

Easing the Transition to High School: Effects of a Freshman Academy on Student Success

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Abstract

This research focuses on the effects of participating in a high school transition program on multiple educational outcomes for individual students. Prior studies present mixed findings on the effectiveness of ninth grade academies for student success, measured primarily in terms of standardized test scores. Our study takes an innovative approach, using an experimental design to examine the effects of the program during the pilot year of a high school's freshman academy. Other methodological innovations include: use of disaggregated student-level information; propensity score matching to control for non-random selection; analysis of multiple student outcomes; and a longitudinal design that tracks outcomes for individual students over time. Our findings indicate that the FA was successful in some but not all of its efforts to improve student outcomes. We find that the influence of Freshman Academy (FA) participation on test scores varied considerably by race and academic background, ranging from modest positive to modest negative effects for different sub-groups. One of the benefits associated with the Freshman Academy was a narrowing of standardized test score distributions and a reduction in the number of students at the lower end; one negative consequence was a reduction in the proportion of high-scoring students. We find a consistently positive influence of the Freshman Academy experience on educational outcomes related to school engagement: FA participants had fewer absences than their non-FA peers, were less likely to drop out of school, and were less likely to receive an out-of-school suspension. Furthermore, students who participated in the FA were more positively oriented toward preparing for and applying to college. Our findings of variation in the FA impact and its persistence throughout the high school years can inform policy decisions regarding the implementation of this type of ninth grade transition program as a means of enhancing opportunities for student success.

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1. Introduction

The ninth grade marks a critical transition point in the US education system with the students moving into high school, where they face a different instructional environment and more intense academic pressures. Students who struggle during the transition year may experience persistent academic and behavioral problems that may prevent them from completing high school. Issues surrounding the transition to high school are particularly salient in North Carolina, where school dropout is a topic of growing concern. One study estimated that only 67 percent of ninth graders in North Carolina graduate in four years (Cook, Fowler, & Harris, 2008). Even more alarming is the estimated national statistic that one third of the students who drop out of school will do so during the ninth grade (Editorial Projects in Education Research Center, 2006). Grade retention, perhaps the strongest predictor of school dropout, is particularly problematic—as many as 15 percent of ninth graders in North Carolina are not promoted to their sophomore year (Cook, Fowler, & Harris, 2008).

Some school districts across the country and in North Carolina are finding that the challenges of transitioning to high school are best addressed by creating ninth grade academies, following a model of a school-within-a-school. By incorporating some of the concepts often used to help middle school students make successful transitions, a Freshman Academy (FA) may provide a mechanism for giving ninth grade students the attention and additional guidance they need.

Although educators and researchers tend to support the concept of a transition program designed to specifically address ninth graders' needs, successful program implementation is hindered by a lack of strong and consistent evidence of its effectiveness for student outcomes. In the age of accountability, high school reform practices will only be implemented at a large scale if there are demonstrated, evidence-based effects on the outcomes they target. Our study contributes to the body of evidence on the effectiveness of one type of ninth grade transition program: the Freshman Academy. We use an experimental design to evaluate the impact of FA participation on multiple academic and non-academic outcomes, tracking students over time and across high school grades. The goal of the study is to provide evidence through rigorous analysis

that will isolate FA program effects to the extent possible, and thus contribute to understanding the potential of the FA for improving educational outcomes when implemented on a larger scale.

Our findings suggest that the influence of Freshman Academy (FA) varies considerably by student outcomes, as well as by race and academic background. The impact of the FA on test scores ranges from modest positive to modest negative effects for different sub-groups. One of the benefits associated with the Freshman Academy was a narrowing of EOC test score distributions and a reduction in the number of students at the lower end; one negative consequence was a reduction in the proportion of high-scoring students. We find a consistently positive influence of the Freshman Academy experience on educational outcomes related to school engagement: FA participants had fewer absences than their non-FA peers, were less likely to drop out of school, and were less likely to receive an out-of-school suspension. Furthermore, students who participated in the FA were more positively oriented toward preparing for and applying to college. Our findings of variation in the FA impact and its persistence throughout the high school years can inform policy decisions regarding the implementation of this type of ninth grade transition program as a means of enhancing opportunities for student success.

2. Challenges for Students Transitioning to High School

Academic Challenges

Since the passage of the No Child Left Behind Act in 2002, along with a pronounced increase in emphasis on end-of-course standardized test performance, there is an ever-widening gap in the expectations placed upon students moving from middle to high school levels, with new ninth graders facing more rigorous academic standards – but with less academic support – than in 8th grade. These higher performance standards, as well as the potential for academic declines associated with all types of school transitions, have led educators and researchers to suggest that “every high school reform initiative should include a focus on the middle to high school transition and successfully moving students through the ninth grade” (Cohen & Smerdon, 2009, p.177).

The academic consequences of a problematic transition to high school can be severe and wide-ranging across a number of outcomes. Several studies show decreasing Grade Point Averages (GPA) from grade 8 to grade 9 across race and gender categories (Seidman et al., 1996; Alspaugh, 1998; Barber & Olsen, 2004; Neild et al., 2008; Stryon and Peasant, 2010).

Langenkamp (2009) found evidence of an overall decline in GPA during the ninth grade, as well as variation in this decline by the student's race and parental education level. Of particular concern is the stronger negative impact of high school transition for students who have struggled prior to high school (Cohen & Smerdon, 2009).

In addition to academic declines during the ninth grade, research evidence points to long-term consequences such as an increased likelihood of being retained in grade or dropping out of high school (Seidman et al., 1996; Isakson & Jarvis, 1999; Cook et al., 2008; Cohen & Smerdon, 2009). Roderick (1993) notes that poor performance in the ninth grade may establish a "pattern of failure," leading to poor outcomes throughout high school. Recent research uses longitudinal student data from national studies to study the impact of the transition year for students entering high school with different pre-high school characteristics. Neild, Stoner-Eby, and Furstenberg (2008) analyze information from a sample of Philadelphia high school students, finding that course promotion and attendance in the ninth grade are predictive of graduation from high school among disadvantaged students. Weiss and Bearman (2007) evaluate differences in transition difficulties by grade configuration, suggesting that the academic decline in GPA during the ninth grade is a problem endemic to the transition to high school, independent of whether a student moves to a different school following the completion of eighth grade. Heck and Mahoe (2010) find that the impact of this early academic decline tends to persist across each grade level, with a significant impact on high school completion; they also present evidence of disparity in the outcomes of transition across diverse social categories.

Developmental and Social Challenges

Student achievement in ninth grade is influenced not only by increased academic standards, but also by social adjustment during the transition to high school. Some of the challenges to social adjustment reflect the life-course changes that coincide with the ninth grade year. This developmental stage of middle adolescence is marked by a shift in identity from the family to friends, and a lifestyle dictated less by parental influence and involvement and more by peers and social networks (Hess & Copeland, 1997; Schiller, 1999; Falbo, Lein, & Amador, 2001; Reents, 2002). This paradigm shift can lead the less confident, less self-aware students to make decisions based more on social acceptance than academic achievement. This change in decision criteria has several consequences for students, including the well-documented ninth

grade decline in academic performance and numerous negative non-academic outcomes. Weiss and Bearman (2007) provide evidence of changes in behavior, including increases in fighting, drinking, smoking, and delinquency during the transition to high school.

In addition to these developmental challenges, students transitioning to high school face changes in school and instructional organization. These changes include larger class sizes, teachers with decreased time or inclination for personal student relationships, an upheaval from being the oldest students in the school to being the youngest, and a lack of familiarity with social cues, surroundings, and support (Isakson & Jarvis, 1999; Weiss & Bearman, 2007; Neild, 2009). The resulting social and academic uncertainty can undermine a student's level of engagement with school by preventing social integration through bonds with teachers, social relationships, and extracurricular participation (Langenkamp, 2009). Lack of engagement may be manifested in negative behaviors and in high levels of absenteeism (Clark & Hunley, 2007).

Future Orientation and High School Success

High school freshmen may have a limited understanding of how performance in ninth grade can affect college admissions, or how the successful completion of high school and a subsequent post-secondary degree can dictate one's future. Many new high school students are focused on navigating the changes around them and do not take time to consider how decisions made in ninth grade can affect their personal, educational, and career goals (Kemple, Herlihy, & Smith, 2005). Efforts to enhance the high school student's future orientation require "mentoring, life skills, and information about why school and learning are important" (Dedmond, Brown, & LaFauci, 2006, p. 3). Making the connection between academic success in high school and life following graduation can be a strong motivator for students, particularly when they arrive at the understanding that a high school diploma is no longer sufficient for most entry-level jobs in our increasingly globalized economy (Shear et al., 2008; Cohen & Smerdon, 2009; Dedmond, 2009). Furthermore, they can be made aware that the lifetime income of high school dropouts and graduates is markedly lower than that of persons who pursue some post-secondary education (US Census Bureau, 2002).

3. Ninth Grade Transition Programs

More than ever, high school freshmen are facing intense academic pressures and sweeping structural changes as they move from one level to the next. Educators and researchers have sought programmatic avenues through transition programs for bridging the gap between middle and high school expectations and fostering more positive outcomes. Ninth grade transition programs vary widely across districts and schools; the term may refer to interventions ranging from a single-day orientation for incoming students to a full year comprehensive program with multiple organizational and curricular components (Styron & Peasant, 2010). In this study, we are concerned with a subset of the latter transition programs, which we refer to as “freshman academies” or FAs. These programs build from the concept of “small learning communities” for the ninth grade, or for sub-groups or teams of ninth graders, and are designed to incorporate organizational and curricular innovations that will contribute to a more supportive environment during the transition year. Some FA models are designed to serve primarily the subset of students who are at risk of academic failure (i.e., Ninth Grade Counts, Texas Ninth Grade Transition and Intervention Program); other programs target all ninth graders in a school (i.e., Talent Development Ninth Grade Success Academy). Drawing from these and other programs that were developed or adapted for individual districts or schools, the research literature highlights some of the following components of a successful ninth grade transition program (Kemple, Herlihy, & Smith, 2005; Hoogstra et al., 2011; Dedmond, 2006; Horwitz & Snipes, 2008; Styron & Peasant, 2010).

Structural Reforms:

One of the important structural reforms characterizing many FAs is the school-within-a-school organization. The separation of ninth graders from the rest of the student body may involve physical separation, such as separate wing or building; for many programs, the re-organization takes the form of a self-contained ninth grade academy that may include subgroups or teams of students and teachers. This organization allows students to form a sense of community with fellow classmates and teachers and also promotes communication between teachers, counselors, and parents.

Instructional Practices:

The school-within-a-school structure often involves team-teaching of core courses comprised exclusively of FA students. Teams of teachers also engage in professional development activities that are centered on ninth grade issues. Another important way to re-structure instruction is to institute block scheduling for all freshman courses. The block schedule creates extended class periods that can be used for cooperative learning activities and also makes possible a more intensive sequence of course-taking in core courses such as English and math for students who require remediation.

Curricular Changes:

Researchers recommend that FAs create a Freshman Transition Course with the combined goals of improving study skills, helping students understand the connection between high school success and future opportunities, increasing engagement with school and recognizing the level of effort needed to succeed, and providing a nurturing environment for students to develop bonds with teachers and peers. Another curricular change that is often instituted is a move away from tracking in ninth grade courses, such that all students receive an enriched curriculum in core courses during the ninth grade and are set on track for a college preparatory sequence of coursework.

Freshman Academies have only recently become more prominent as a mechanism for high school reform. Some of the larger-scale programs have been implemented in Philadelphia, Chicago, Portland, Texas, and Florida. According to a 2008 survey, North Carolina is an enthusiastic adopter of the FA concept, with a third of high schools incorporating some type of school-within-a-school transition strategy for ninth graders (Cook et al., 2008). Unlike other locations, however, there has not been a coordinated effort in North Carolina to design and implement programs that are comparable in their goals and outcomes. As is the case with high school reform efforts more generally, the policy and research communities face the difficult but essential question of whether the strategy is effective as a means for helping students improve their performance in school. The broad appeal of FAs in NC, and lack of research on their impact on student outcomes, suggested to us that there is a need for rigorous evaluation that can inform decisions to implement this type of high school reform effort state-wide.

4. Evaluations of Ninth Grade Transition Programs

The research literature presents mixed findings on the effectiveness of ninth grade academies for student success, measured most often by differences in test scores and grade promotion rates. A number of methodological factors may account for these inconsistent research findings; a review of previous studies of transition programs informs our research design in fundamental ways. Our study focuses on a single high school's FA pilot year, when a subset of incoming students was randomly assigned to a comprehensive Freshman Academy. Our analytic strategy is to identify causal links between participating in this high school transition program and a number of educational outcomes for individual students. Our goal is not only to find program effects, but also to possibly shed light on the processes through which the high school transition program influences student outcomes. This strategy includes: use of disaggregated student-level information; an experimental design; analysis of multiple student outcomes; and a longitudinal design that tracks outcomes for individual students over time. We highlight the value of each of these components in a brief review of prior studies that evaluate FA program effectiveness.

Several evaluation studies on FAs use a case study approach to examine differences in academic outcomes for students within a single school. In these studies, students self-select into the Academy; the research design to estimate effects of Academy participation includes a combination of pre- and post-tests and comparison to a non-equivalent group within the school (Connolly, 2001; VanMetre, 2009; Buhrman, 2010). Taken together, these studies suggest some positive influence of FA participation, but the evidence is inconsistent across schools and outcomes. Furthermore, this research design, with self-selection into treatment and lack of a comparable untreated group, is insufficient for one to draw conclusions about FA effectiveness. The focus on a single school and the small sample sizes are important threats to external validity of these findings.

Two types of quasi-experimental designs have been used to evaluate FA programs in various locations. The first compares outcomes for ninth grade students across schools, based on the presence or absence of a FA. Two studies that evaluate outcomes across schools in a single year find some advantages associated with the presence of a FA (Cook et al., 2008; Styron & Peasant, 2010). Neither, however, is able to consider the influence of a student's prior academic performance, which is widely acknowledged to be the strongest predictor of a student's success

in high school. Furthermore, this design does not address the potential influence of differences among schools that are related to both the presence of a FA and to student performance; such differences undermine the possibility of attributing school differences to the FA program. Zota (2009) employs a more rigorous design using state-wide panel data for North Carolina students and schools to identify the impact of the implementation of a FA in a school on student outcomes, finding no significant effects attributable to the FA. Though this study's difference-in-difference design addresses some problems of selection bias and controls for prior student characteristics, there is an important threat to the validity of the conclusions. These comparisons across schools rely on the assumption that the treatment, or design of the FA, is equivalent in each of the schools included in the comparison. Information on FAs in North Carolina is presented in a study by Cook et al. (2008) in which they collected data on the (school-reported) presence and characteristics of transition programs in each public high school. A review of the school-level descriptions in this database reveals tremendous variation across districts and schools in the target population (i.e., at-risk students vs. all ninth graders) and programmatic content of the reported Freshman Academies (i.e., only remedial support vs. comprehensive curriculum). The issue of program comparability as a threat to the validity of FA evaluation has been acknowledged and is the focus of in-depth implementation analysis in evaluations of large-scale ninth grade transition programs (Kemple et. al, 2005; Hoogstra et. al, 2011; Portland Schools Foundation, 2011).

A second type of quasi-experimental design, comparing students within and across schools who were not randomly assigned to a FA program, addresses the issue of selection bias by using propensity score matching to create an equivalent non-FA comparison student group (Kemple et. al, 2005; Hoogstra et. al, 2011; Portland Schools Foundation, 2011). Each of these studies finds modest effects of ninth grade transition programs that are implemented across schools or over time. In their recent evaluations of the Talent Development Model, Kemple et. al. (2005) use an interrupted time series design (differences between schools and within schools over time) to estimate FA program impact. The authors acknowledge that there are potential alternative explanations for the observed differences in student outcomes that indicate positive program effects. One threat to causal inference is variation associated with the process through which students and schools are recruited to the program or network (Kemple et al, 2005). Another issue in this design is the validity of the assumption that there are no other significant

changes in the treatment and control schools that would systematically affect their performance over time. However, most high schools experience multiple changes over time, including the introduction of other programmatic interventions and changes in policy that affect high school curricula and instructional practices. Both of these confounding factors have the potential to significantly affect key student outcomes.

Based on our review of the strengths and drawbacks of the varied approaches to evaluating student outcomes of the FA intervention, we elected to focus our study on the impact of participating in the pilot year of a comprehensive FA program in a single school. Our focus on one school, one year, and a small sample of students may be problematic in terms of external validity; however, we believe that these problems are counterbalanced by the potential for causal inference represented by our experimental design, whereby we evaluate the FA through a randomized control trial. This design allows our study to establish a causal relationship between FA participation and student outcomes, avoiding potential sources of bias from self-selection into the treatment group and controlling for pre-treatment characteristics. By limiting the analysis to a single school and a single year of implementation, we avoid additional problems that plague the cited quasi-experimental studies: substantial differences in program implementation across schools and competing interventions and changing policies that confound the effects of the FA on student outcomes.

We employ a longitudinal design to evaluate long-term effects of the FA, measuring individual student outcomes in ninth grade and in each subsequent high school year. This approach allows us to directly measure the impact of this program on the issues that initiated the creation of FAs as a high school reform program: academic performance, engagement in school, and future orientation. The longitudinal student-level database allows us to go beyond the outcomes most frequently assessed in evaluation studies – GPA and test scores. In this study, we include in our analyses a number of other outcomes that are related to academic success, including: grade promotion, suspensions, enrollment in advanced courses, absenteeism, high school dropout, and college plans. We thus are able to determine whether any advantages resulting from experiencing the treatment persist during the post-treatment high school years. Unlike studies that compare students from different schools, we have no reason to believe that our control and treatment groups would be differentially affected by within-school trends in key outcomes.

Our study is by design limited in its external validity – the focus on a single school and the small sample size limit the generalizability of the findings to large-scale programs or different student populations. The strength of the study is in the internal validity of our findings on program effects. More specifically, our experimental design allows us to minimize the selection biases that plague matched-sample comparisons. In addition, we believe the problems with the external validity of our study are somewhat mitigated by the characteristics of the study school, which has a large student population that is diverse racially, ethnically, socio-economically, and by levels of prior academic performance. The FA at this school targets all ninth grade students and is comprehensive in its programmatic approach. It is our goal to contribute to the research literature a rigorous analysis that will isolate FA program effects to a greater extent than is possible in most evaluation studies. Our findings can help to inform decisions on the implementation of FAs based on their potential impact on indicators of student success in high school.

5. Evaluating the Freshman Academy at Westside High School

During the 2004-2005 school year, the high school that we refer to as “Westside High School” (name changed for confidentiality) implemented a pilot Freshman Academy program that included a third of the incoming ninth grade class. Westside High School (WHS) is a standard 9-12 secondary school in a mid-size city with a population of 1,746 students. In 2004-05, WHS was designated as a School of Progress, meeting expected growth, and meeting 15 out of 19 Adequate Yearly Progress (AYP) targets. More information on the school and district is available in Table 1.

In 2004, Westside was in good standing in terms of accountability ratings and scored above the district average in most academic performance measures, including graduation rates. However, end-of-year test scores for some courses taken in the ninth grade lagged behind the district average and grade retention was a concern for the school’s administration. A group of teachers and guidance counselors took the lead on a plan to design a freshman transition program that would use a comprehensive approach, such as that of the Talent Development Model, with the programmatic components selected on the basis of Westside’s specific needs. The program was designed to provide academic and social support to all ninth graders, as well as to promote career and college planning during the freshman year.

During the 2004-2005 pilot year of the program, students were randomly assigned to participate in the Freshman Academy; participants were then randomly assigned to a “team” consisting of a counselor and four teachers in core subjects. The pilot program contained many elements of successful high school transition programs that target specific needs of ninth graders; some components of the academy have been further developed in subsequent years of implementation. One core element was the requirement that students enroll in a Freshman Focus course with a curriculum designed by the WHS Freshman Academy teachers to: a) develop academic and life skills, character, and citizenship and b) encourage self-evaluation and foster civic engagement. Other elements of the Freshman Academy program included the following:

Structural Change/Shift to Small Learning Communities: The portion of the ninth grade class assigned to the FA was divided into “teams” of students sharing a counselor and teachers for core subjects.

Curricular/Instructional Practices for Academic Support:

- Workshops and tutoring specifically for ninth graders,
- Core courses taught at “honors” level for all ninth graders,
- All homework submitted at the start of the school day,
- Mandatory study hall for students not completing the home or classwork, and
- Shared planning period for academy teachers.

Curricular/Instructional Practices for Social Support:

- Structured orientation for incoming students,
- Frequent progress reports and regular communication with parents,
- Academy parent nights to familiarize parents with Academy staff, expectations, and policies, and
- Team incentive events and service activities.

Promoting Future Orientation:

- “Freshman Focus” class stressing study skills, character, civic engagement, and preparing for college,
- Campus tours of local universities for all Academy ninth graders, and
- Career development focus.

6. Data and Sample

This research relies primarily on data from the North Carolina Education Research Data Center (NCERDC) at Duke University, which houses information on all students, teachers, and schools in North Carolina public schools from the 1995-96 school year to the present. The longitudinal nature of the data allows researchers to create data files with information for the entire high school experience of a student cohort. With permission from administrators at the school and the school district, we were able to identify students participating in the WHS Freshman Academy during the pilot year of this program and use NCERDC data to track the students’ outcomes over time.

Assignment to Treatment

The Freshman Academy pilot at WHS was designed to include a subset of incoming students selected at random from the population of eligible rising ninth graders enrolling at WHS in the fall of 2004. The guidance office at WHS provided the researchers with a list of all ninth grade students enrolled at the school in fall 2004, flagging those students who participated in the Freshman Academy. These students were then matched to administrative records from the North Carolina Department of Public Instruction by the NCERDC. All but 18 of the 528 students in the WHS list were matched to the NCERDC database.

Not all students who were enrolled in ninth grade were eligible for random selection into the Freshman Academy. Students were excluded from the FA lottery on several conditions: repeating ninth grade; severe exceptionalty; current limited English proficiency; or having failed the grade 8 End of Grade Reading exam. In defining the control sample, we excluded all students meeting these exclusion criteria. Because eligibility for the FA was limited to students

who were in public school in grade 8 in 2003-04 and passed the state reading exam, students who did not take the standardized NC eighth grade EOG in 2004 were excluded from the control group. The 78 students removed from the sample in this stage included students who were retained in ninth grade and later joined the 2004-05 freshman class as repeaters, as well as students entering the public school system from out of state, private schools, or home schools (who did not take the 8th grade EOG exams). Students classified as behaviorally-emotionally handicapped, educable mentally handicapped, severely mentally disabled, or autistic; those noted as currently limited English proficient in 8th grade; and those with End of Grade Reading achievement levels of 1 or 2 were not eligible for selection and were therefore removed from the control sample (N=142). The resulting sample included 278 students who were eligible to enter the Freshman Academy. Of these, 91 participated in the FA and the remaining 187 comprised the initial control group.

Adjusting for non-random selection

After excluding students meeting any of the above criteria, we used t-tests to compare the FA and control groups. With “true” random selection into the FA, we should not see systematic variation across the two groups. However, a comparison of the groups indicated significant differences in several characteristics that may be related to subsequent educational outcomes. As presented in Table 2, there are significant mean differences between the initial or “full” control group and the FA group on race composition, parental education, free and reduced price lunch eligibility, and AIG status.

Although we cannot be certain of the reasons for the differences between the treatment and control groups, we hypothesize that there may have been some post-hoc adjustments to the FA group. We believe, based on a review of student characteristics in the school across several years, that WHS teachers’ and counselors’ assessments of exceptionality and English Learner status for some students may have differed from the classifications available in administrative data. Another possible source of bias would arise if parents were able to negotiate FA status by submitting a request to the school. However, WHS guidance counselors indicated to us that only two students were re-assigned by parental request (removed from the FA). Another factor that would affect the selection process is the strictness with which the exclusion criteria were applied. In our analysis of this issue we noted that two students included in the FA had failed the 8th grade

reading exam and thus should not have been eligible for the FA lottery. Their inclusion indicates that there was a small degree of flexibility in this criterion that possibly influenced initial FA assignment.

Although we found occasional rather than systematic selection issues, these are of concern because of the relevance of the characteristics on which treatment and control groups differ, to our outcome measures. Thus, we took steps to correct for potential selection biases by adjusting the control group's composition using propensity scores to represent the likelihood of inclusion based on multiple predictive factors. The first step in this process was to estimate a logistic regression model predicting each student's likelihood of participating in the FA. To determine the proper specification, a series of regressions were used to identify variables impacting selection into the FA. Results from these analyses show that gender, race/ethnicity, free lunch status, parent education, 8th grade math achievement, and academically gifted status are all significant predictors of FA selection, despite the school's attempt at random selection. These variables were then included in a single model predicting FA participation where:

$$\text{FA selection} = \beta_0 + \beta_1(\text{sex}) + \beta_2(\text{race}) + \beta_3(\text{free lunch}) + \beta_4(\text{parent education}) + \beta_5(8\text{th grade math}) + \beta_6(\text{AIG}) + \varepsilon.$$

As shown in Table 2, white students, high performing students (achievement score of 3 or 4 on 8th grade math exam; designated as academically gifted), and students with higher SES (non-free lunch eligible; college-educated parent) were more likely to be placed into the Freshman Academy. These logistic regression estimates were then used to create a propensity score for each student indicating the likelihood of participating in the FA based on these characteristics (Wilde & Holler, 2007). To balance the sample, students with the highest propensity scores were selected, creating a control group composed of students most similar to those selected into the FA. Multiple propensity scale cut scores were tested in trimming the sample and the most balanced control group was generated using all students with p-scores above -0.2. As presented in Table 3, the balanced control group is not significantly different from the FA group in the mean levels of these important student background characteristics.

Table 4 provides comparisons between the trimmed control group (henceforth referred to simply as the control group) and the FA group on each of the outcome variables examined in our preliminary analyses. The two groups were then compared on a number of outcomes, both in the

ninth grade (English 1, algebra 1, and biology scores; number of days absent; and grade promotion) and beyond (suspension, advanced course taking, grade point average, dropout, and college plans). T-tests for each outcome indicate the statistical significance of differences in treatment vs. control group means for the entire sample. In cases of unequal variances, an approximate t statistic is calculated and Satterthwaite's approximate for degrees of freedom is used to determine significance.¹ To test the hypothesis that the FA may have different effects on different groups of students, the tests were run separately for each of four subgroups: Black students, white students, students performing above the sample mean on the 8th grade end of grade exam, and students performing below the sample mean².

7. Findings

Ninth grade outcomes

Nearly all students take the English 1 course in ninth grade, with 99 percent of students taking the corresponding End of Course exam at the end of the year. Overall, we found no significant difference in test performance between FA and control students. However, though not reaching statistical significance, the subgroup analyses show that FA students who had scored below the mean on the 8th grade end of course reading exam outperformed non-FA students with similar scores in the previous year (Figure 1)³.

Though there were no mean differences between the FA and control students, the distribution of scores looks notably different for each group. Specifically, the FA group has fewer very low-performing or very high-performing students and a higher percentage of average scores than the non-FA sample (Figure 2).

In contrast to English 1, students may take algebra 1 and biology at different points throughout their high school careers – and advanced students may even take algebra 1 in middle school. However, ninth grade is the most common year in which to take the course, with 42

¹ SAS Institute Inc., SAS OnlineDoc, Version 8, Cary, NC: SAS Institute Inc., 2000.

² In addition to t-tests, we used numerous OLS, logistic, and probit regressions to examine the effect of FA participation while controlling for a wide variety of factors. Large standard errors and the small sample size yielded statistically insignificant results and poor model fit. Because factors shown to have the most impact on our outcome measures were accounted for in the propensity score model, there is little added benefit to these methods; however regression results are available upon request.

³ The sample trimming process controlled for much of the variation across groups, and substantially lowered the sample size. Taking this into consideration, for some outcomes/groups we discuss differences that are of interest but do not reach our standard level of statistical significance.

percent of the non-FA and 49 percent of the FA students taking the end of course exam for Algebra 1 at the conclusion of freshman year.⁴ Among those students, FA students who had performed below the sample mean in 8th grade math performed significantly better on the Algebra I EOC than did their counterparts in the control group (Figure 3). Similar to English 1, the distribution of the algebra scores shows fewer very low or very high scores among FA participants (Figure 4).

As part of the FA program, participants were encouraged to take biology, whereas many non-FA students do not enroll in this class until their sophomore year. As a result, 82 percent of FA students took the biology exam at the end of ninth grade. In contrast, only 59 percent of non-FA students took the biology end of course exam as freshmen. We did not find any significant differences in biology scores, though non-FA students scored higher overall and in all subgroups (Figure 5).

On average, FA students had slightly better attendance records than their counterparts. Black FA students had significantly fewer days absent, missing only 3 days while black students in the control group missed nearly 6 days of school (Figure 6).

Despite slightly lower end of course exam scores, a higher proportion of FA students were promoted to grade 10 than of the control group. Most notably, the promotion rate was 14 percent higher for lower performing FA students (those who had scored below sample average on the 8th grade reading exam) and 15 percent higher for black FA students when compared to the control group (Figure 9).

Post-ninth grade outcomes

To examine later effects of FA participation, we used student outcome data through 2007-08 to assess academic performance and behavior. For these analyses, we encounter the challenge of and decreased sample sizes in the upper grades, due to students dropping out of school and to grade retention. Thus, the outcomes measured in the 12th grade are based on a much smaller sample (Table 4). For outcomes measured through the 11th grade, we find that the FA had a lasting impact on students remaining at Westside High two years after the FA pilot. FA students were significantly less likely to be suspended from school, with a suspension rate

⁴ 30% of non-FA students and 22% of FA students completed Algebra 1 in middle school.

four times lower than that of their non-FA peers (Figure 7). Among students who had scored below average on the 8th grade reading exam, the suspension rate of non-FA students was 13 percentage points higher than the rate among students who had participated in the FA.

The equal rates of Algebra 1 completion by the end of ninth grade foreshadow parity in math course-taking patterns throughout high school, and we see no FA-related overall differences in the percentage of students taking at least one advanced math course by the end of 2006-07 (Figure 9). However, there are discernable differences between groups of students based on academic performance prior to the ninth grade. Observed longitudinally, though high performing and white students who participated in the FA are slightly less likely to enroll in advanced math by their junior year, the program seems to improve the trajectory of low performing and black students. At the end of 2006-07, one-third of low performing FA students had taken an advanced math course, compared to only one-fifth of control students.

Among students who remained on-track and entered grade 12 in 2007-08, we see no significant differences in weighted or unweighted GPA (Figures 10). With the exception of the low-performing group, subgroup tests show that FA students have slightly lower grade point averages at the end of their high school careers. As with the end of course scores discussed earlier, FA participation seems to compress the range of scores such that few FA participants have very low or very high GPAs and a greater percentage have average scores (Figure 11).

To gauge the rigor of students' schedules, we created an indicator by subtracting the unweighted GPA from the weighted GPA. The weighted score is a 6-point scale which gives a higher value to advanced placement courses, while the unweighted score is the standard 4-point grading scale. If a student took many advanced courses, he or she would have several opportunities to score above 4.0 and we would see a larger difference between the two scores than would be possible for a student taking only standard courses. Thus the difference between the two scores can be considered a proxy for course-load difficulty. Of students scoring below the mean in grade 8, those who participated in the FA had significantly higher course challenge scores than similarly performing students who were not in the FA (Figure 12).

We also find that FA students are more likely to complete high school (Figure 8). Though just shy of statistical significance, the dropout rate for the control group was notably higher than that of the FA group. This difference was even greater among lower performing students, with a dropout rate of only 3 percent among FA students versus 12 percent of students

in the control group. Among high-achieving students and among black students, none of the students who attended the FA as ninth graders dropped out of school.

At the end of the senior year, students are asked about their plans following graduation. As shown in Figure 9, FA students are slightly more likely to state intentions to enroll at a four-year college than control students. However, this difference is large among low performing students: Nearly 78 percent of FA seniors who had scored below average on the 8th grade EOG reading test stated plans to attend a four-year college, versus 61 percent of control students. Though only reaching near significance, this finding is particularly notable given the lower denominator in the control group due to grade retention and dropout.

8. Conclusions and Recommendations

This study, using longitudinal data, student-level information, and multiple outcomes, contributes to the literature in several ways and should be useful in informing policy decisions regarding the implementation of Freshman Academies similar to the WHS model in other secondary schools. First, in contrast to research that evaluates transition programs by comparing students across schools, our approach – tracking student outcomes over time in a single large high school – avoids a challenge to validity that characterizes these comparisons: the substantial variation among schools in program content. Second, our ability to use an experimental design allows us to minimize selection bias and isolate the effects of the FA treatment to a greater extent than is possible with matched-comparison designs. Third, the study provides a potentially informative demonstration of how to address the challenge of non-random selection in a “less than perfect” experimental design, an issue that often arises when researchers must use study samples that they have not themselves selected for evaluating programmatic impacts in educational settings. Finally, by using longitudinal student data, we are able to examine both the single year and the more long-term effects of the FA experience. We hope that our study demonstrates the feasibility and potential value of using longitudinal administrative data to evaluate the impact of school-wide high school reforms on a wide range of students’ academic and behavioral outcomes.

Our findings indicate considerable variation in the effects of the FA across academic and behavioral outcomes, as well as for different groups of students. The influence of FA participation on test scores in the ninth grade varies considerably by race and academic

background, ranging from significant positive effects to significant negative effects for different sub-groups. The groups who seem to benefit from the FA are students who entered high school with a low level of prior academic performance; in terms of standardized test scores, students at low academic risk experienced no or, for some outcomes, slightly negative consequences of the FA experience. We note that the FA is associated with a narrowing of test score distributions – a reduction in the number of students at both the lower and upper ends. The positive FA effects at the lower end of the test score distributions are reflected in a higher rate of promotion to tenth grade among FA students. While less grade retention and fewer low-scoring students are clearly consistent with program goals, a decline in the proportion of high scorers is a worrisome unintended consequence. Concerns about this outcome led the FA leadership at Westside to reinstate some curricular tracking in the ninth grade after the pilot year, such that students with stronger academic backgrounds would have access to honors core courses. The pattern of effects on strictly academic outcomes suggests that FA programs may benefit from a design that customizes the type of transition support provided to different groups of students. Programs that include all ninth graders must address needs for remediation as well as for enriched curricula; attempting to serve all students with the same coursework may be counterproductive for higher achieving students and dilute the effects for students who enter high school with a weaker academic background.

We find a consistently beneficial influence of the FA experience on educational outcomes related to school engagement. FA participants had significantly fewer absences than their non-FA peers, were less likely to be suspended, and were less likely to drop out of school. These outcomes signal the enduring benefits of the program components addressing the social and developmental challenges associated with the transition to high school for many students. Participating in the FA also may have beneficial influences on students' future orientation, as manifested in the increases in stated plans to apply to college. This influence appears strongest for students who enter high school at a low performance level – that is, the group that is least likely to consider attending college. We found that this same group of students was more likely to enroll in challenging courses throughout high school if they participated in the FA during their ninth grade year. These demonstrated benefits of the FA model for disadvantaged students suggest that if implemented on a large scale, the program can contribute to better preparing these students to embark on more successful educational and career trajectories.

We have noted the limitations of our research design – with a focus on a small number of students in a single school, we cannot claim to generalize our findings to high schools that are very different from the study school. However, we hope that our findings on the impact of FA participation and the patterns of effects for sub-groups of students, will provide decision-makers with evidence of the value of a transition program and how its design may be customized to help students of all backgrounds succeed in high school.

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Table 1: School and District Descriptive Statistics

| | School | District |
|---|--------|----------|
| School size | 1,746 | 1,330 |
| <i>Demographics</i> | | |
| Free/reduced price lunch eligible | 19 | n/a |
| Asian | 5 | 2 |
| Black | 22 | 59 |
| Hispanic | 9 | 12 |
| White | 53 | 27 |
| <i>Academics</i> | | |
| Performing at or above grade level | 71 | |
| At or above grade level – English 1 | 83 | 76 |
| At or above grade level – Algebra 1 | 60 | 66 |
| Enrolled in Career/Technical Courses | 9 | 11 |
| Enrolled in Advanced Placement Courses | 8 | 4 |
| <i>Teachers</i> | | |
| New teachers (0-3 years) | 23 | 25 |
| Veteran teachers (11+ years) | 45 | 47 |
| Advanced degree | 41 | 34 |
| One-year turnover rate | 12 | 18 |
| <i>Behavior</i> | | |
| Short term suspensions (N per 100 students) | 18 | 23 |
| Attendance | 96 | 94 |

Table 2: Logistic Regression results for FA enrollment

| | Coefficient | SE |
|--------------------------|-------------|--------|
| Intercept | -1.0002 | 0.6050 |
| Female | -0.9426*** | 0.2832 |
| White | 0.7636 | 0.5218 |
| Hispanic | -0.3840 | 0.7834 |
| Black | -0.0238 | 0.5610 |
| Free/Reduced Price Lunch | 0.0183 | 0.3886 |
| College-educated Parent | 0.6153# | 0.3292 |
| Low Score on EOG 8 Math | -0.3708 | 0.3669 |
| Academically Gifted | 0.8638** | 0.3278 |

N = 278

Table 3: Means of control variables by FA status, full and trimmed samples

| Grade 8 Variables | FA | Non - FA | |
|---------------------------------|-----------|-----------------|----------------|
| | | Full | Trimmed |
| Female | 0.385 | 0.558 | 0.411 |
| Black | 0.297 | 0.447** | 0.327 |
| Hispanic | 0.044 | 0.131 | 0.009 |
| Other Race | 0.066 | 0.090 | 0.084 |
| White | 0.593 | 0.332*** | 0.579 |
| Free/Reduced Price Lunch | 0.165 | 0.307* | 0.178 |
| EOG 8 Reading Score | 268.3 | 267.3 | 269.8 |
| EOG 8 Math Score | 275.2 | 274.5 | 276.6 |
| Academically Gifted Math | 0.121 | 0.050* | 0.093 |
| Any Learning Disability | 0.011 | 0.015 | 0.001 |
| Parent Graduated College | 0.681 | 0.462** | 0.626 |
| Ever Limited English Proficient | 0.022 | 0.005 | 0.009 |
| N | 91 | 187 | 107 |

Significance of mean differences between control and treatment groups are noted.

*# <.10, * <.05, ** <.01, *** <.001*

Table 4: T-test of mean differences by FA status

| Outcome Variables | N | Not FA | FA | |
|---------------------------------|----------|---------------|-------------|----|
| English 1 Scale Score | 220 | 62.88 | 61.51 | |
| Algebra 1 Scale Score | 159 | 66.58 | 64.30 | |
| Biology Scale Score | 158 | 64.01 | 60.77 | ** |
| Geometry Score | 56 | 67.65 | 65.04 | |
| Promotion to grade 10 | 216 | 0.86 | 0.90 | |
| Dropout | 225 | 0.07 | 0.02 | # |
| Days Absent | 223 | 5.37 | 5.15 | |
| GPA – Unweighted | 166 | 2.98 | 2.85 | |
| GPA - Weighted | 166 | 3.57 | 3.44 | |
| Class Rank | 164 | 133 | 144 | |
| Advanced Math Course Enrollment | 214 | 0.57 | 0.66 | |
| Plans to attend 4 year college | 168 | .80 | .86 | |
| Suspended at least once in 2007 | 225 | 0.10 | 0.03 | * |

Note: Significantly fewer students appear in the grade 12 GPA data.

Figure 1: English 1 Scores

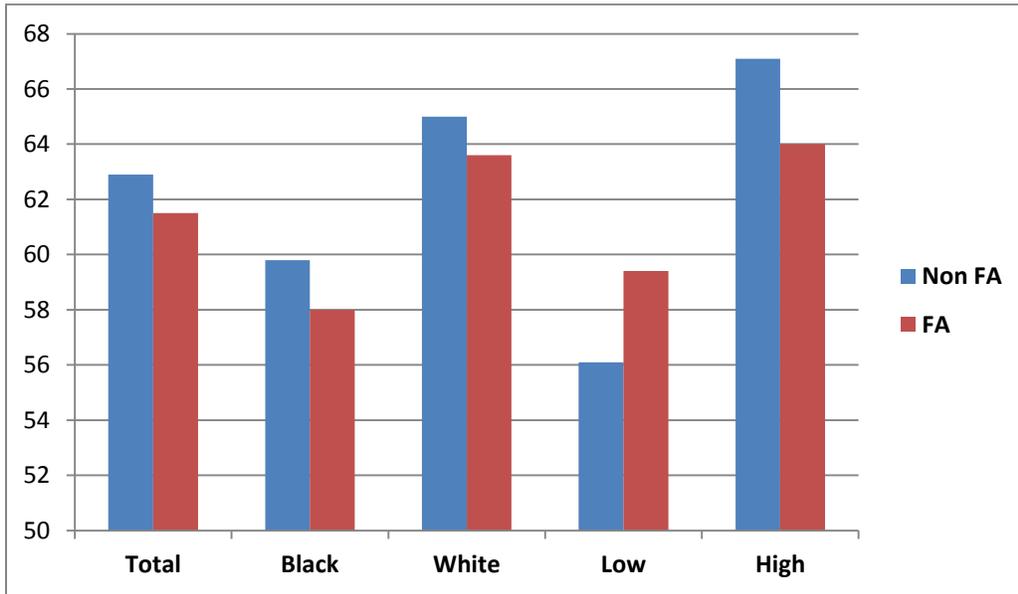


Figure 2: English 1 Score Distribution

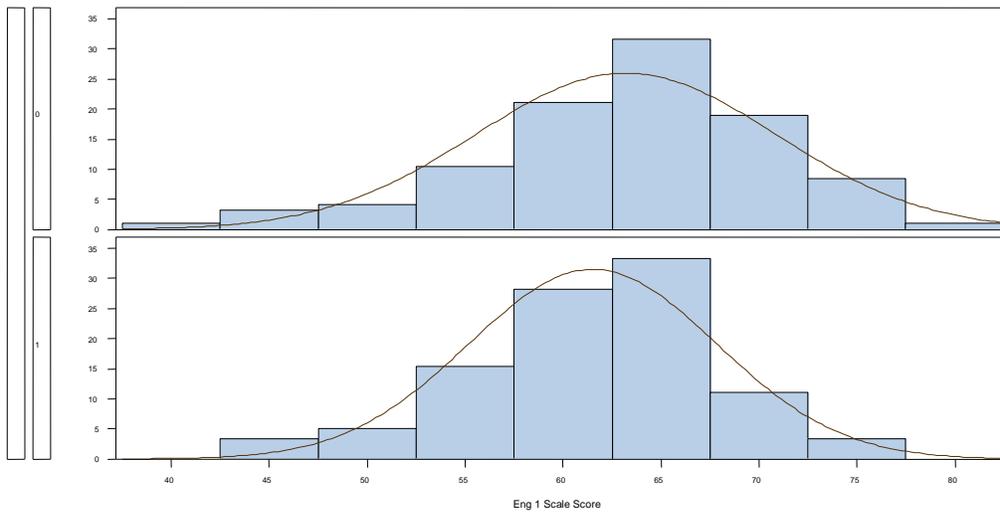
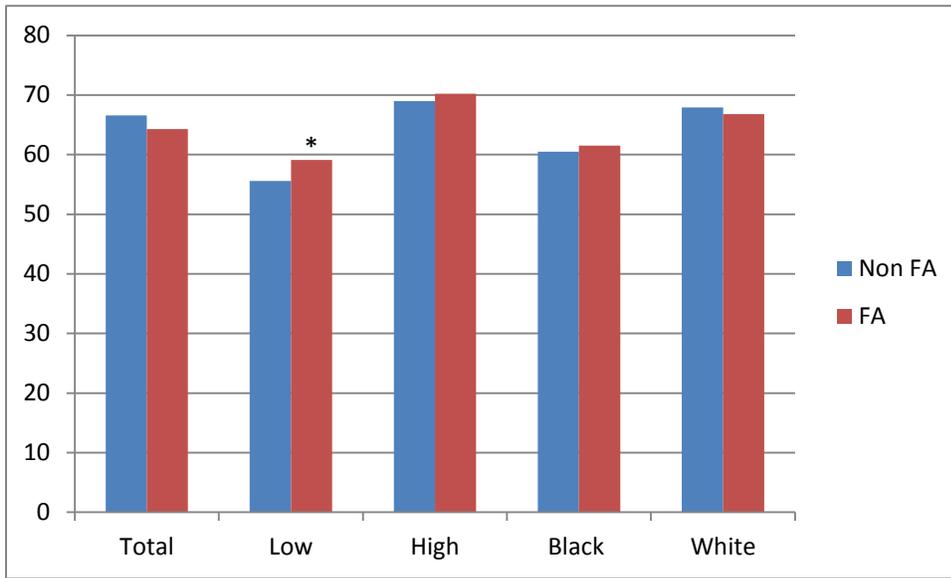


Figure 3: Algebra 1 Scores



Significance Level: * <.05

Figure 4: Algebra 1 Score Distribution

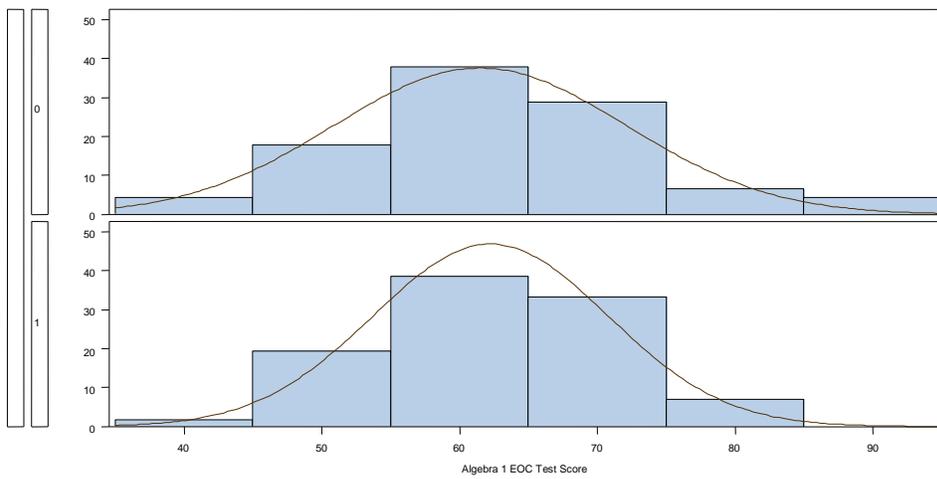


Figure 5: Biology Scores

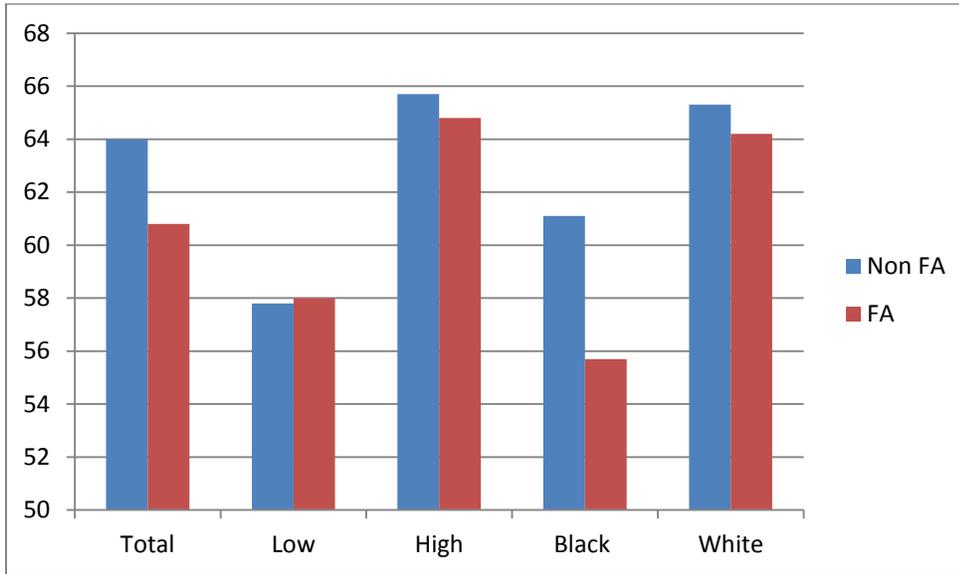
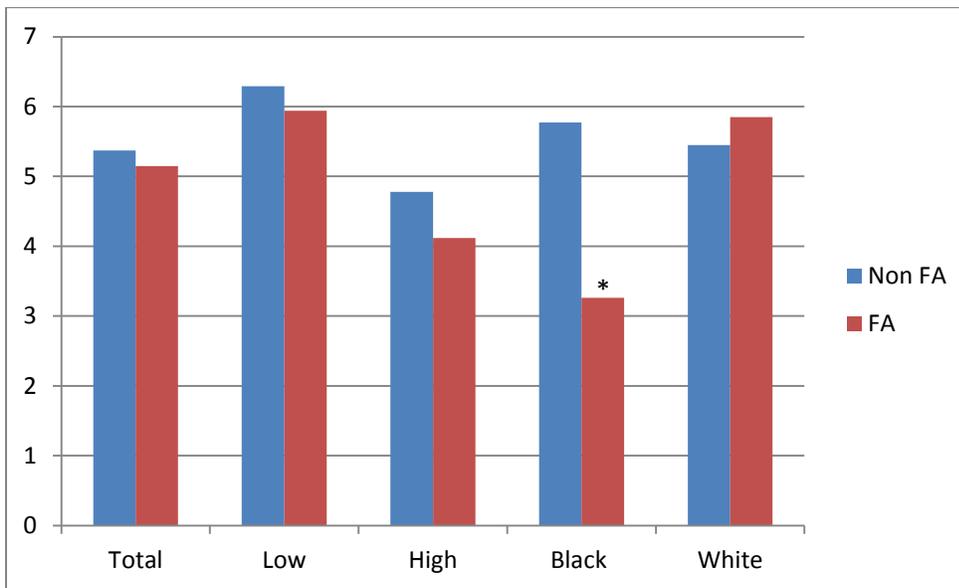
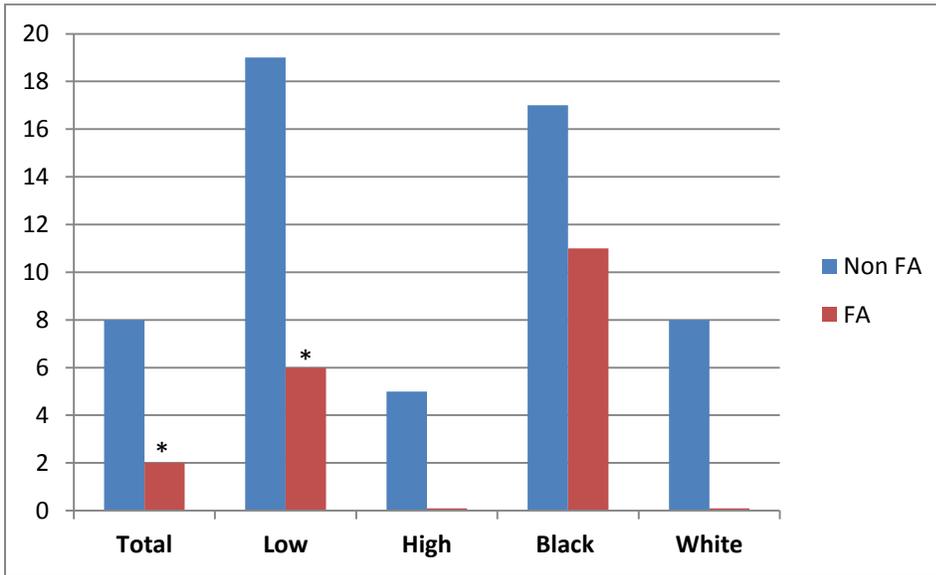


Figure 6: Days Absent



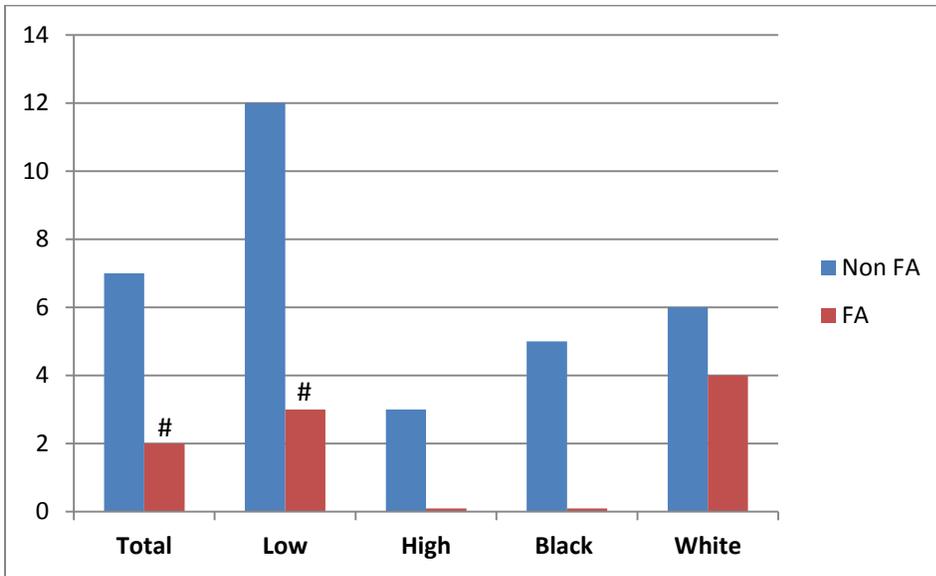
Significance Level: * <.05

Figure 7: Suspension Percentages – FA vs. Non FA



Significance Level: * <.05

Figure 8: Dropout Percentages – FA vs. Non FA



Significance Level: # <.10

Figure 9: Percent Difference of FA vs. Non FA

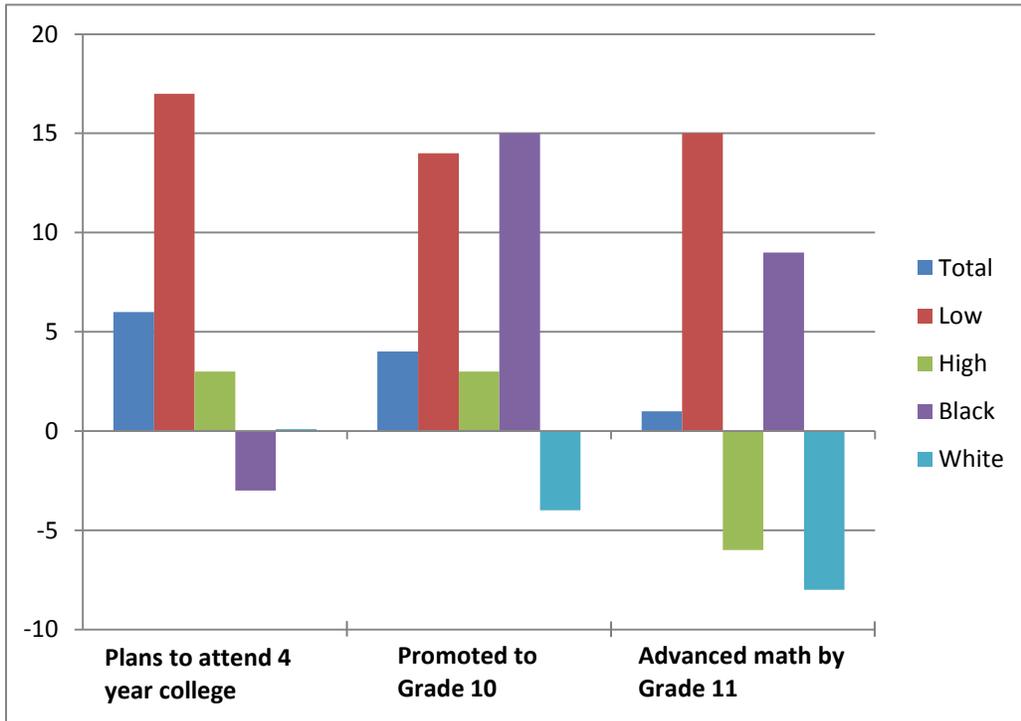


Figure 10: GPAs – FA & Non FA

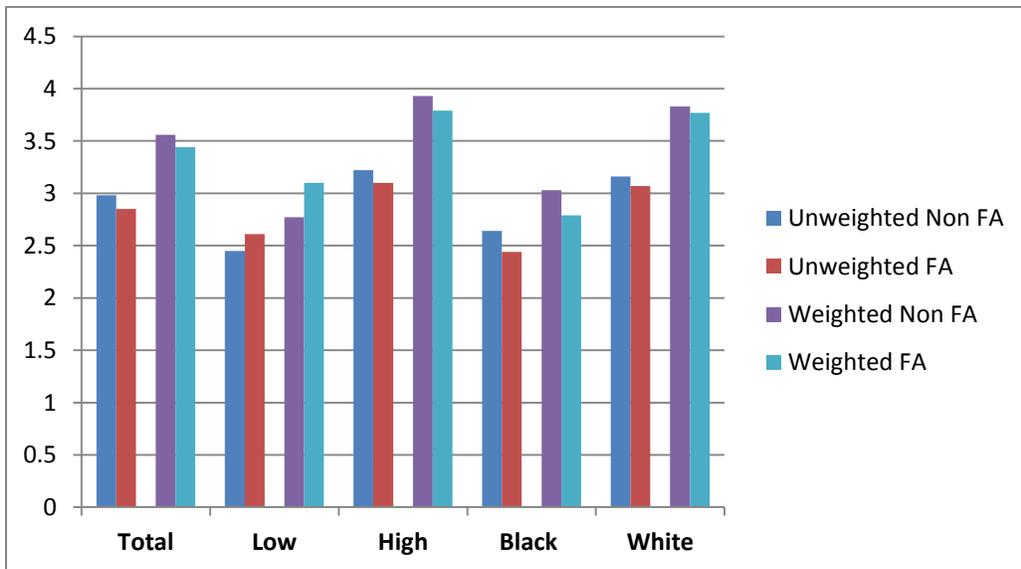


Figure 11: GPA Distribution

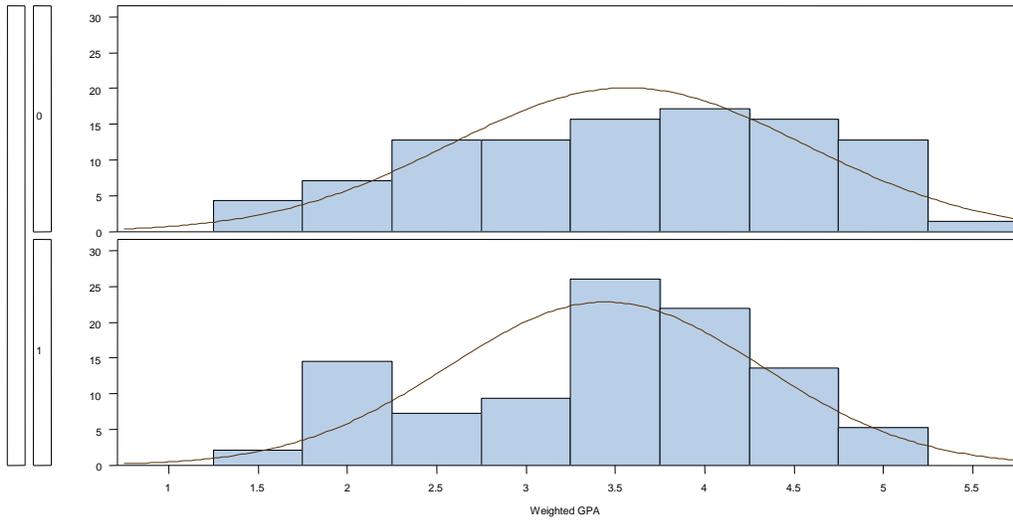
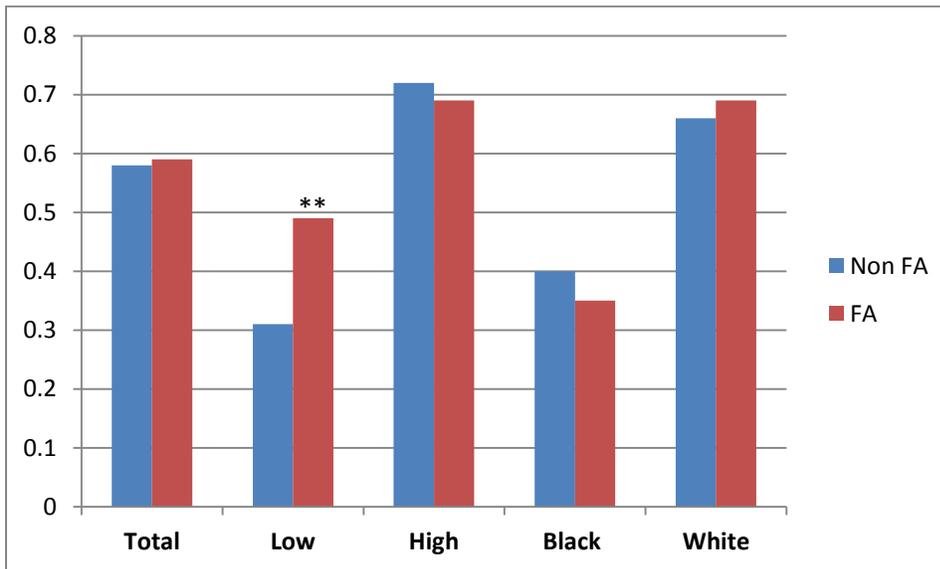


Figure 12: Challenge Score



Significance Level: ** < .01