ability students

Table 3

Summary of Studies Concerning Gender and Academic Self-Concept for Gifted or High Ability Students

Author	Sample(s)	Comparison Group	Identification for High Ability	Research Design	Program	Instrument	Instrument Type	Results
Akande, 1997	Nigeria Zimbabwe 11-13 y.o. *N*=204	Average Ability	>85th percentile Achievement Test	Intact Groups	No	Perception of Ability Scale for Students (Boersma & Chapman, 1992)	Academic Self-Concept Scale with domain-specific and general subscales	Boys had higher academic self-concept than girls
Colangelo et al., 1987; Kelly & Colangelo, 1984	U.S. 11-14 y.o. *N*=243	Average Ability	School identification, Ability, and Achievement Scores, 35% of the population identified as gifted	Intact Groups	Yes	School Attitude Measure (Dolan & Enos, 1990)	Academic Self-Concept Subscale	No gender differences among high ability students

Author	Sample(s)	Comparison Group	Identification for High Ability	Research Design	Program	Instrument	Instrument Type	Results
Dai, 2001	<u>Study 1:</u> China 14-16 y.o. *N*=208 <u>Study 2:</u> China 14-16 y.o. *N*=148	<u>Study 1:</u> Average Ability at same school <u>Study 2:</u> Heterogen-eous group at different school	School identification, Achievement tests	Intact Groups	Yes	Chinese version of the Academic Self-Concept Question-naire (Marsh, 1990)	Academic Self-Concept subscale	<u>Study 1:</u> Boys had higher academic self-concept than girls <u>Study 2:</u> High ability girls had higher academic self-concept than boys, no difference on math academic self-concept
Hotulainen & Schofield, 2003	Finland 13-14 y.o. *N*=141	Average Ability in preschool	Preschool identification with Ability Test	Longitud-inal	No	Perceived Compet-ence for Children, Revised (Harter, 1983)	Scholastic Competence Subscale	No gender differences among high ability students

Author	Sample(s)	Comparison Group	Identification for High Ability	Research Design	Program	Instrument	Instrument Type	Results
Kelly& Jordan, 1990	U.S. 12-14 y.o. *N*=90	Average Ability (45th – 65th percentile)	Highly Gifted (>95th percentile) Moderately Gifted (90th – 95th percentile) Achievement Test	Intact Groups	Yes	Perceived Compet-ence for Children, Revised (Harter, 1983)	Scholastic Competence Subscale	Boys had higher academic self-concept than girls
Lewis & Knight, 2000	U.S. 9-18 y.o. *N*=368	No Comparison Group	91st percentile on Ability Test	Intact Groups	Yes	Piers-Harris Children's Self-Concept Scale (Piers, 1984)	Academic Self-Concept Subscales	Girls had higher intellectual self-concept than boys. Boys had higher school status and anxiety self-concept than girls.
Nagy et al., 2006	East and West Germany 14-18 y.o. *N*=1,148	n/a	All Academic Track Students	Large Scale Database	n/a	5-items	Domain-Specific Academic Self-Concept	Boys had higher math self-concept than girls. Girls had higher biology self-concept than boys.

Author	Sample(s)	Comparison Group	Identification for High Ability	Research Design	Program	Instrument	Instrument Type	Results
Olszewski-Kubilius & Turner, 2002	U.S. 14-18 y.o. *N*=5,544	n/a	Participate in Talent Search Program	Intact Group	n/a	Separate Questions	n/a	More boys said that they were better at math than girls said they were better at math.
Pajares & Graham, 1999	U. S. 11-13 y.o. *N*=273	Average Ability at the same school	98th percentile on Ability Test	Intact Groups	Yes, Math	Academic Self-Concept Question-naire II (Marsh, 1992c)	Math Subscale	No gender differences among high ability students
Siegle & Reis, 1998	U.S. 9-15 y.o. *N*=5,385	n/a	Identified by School (various measures)	Intact Groups	Yes, Varied	Academic Achieve-ment Survey (Siegle & Reis, 1993)	Perception of talent in four domains	Girls had higher language arts self-concept than boys. Boys had higher math, social studies, and science self-concept than girls.

Author	Sample(s)	Comparison Group	Identification for High Ability	Research Design	Program	Instrument	Instrument Type	Results
Ziegler et al., 1996	Germany 11-13 y.o. *N*=547	Average Ability (16th – 82nd percentile)	Highly Gifted (>98th percentile) Moderately Gifted (98th - 84th percentile) Ability Test	Large Scale Database	Yes, Physics	Question-naire for the Assess-ment of Self- and Compet-ence Ratings of Children (Wunsche & Schnee-wind, 1989)	Academic Self-Concept Subscale	Boys had higher physics self-concept than girls.

Table 4

Summary of Studies Concerning the Internal/External Frame of Reference Model and Gifted Students or High Ability Students

Author	Sample(s)	Comparison Group	Identification for High Ability	Research Design	Program	Instrument	Instrument Type	Results
Brunner et al., 2008	Germany 14-16 y.o. *N*=25,301	n/a	n/a	Large Scale Database	n/a	Self-Descriptive Questionnaire (Marsh, 1992b)	Math, Verbal, and Academic Self-Concept Subscale	Positive correlation between academic self-concept and each domain-specific self-concept.
Mui et al., 2000	China 13-18 y.o. *N*=511	No Comparison Group	School Identification, Achievement Test	Intact Group	Yes, Selective School, Accelerated	Self-Descriptive Questionnaire II (Marsh, 1992c)	Academic Self-Concept Subscale with subject-area domains	Positive correlation between academic self-concept and achievement within domain (.36 & .51). Negative correlation between domains (-.11 & -.22).

Author	Sample(s)	Comparison Group	Identification for High Ability	Research Design	Program	Instrument	Instrument Type	Results
Nagy et al., 2006	East and West Germany 14-18 y.o. *N*=1,148	n/a	All Academic Track Students	Large Scale Database	n/a	5-items	Domain-Specific Academic Self-Concept	Positive correlation between academic self-concept and course selection within domain (.39). Negative correlation between domains (-.21).
Plucker & Stocking, 2001	U.S. 12-16 y.o. *N*=131	No Comparison Group	97th percentile on achievement test and SAT scores	Intact Group	Yes, Resident-ial Summer Camp	Self-Descrip-tive Question-naire II (Marsh, 1992c)	Academic Self-Concept Subscale with subject-area domains	No correlation between domains of academic self-concept or achievement
Williams & Montgom-ery, 1995	U. S. 13-15 y.o.	No Comparison Group	School Identification	Intact Group	Yes, Honors Program	ME Self-Concept Scale for Gifted Children (Feldhus-en & Kolloff, 1981)	Academic Self-Concept Subscale	No correlation between domain specific academic self-concepts. Positive correlation between domain specific achievement.

Table 5

Summary of Studies Concerning the Social Comparison and Gifted or High-Ability Students

Author	Sample(s)	Comparison Group	Identification for High Ability	Research Design	Program	Instrument	Instrument Type	Results
Cheung & Rudowicz, 2003	Hong Kong 12-16 y.o. *N*= 2,720	Three groups, based on how much they ability group students	n/a	Intact Groups	Yes	Chinese version of Motivated Strategies for Learning Question-naire (Pintrich & deGroot, 1990)	Self-efficacy of Study Subscale	More ability grouping, higher academic self-concept
Craven et al., 2000	Australia 8-11 y.o. *N*=634	Gifted students in: Selective Schools, Selective Classes, Heterogen-eous Classes	School Identification, Ability Tests, Recommend-ation, Interview	Intact Groups	Yes	Self-Descrip-tive Question-naire I (Marsh, 1992b)	Academic Self-Concept Subscale	Selective Schools lower academic self-concept

Author	Sample(s)	Comparison Group	Identification for High Ability	Research Design	Program	Instrument	Instrument Type	Results
Froddy & Crundall, 1993	Australia 18-25 y.o. *N*=130	n/a	n/a	Longitud-inal	Yes, Intro-ductory Psych-ology Course	n/a	n/a	Students most often compared with similar ability peers, then peers with more ability.
Gibbons et al., 1994	U.S. 13-14 y.o. *N*=433	Average Ability	Selected for Camp >930 SAT	Intact Group	Yes, Resident-ial Camp	Self-Descrip-tive Question-naire II (Marsh, 1992c)	Academic Self-Concept Subscale	Low achievement, lower academic self-concept during camp, but raise after camp is over
Guay, Boivin, & Hodges, 1999	Canada 7-10 y.o. *N*=1,002	n/a	n/a	Intact Groups	n/a	Self-Perception Profile for Children (Harter 1983, 1985)	Scholastic Competence Subscale	Academic self-concept based on achievement and peer achievement
Jones & Regan, 1974	U.S. 16-25 y.o. *N*=102	n/a	n/a	Intact Groups	Yes, college and AP courses	n/a	n/a	Students most often compared with similar ability peers

Author	Sample(s)	Comparison Group	Identification for High Ability	Research Design	Program	Instrument	Instrument Type	Results
Ludtke et al., 2005	U.S. 11-15 y.o. *N*=1,841	n/a	n/a	Large Scale Database	n/a	4-item scale	Math Self-Concept	Class average ability had a negative correlation with individual academic self-concept
Manor-Bullock, 1995	U.S. 16-18 y.o. *N*=67	No Comparison Group	School identification	Intact Group	Yes, Residen-tial School	Self-Descrip-tive Question-naire II (Marsh, 1992d)	Academic Self-Concept Subscale	Academic self-concept increase in fall and decrease in spring
Marsh & Parker, 1984	Australia 10-13 y.o. *N*=305	n/a	n/a	Intact Groups	n/a	Self-Descrip-tive Question-naire I (Marsh, 1992b)	Academic Self-Concept Subscale	Negative correlation between school average achievement and academic self-concept
Marsh et al., 2000	China 14-18 y.o. *N*=7,997	n/a	n/a	Large Scale Database	n/a	Self-Descrip-tive Question-naire II (Marsh, 1992d)	Academic Self-Concept Subscale	Negative correlation between school average achievement and academic self-concept

Author	Sample(s)	Comparison Group	Identification for High Ability	Research Design	Program	Instrument	Instrument Type	Results
Marsh et al., 2001	Germany 11-13 y.o. *N*=2,778	East and West Germany	n/a	Large Scale Database	n/a	4 item scale	Math Self-Concept	Negative correlation between class average achievement and academic self-concept
Marsh, 1987	Australia 14-17 y.o. *N*=1,672	n/a	n/a	Large Scale Database	n/a	scale	Academic Self-Concept Scale based on social comparisons	Negative correlation between school average achievement and academic self-concept
Marsh, 1991	U.S. 14-18 y.o. *N*=10,613	n/a	n/a	Large Scale Database	n/a	8 items dichotom-ous	Academic Self-Concept Scale based on social comparisons	Negative correlation between school average achievement and academic self-concept, future goals, and achievement

Author	Sample(s)	Comparison Group	Identification for High Ability	Research Design	Program	Instrument	Instrument Type	Results
Marsh, 1995	Australia 5-13 y.o. Study 1: *N*=100 Study 2: *N*=48	Study 1: heterogen-eous classes at same school Study 2: heterogen-eous classes at different school	Homogen-eous Selective Classes	Intact Groups	Yes	Self-Descrip-tive Question-naire I (Marsh, 1992b)	Academic Self-Concept Subscale	Selective classes have a significant decline in academic self-concept
Michinov & Montell, 1997	France 19-23 y.o. *N*=20	n/a	n/a	Intact Groups	Yes, French Navy Recruits	n/a	n/a	Participants preferred to compare upwards when improvement was possible, downward when no improvement possible
Shaunessy et al., 2006	U.S. 13-18 y.o. *N*=301	General Education Classes	School Identification	Intact Groups	yes, IB	Self-Efficacy Question-naire for Children (Muris, 2001)	Academic Self-Efficacy Subscale	IB students had higher academic self-concept

Author	Sample(s)	Comparison Group	Identification for High Ability	Research Design	Program	Instrument	Instrument Type	Results
Shields, 1996	Canada 9-17 y.o. *N*=83	Homo-geneous and Hetero-geneous Classes	School Identification, Achievement Test (all gifted in sample)	Intact Groups	yes, selective classes	Edcuat-ional Process Question-naire (Shields, 1996)	Academic Self-Concept Subscale	Homogeneously grouped gifted students had higher academic self-concept than heterogeneously grouped gifted students.
Smith & Sachs, 1997	U.K. *N*=60	n/a	n/a	Intact Groups	n/a	n/a	n/a	Students compared with higher ability peers when interested in improving performance
Strube & Roemmele, 1985	U.S. 18-21 y.o. *N*=64	n/a	n/a	Intact Groups	n/a	n/a	n/a	Participants with low self-concept chose self-protective strategies
Suls, Gastorf, & Lawhon, 1978	U.S. 14-18 y.o. *N*=134	n/a	n/a	Intact Groups	n/a	n/a	n/a	Students would prefer to compare their results to age-mates as opposed to same gender

Author	Sample(s)	Comparison Group	Identification for High Ability	Research Design	Program	Instrument	Instrument Type	Results
Wright & Leroux, 1997	U.S. 13-15 y.o. *N*=25	No Comparison Group	School Identification, Achievement Test, Grades, Interview	Longitud-inal	Yes, Self-Contain Classes	Self-Perception Profile for Adoles-cents (Harter 1983, 1985)	Scholastic Competence Subscale	No change in scores over the course of the year
Zeidner & Schleyer, 1999a, 1999b, 1999c, 1999d	Israel 10-12 y.o. *N*=982	Homo-geneous and Hetero-geneous Classes	85th percentile on achievement test, or teacher recommenda-tion All gifted sample	Intact Groups	Yes, selective classes	Hebrew version of Multi-Dimen-sional Self-Concept Scale (Bracken, 1992; Bracken & Howell, 1991)	Academic Self-Concept Subscale	Gifted in heterogeneous classes had higher academic self-concept than those in homogeneous classes

Table 6

Summary of Studies Concerning Acceleration and Longitudinal Studies of Academic Self-Concept

Author	Sample(s)	Comparison Group	Identification for High Ability	Research Design	Program	Instrument	Instrument Type	Results
Dixon et al., 2001	U.S. 15-18 y.o. *N*=156	No Comparison Group	School Identification, All Gifted Sample	Intact Group	Yes, Resident-ial School	Self-Descript-ive Question-naire III (Marsh, 1992c)	Academic Self-Concept Subscale	Different patterns of self-concept within population of residential school students
Manor-Bullock, 1995	U.S. 16-18 y.o. *N*=67	No Comparison Group	School identification	Intact Group	Yes, Residen-tial School	Self-Descrip-tive Question-naire II (Marsh, 1992c)	Academic Self-Concept Subscale	Academic self-concept increase in fall, and decrease in spring
Olszewski-Kubilius & Turner, 2002	U.S. 14-18 y.o. *N*=5,544	n/a	Participate in Talent Search Program	Intact Group	n/a	Separate Questions	n/a	Perceived academic success positively correlated with achievement

Author	Sample(s)	Comparison Group	Identification for High Ability	Research Design	Program	Instrument	Instrument Type	Results
Rinn, 2005	U.S. 18-22 y.o. *N*=294	Non-honors students with SAT score > 1300	School Identification	Intact Groups	Yes, Honors Program	Self-Descript-ive Question-naire III (Marsh, 1992c)	Academic Self-Concept Subscale	Honors Students higher academic self-concept than comparison group

Appendix B

International Baccalaureate Survey

Perceived Challenge and Academic Self-Concept Scale
Answer every question in this survey. Choose only one answer per question.

	strongly disagree	disagree	disagree some-what	neither agree nor disagree	agree some-what	agree	strongly agree
1. I often am confused by the content of my IB classes.	1	2	3	4	5	6	7
2. I need to try hard to be successful in my IB classes.	1	2	3	4	5	6	7
3. I am a good student.	1	2	3	4	5	6	7
4. It takes a lot of effort for me to be successful in my IB classes.	1	2	3	4	5	6	7
5. I will be successful in my IB classes in the future.	1	2	3	4	5	6	7
6. I often am confused while doing the out of class IB assignments.	1	2	3	4	5	6	7
7. It is difficult for me to complete the assignments for my IB classes.	1	2	3	4	5	6	7
8. I do well in school.	1	2	3	4	5	6	7
9. I struggle with completing the assignments for my IB classes.	1	2	3	4	5	6	7
10. Learning new things is easy for me.	1	2	3	4	5	6	7
11. I find it difficult to understand the assignments for my IB classes.	1	2	3	4	5	6	7
12. I am good at learning new things.	1	2	3	4	5	6	7
13. The work for my IB classes is overwhelming.	1	2	3	4	5	6	7
14. I learn things quickly.	1	2	3	4	5	6	7
15. I struggle with completing the out of class assignments for my IB classes.	1	2	3	4	5	6	7
16. I make good grades in school.	1	2	3	4	5	6	7
17. I often am confused by the content of the lectures in my IB classes.	1	2	3	4	5	6	7
18. I must work hard to be successful in my IB classes.	1	2	3	4	5	6	7
19. The level of effort for my IB classes is overwhelming.	1	2	3	4	5	6	7

Iowa-Netherlands Comparison Orientation Measure

Answer every question in this survey. Choose only one answer per question.

	strongly disagree	disagree	disagree some-what	neither agree nor disagree	agree some-what	agree	strongly agree
1. I often compare how my loved ones (boy or girl friend, family members, etc.) are doing with how others are doing.	1	2	3	4	5	6	7
2. I always pay a lot of attention to how I do things compared with how others do things.	1	2	3	4	5	6	7
3. If I want to find out how well I have done something, I compare what I have done with how others have done.	1	2	3	4	5	6	7
4. I often compare how I am doing socially (e.g., social skills, popularity) with other people.	1	2	3	4	5	6	7
5. I am not the type of person who compares themselves often with others.	1	2	3	4	5	6	7
6. I often compare myself with others with respect to what I have accomplished in life.	1	2	3	4	5	6	7
7. I often like to talk with others about mutual opinions and experiences.	1	2	3	4	5	6	7
8. I often try to find out what others think who face similar problems I face.	1	2	3	4	5	6	7
9. I always try to like to know what others in a similar situation would do.	1	2	3	4	5	6	7
10. If I want to learn more about something, I try to find out what others think about it.	1	2	3	4	5	6	7
11. I *never* consider my situation in life relative to other people.	1	2	3	4	5	6	7

From: Gibbons, F. X., & Buunk, B. P. (1999). Individual differences in social comparison: Development of a scale of social comparison orientation. *Journal of Personality and Social Psychology, 76,* 129-142.

What are your grades <u>since</u> beginning to take IB classes?

□ All As	□ More Bs than Cs
□ Mostly As	□ More Cs than Bs
□ More As than Bs	□ More Cs than Ds
□ More Bs than As	□ More Ds than Cs
□ Mostly Bs, some As and Cs	□ Mostly Ds and Fs

What are your grades <u>before</u> beginning to take IB classes?

□ All As	□ More Bs than Cs
□ Mostly As	□ More Cs than Bs
□ More As than Bs	□ More Cs than Ds
□ More Bs than As	□ More Ds than Cs
□ Mostly Bs, some As and Cs	□ Mostly Ds and Fs

Gender:	**SAT PSAT Score (please circle)**	**Classification:**
☐ Male ☐ Female	**Composite (Total): _____** **Writing: _____** **Critical Reading: _____** **Math: _____** *Substitute PSAT score, if you have not completed the SAT*	☐ Freshman ☐ Sophomore ☐ Junior ☐ Senior ☐ Other (please specify): _____

	much worse	worse	some-what worse	about the same	some-what better	better	much better
How has your academic achievement changed since beginning to take IB courses?	1	2	3	4	5	6	7

Please list the colleges and universities for which you are planning to apply when you graduate, if you are applying to less than 5, leave the remaining lines blank. Indicate *the most important* reason why you are applying to each school with a ONE check mark.								
	Highly Selective School or Prestige of School	Family Legacy	Availability of Scholarships	Availability of Specialized Programs	Close to Home	Likely to be Accepted	Friends or Social Activities	Religious Affiliation
1.								
2.								
3.								
4.								
5.								

Indicate the highest level of education you plan on pursuing.
□ High School Diploma/GED
□ Associates Degree (2 year degree)
□ Bachelors Degree (4 year degree)
□ Masters Degree (Advanced Graduate Degree)
□ Doctoral Level Degree (e.g., PhD, MD, etc)

Appendix C

Advanced Placement Survey

Perceived Challenge and Academic Self-Concept Scale

Answer every question in this survey. Choose only one answer per question.

	strongly disagree	disagree	disagree some-what	neither agree nor disagree	agree some-what	agree	strongly agree
1. I often am confused by the content of my AP classes.	1	2	3	4	5	6	7
2. I need to try hard to be successful in my AP classes.	1	2	3	4	5	6	7
3. I am a good student.	1	2	3	4	5	6	7
4. It takes a lot of effort for me to be successful in my AP classes.	1	2	3	4	5	6	7
5. I will be successful in my AP classes in the future.	1	2	3	4	5	6	7
6. I often am confused while doing the out of class AP assignments.	1	2	3	4	5	6	7
7. It is difficult for me to complete the assignments for my AP classes.	1	2	3	4	5	6	7
8. I do well in school.	1	2	3	4	5	6	7
9. I struggle with completing the assignments for my AP classes.	1	2	3	4	5	6	7
10. Learning new things is easy for me.	1	2	3	4	5	6	7
11. I find it difficult to understand the assignments for my AP classes.	1	2	3	4	5	6	7
12. I am good at learning new things.	1	2	3	4	5	6	7
13. The work for my AP classes is overwhelming.	1	2	3	4	5	6	7
14. I learn things quickly.	1	2	3	4	5	6	7
15. I struggle with completing the out of class assignments for my AP classes.	1	2	3	4	5	6	7
16. I make good grades in school.	1	2	3	4	5	6	7
17. I often am confused by the content of the lectures in my AP classes.	1	2	3	4	5	6	7
18. I must work hard to be successful in my AP classes.	1	2	3	4	5	6	7
19. The level of effort for my AP classes is overwhelming.	1	2	3	4	5	6	7

Iowa-Netherlands Comparison Orientation Measure

Answer every question in this survey. Choose only one answer per question.

	strongly disagree	disagree	disagree some-what	neither agree nor disagree	agree some-what	agree	strongly agree
1. I often compare how my loved ones (boy or girl friend, family members, etc.) are doing with how others are doing.	1	2	3	4	5	6	7
2. I always pay a lot of attention to how I do things compared with how others do things.	1	2	3	4	5	6	7
3. If I want to find out how well I have done something, I compare what I have done with how others have done.	1	2	3	4	5	6	7
4. I often compare how I am doing socially (e.g., social skills, popularity) with other people.	1	2	3	4	5	6	7
5. I am not the type of person who compares themselves often with others.	1	2	3	4	5	6	7
6. I often compare myself with others with respect to what I have accomplished in life.	1	2	3	4	5	6	7
7. I often like to talk with others about mutual opinions and experiences.	1	2	3	4	5	6	7
8. I often try to find out what others think who face similar problems I face.	1	2	3	4	5	6	7
9. I always try to like to know what others in a similar situation would do.	1	2	3	4	5	6	7
10. If I want to learn more about something, I try to find out what others think about it.	1	2	3	4	5	6	7
11. I *never* consider my situation in life relative to other people.	1	2	3	4	5	6	7

From: Gibbons, F. X., & Buunk, B. P. (1999). Individual differences in social comparison: Development of a scale of social comparison orientation. *Journal of Personality and Social Psychology, 76,* 129-142.

What are your grades <u>since</u> beginning to take AP classes?

□ All As	□ More Bs than Cs
□ Mostly As	□ More Cs than Bs
□ More As than Bs	□ More Cs than Ds
□ More Bs than As	□ More Ds than Cs
□ Mostly Bs, some As and Cs	□ Mostly Ds and Fs

What are your grades <u>before</u> beginning to take AP classes?

□ All As	□ More Bs than Cs
□ Mostly As	□ More Cs than Bs
□ More As than Bs	□ More Cs than Ds
□ More Bs than As	□ More Ds than Cs
□ Mostly Bs, some As and Cs	□ Mostly Ds and Fs

Gender:	**SAT PSAT Score (please circle)**	**Classification:**
☐ Male ☐ Female	**Composite (Total): _____** **Writing: _____** **Critical Reading: _____** **Math: _____** *Substitute PSAT score, if you have not completed the SAT*	☐ Freshman ☐ Sophomore ☐ Junior ☐ Senior ☐ Other (please specify): _____

	much worse	worse	some-what worse	about the same	some-what better	better	much better
How has your academic achievement changed since beginning to take AP courses?	1	2	3	4	5	6	7

Please list the colleges and universities for which you are planning to apply when you graduate, if you are applying to less than 5, leave the remaining lines blank. Indicate *the most important* reason why you are applying to each school with a ONE check mark.								
	Highly Selective School or Prestige of School	Family Legacy	Availability of Scholarships	Availability of Specialized Programs	Close to Home	Likely to be Accepted	Friends or Social Activities	Religious Affiliation
1.								
2.								
3.								
4.								
5.								

Indicate the highest level of education you plan on pursuing.
□ High School Diploma/GED
□ Associates Degree (2 year degree)
□ Bachelors Degree (4 year degree)
□ Masters Degree (Advanced Graduate Degree)
□ Doctoral Level Degree (e.g., PhD, MD, etc)

Appendix D

Residential School Survey

Perceived Challenge and Academic Self-Concept Scale

Answer every question in this survey. Choose only one answer per question.

	strongly disagree	disagree	disagree some-what	neither agree nor disagree	agree some-what	agree	strongly agree
1. I often am confused by the content of my classes.	1	2	3	4	5	6	7
2. I need to try hard to be successful in my classes.	1	2	3	4	5	6	7
3. I am a good student.	1	2	3	4	5	6	7
4. It takes a lot of effort for me to be successful in my classes.	1	2	3	4	5	6	7
5. I will be successful in my classes in the future.	1	2	3	4	5	6	7
6. I often am confused while doing the out of class assignments.	1	2	3	4	5	6	7
7. It is difficult for me to complete the assignments for my classes.	1	2	3	4	5	6	7
8. I do well in school.	1	2	3	4	5	6	7
9. I struggle with completing the assignments for my classes.	1	2	3	4	5	6	7
10. Learning new things is easy for me.	1	2	3	4	5	6	7
11. I find it difficult to understand the assignments for my classes.	1	2	3	4	5	6	7
12. I am good at learning new things.	1	2	3	4	5	6	7
13. The work for my classes is overwhelming.	1	2	3	4	5	6	7
14. I learn things quickly.	1	2	3	4	5	6	7
15. I struggle with completing the out of class assignments for my classes.	1	2	3	4	5	6	7
16. I make good grades in school.	1	2	3	4	5	6	7
17. I often am confused by the content of the lectures in my classes.	1	2	3	4	5	6	7
18. I must work hard to be successful in my classes.	1	2	3	4	5	6	7
19. The level of effort for my classes is overwhelming.	1	2	3	4	5	6	7

Iowa-Netherlands Comparison Orientation Measure

Answer every question in this survey. Choose only one answer per question.

	strongly disagree	disagree	disagree some-what	neither agree nor disagree	agree some-what	agree	strongly agree
1. I often compare how my loved ones (boy or girl friend, family members, etc.) are doing with how others are doing.	1	2	3	4	5	6	7
2. I always pay a lot of attention to how I do things compared with how others do things.	1	2	3	4	5	6	7
3. If I want to find out how well I have done something, I compare what I have done with how others have done.	1	2	3	4	5	6	7
4. I often compare how I am doing socially (e.g., social skills, popularity) with other people.	1	2	3	4	5	6	7
5. I am not the type of person who compares themselves often with others.	1	2	3	4	5	6	7
6. I often compare myself with others with respect to what I have accomplished in life.	1	2	3	4	5	6	7
7. I often like to talk with others about mutual opinions and experiences.	1	2	3	4	5	6	7
8. I often try to find out what others think who face similar problems I face.	1	2	3	4	5	6	7
9. I always try to like to know what others in a similar situation would do.	1	2	3	4	5	6	7
10. If I want to learn more about something, I try to find out what others think about it.	1	2	3	4	5	6	7
11. I *never* consider my situation in life relative to other people.	1	2	3	4	5	6	7

From: Gibbons, F. X., & Buunk, B. P. (1999). Individual differences in social comparison: Development of a scale of social comparison orientation. *Journal of Personality and Social Psychology, 76,* 129-142.

What are your grades <u>since</u> beginning (Residential school)?

□ All As	□ More Bs than Cs
□ Mostly As	□ More Cs than Bs
□ More As than Bs	□ More Cs than Ds
□ More Bs than As	□ More Ds than Cs
□ Mostly Bs, some As and Cs	□ Mostly Ds and Fs

What are your grades <u>before</u> beginning (Residential school)?

□ All As	□ More Bs than Cs
□ Mostly As	□ More Cs than Bs
□ More As than Bs	□ More Cs than Ds
□ More Bs than As	□ More Ds than Cs
□ Mostly Bs, some As and Cs	□ Mostly Ds and Fs

Gender:	**SAT PSAT Score (please circle)**	**Classification:**
☐ Male ☐ Female	**Composite (Total): _____** **Writing: _____** **Critical Reading: _____** **Math: _____** *Substitute PSAT score, if you have not completed the SAT*	☐ Freshman ☐ Sophomore ☐ Junior ☐ Senior ☐ Other (please specify): _____

	much worse	worse	some-what worse	about the same	some-what better	better	much better
How has your academic achievement changed since beginning (Residential school)?	1	2	3	4	5	6	7

Please list the colleges and universities for which you are planning to apply when you graduate, if you are applying to less than 5, leave the remaining lines blank. Indicate *the most important* reason why you are applying to each school with a ONE check mark.								
	Highly Selective School or Prestige of School	Family Legacy	Availability of Scholarships	Availability of Specialized Programs	Close to Home	Likely to be Accepted	Friends or Social Activities	Religious Affiliation
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Indicate the highest level of education you plan on pursuing.
□ High School Diploma/GED
□ Associates Degree (2 year degree)
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□ Masters Degree (Advanced Graduate Degree)
□ Doctoral Level Degree (e.g., PhD, MD, etc)