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Independent school entrance testing as a predictor of student academic success

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INDEPENDENT SCHOOL ENTRANCE TESTING AS A PREDICTOR OF STUDENT ACADEMIC SUCCESS

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DEDICATION

I dedicate this to my incredibly supportive husband Dana, and my two amazing daughters, Sarah and Sydney.

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Thank you to my family for your love and support.

Dr. Ronald Stephens, thank you for your prolonged support and encouragement, especially in the final sprint to the finish line.

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ABSTRACT

Much research has been done on the correlations between SAT and ACT scores and student performance in college. However, research into independent school practices reveals little has been done at this level. The test many independent schools use is the ISEE (Independent School Entrance Exam). To date, no local or national research has been done on the correlation of ISEE scores and student performance. The purpose of this study was to analyze the school's historical entrance test scores and conduct research to determine how well they correlate with students' success at the school, specifically with freshmen end of year weighted GPA.

Data were gathered for all current, graduated, withdrawn, and expelled students from 2005-2012. For each student, the data included the ISEE scores in verbal reasoning, quantitative reasoning, reading comprehension, and mathematics achievement. Also gathered was each student's 9th grade weighted cumulative GPA. Seven extracts were performed to identify students who were new freshmen to the high school beginning with 2005.

The study concluded that the test scores are not the best predictor of student success, but they are a factor to be taken into consideration. Regression analysis revealed a weak positive relationship among the four ISEE sub scores and end of year freshman weighted GPA. Combined, the four showed that 30% of the variability of GPA can be attributed to the testing results.

Not easily measured, admission decisions are a delicate balance of qualitative and quantitative measures.

The school will use the research as a guideline for admission decisions and use caution in proceeding in the overuse of test scores as a large mitigating factor. It is known that there is a relationship but decision-makers must take a holistic approach.

Chapter 1: Introduction

Selective independent and private secondary schools face a common challenge: admission criteria and the role varying factors play in the decision-making process. Most schools require an often lengthy application, teacher recommendations, interviews, transcripts, and entrance testing at a minimum. The independent school admission process is similar to that of the college application process with students competing at the same college-level rigor and schools having to decide whom to admit. Selective schools have multiple goals in the admission process that include ". . . assembling a student body with non-academic achievements, promoting cultural diversity, and promoting support from alumni" (Sawyer, 2010, p. 5). Clearly, applicant pools contain top students meeting the highest level of every criterion. These require very little thought by admission officers during the evaluation process. Then, there are the average or below average academic students who may bring something else to the community. Perhaps these students have abundant artistic talent in the visual or performing arts. Perhaps they have star athletic abilities. While academics are the core of any college preparatory institution, it is not in the absence of all else. "Directors of Admissions, at highly selective universities agree, that a student's academic rigor and performance, when taken in the context of the student's high school environment, are two of the better predictors of college success" (T.K. Patterson, personal communication, November 22, 2010). This is why it's important to admit students who can make a positive contribution to campus life and to the

school's mission. Additionally, schools face *legacy* candidates who gain extra consideration for family members who graduated from the school or who are currently attending. In addition, there are applicants' families who have the potential of contributing to capital fundraising or endowments. All of these factors come into play and trade-offs enter into the admission process. The difficulty remains in determining how much of a trade-off affects the potential for academic success.

Entrance testing can be significant for schools since it provides a source of quantitative evaluation in the face of so many qualitative contributors. At the same time (notably at the college level), "To simplify the admission world to test scores is willfully misleading. Yet we require the test—not because it is crucial to our admission decisions but because it fits into a model that the outside world has set for the process" (Brown U: Column, 2005, para. 3). So it's not surprising that more than 1,100 independent schools use the ISEE (Independent School Entrance Exam) that measures students' skills in verbal and quantitative areas. With results in hand, it is simple to assume that a student with low ISEE scores will perform poorly academically.

Schools need tools to examine the test results and determine the extent to which these scores actually predict how well a student may perform at a given school.

And many colleges have done just that and are moving away from testing (Brown U: Column, 2005). And with regard to test scores, (Cloud, 2001, p. 62)

"Assuming we can measure innate intelligence, do we want a society that rewards genes? Are we afraid of what kind of society that might be? Or should we instead reward only the achievements of life—what we do with our gifts, not what we start with?"

Unfortunately, with students, admission officers do not have a lens to predict the future life achievements of their applicants and must rely in part on quantitative measuring devices in the decision-making process. Test scores may or may not be part of the solution to this predicament. Many schools weigh other non cognitive factors ". . . in achieving their institution's larger goals . . ." including, but not limited to personal experience, artistic or athletic ability, demonstration of leadership, and social interaction to balance the test score influence on decision making (Sawyer, 2010, p.5). Test score defenders would like a solid correlation between academic success and student scores. Such a finding would not only boost the perceived value of test scores, but would also imply a level of integrity of admission decisions that already rely on such data. Other factors may become less valued and test scores would become more important than ever. However, no such measuring standard exists for the ISEE test.

If a high correlation between test scores and academic success can be defined, the other elements in the admission decision process can take a more complimentary role, rather than one that bears equal footing. Conversely, a low correlation or none

at all may indicate no need for test scores in the admission process, or, at least in limited use.

Background

Much of admission evaluation is based on a qualitative review of documents, essays, recommendations and interview remarks. Of course, grade point average is significant but since students come from many different schools of varying quality, any reliable quantitative measurement is difficult at best. However, entrance testing provides a quantitative measure to the process and therefore testing can become a large part of the admission decision for many schools. Yet, many institutions don't really know how well those test scores correlate to how well their students perform in school once admitted.

All students have their gifts, but few are gifted in everything. For example, a musical virtuoso may be challenged to complete Algebra I. Notable athletes may struggle with the rigors of a curriculum that is entirely college preparatory. Certainly, the admissions committee does not want to set up those students for failure. At the same time, the curriculum, as stressful as it may be for some, may be the key in truly preparing them to succeed at the college level. Furthermore, the school is faced with providing resources to assist lower performing students. Teachers lament over these students as a drain on their ability to give more attention to the class as a whole and, as it should be, refuse to *dumb down* the classroom to the lowest common

denominator. And so it is with all of these determining factors that we struggle each year as the admission committee meeting approaches.

The ISEE test ranks students on a stanine of one through nine in four different areas: verbal reasoning, quantitative reasoning, reading comprehension, and math achievement. According to the Educational Records Bureau, "Stanine scores range from 1 to 9, with a score of 5 representing the average. The percentage of scores at each stanine level in a normalized standard score scale is 4, 7, 12, 17, 20, 17, 12, 7, and 4, respectively" (Independent School Entrance Examination, 2006, p. 53).

Percentile rank scores provide similar, though more precise, information. For example, a percentile rank near the middle of the distribution (e.g., 45 to 55) will be roughly equivalent to a stanine score of 5" (Independent School Entrance Examination, 2006, p. 55).

On average, the school's student body has a stanine of about five in any given area. Students with scores of seven or higher—and we see that these students are typically consistent across all four areas, are an admission *no brainer* as long as they meet other academic and non-academic criteria. Even students with scores aligned with our average do not cause too much worry, though we examine transcripts and recommendations much more closely. It is the student with scores from one to three that are a large cause for concern because it indicates a possible deficiency in one or more areas that can suggest a student may struggle in certain subjects. But what if the applicant is an Olympic hopeful or on the track to be a concert pianist? Do we not

want to nurture that student to develop to the best of his or her abilities? That is the tough question. And knowing how well the ISEE test is a predictor of success, and if it is, to what extent, is imperative. While the focus of this study is on one school, it is important to wonder if the socio-economic affluence of our local community is an immeasurable factor. For instance, if there is a correlation between ISEE score and freshman GPA, are the predictors unique to the population? Would we see varying results in a community whose families had fewer resources such as tutoring or special educational therapists? The answer is probably yes, but trying to gather information from other schools for this study proved difficult because of the way they gather data and because of concerns over privacy. So, we are left with one school's population.

Interestingly, upon looking at the individual records of students currently on academic probation (a semester GPA lower than 2.0), most of these students' ISEE scores do not fall into the lower levels, and, in fact, several have ISEE scores that would put them in the top ten percent of our students based on scores alone. This would suggest that there are clearly other factors in play, but how to measure these is a challenge. Some of these other factors may include student motivation, participation in outside activities, parent involvement, and a student's general like or dislike of school, to name a few. So we are left with the only quantifiable aspect of the admission process, the ISEE.

Statement of the Problem

Available literature on independent school entrance testing is extremely limited and literature on the ISEE exam is non-existent. Most of the studies on testing relate to the use of the SAT and ACT exams in college entrance testing. While one could say testing is testing, one cannot assume that the same rules apply when comparing correlation results with SAT and ISEE results. Secondary school students are a different population from college-bound seniors. Also, because independent school admission can be very competitive, it is important to know and understand the tools schools use in their decision-making process and how these tools can be held accountable for the extent to which test scores play a role.

Accountability to faculty is of prime importance. However, finding a balance among the types of learner is also important. Bringing faculty into the process lends credibility to the admission process and allows us to ". . . find applicants with bodily-kinesthetic intelligence of the athlete or dancer, the musical intelligence of the instrumentalist or vocalist, the spatial intelligence of the visual artist, the interpersonal intelligence of the leader of community service or the student body, the interpersonal intelligence of someone who conveys a particularly mature sense of self, and the naturalist intelligence of someone who is saving the planet" (Teare, 2004, para. 6). And yet, independent school testing remains an elusive standard that forces us to ask, "What do the scores mean?" while holding on to them with clenched fist.

Purpose of the Study

Much research has been done on the correlations between SAT and ACT scores and student performance in college. However, research into independent school practices reveals little has been done at this level. The test many independent schools use is the ISEE (Independent School Entrance Exam) created by the Educational Records Bureau (ERB). To date, no research has been done on the correlation of ISEE test scores and student performance. The purpose of this study is to look closely at the school's historical entrance test scores and conduct research to determine how well they correlate with or *predict* students' success at the school, specifically with freshmen end of year grade point average. Finally, if findings show a relationship between any portion of the ISEE exam and student GPA, a regression formula will be created to *predict* a freshman year GPA based on the ISEE score inputs in an effort to assist in the admission decision-making process.

Research Questions

The research questions of this study are:

1. Is there a relationship between the ISEE Verbal Reasoning scores and student weighted cumulative GPA at the end of freshman year?
2. Is there a relationship between the ISEE Reading scores and student weighted cumulative GPA at the end of freshman year?
3. Is there a relationship between the ISEE Math scores and student weighted cumulative GPA at the end of freshman year?

4. Is there a relationship between the ISEE Quantitative reasoning scores and student weighted cumulative GPA at the end of freshman year?

Significance of the Study

This study is significant because there is no current research on the correlation or relationship between ISEE test scores and student performance. The significance is twofold. First, the results of the study could be ground-breaking if the data show that a relationship exists, or if it does not, and the relative strength or weakness of the findings. With so many schools depending upon the ISEE in the admission process, knowledge of its predictability could validate schools' use of the test and provide credibility. Conversely, if it is not a significant predictor, it may be cause for schools to reevaluate their admission assessment process. Second, the study could pave the way for other schools to study results at their own institutions and for the Educational Records Bureau to find the impetus to conduct a nationwide study with a critical mass of schools.

Definition of Terms

The following terms are defined to clarify references in this study:

- Independent School—any nonpublic K-12 (or any portion thereof) school.
- ISEE—Independent School Entrance Exam, a test designed specifically for independent schools to measure an applicant's verbal and quantitative aptitude.

- ERB—Educational Records Bureau. The ERB designs tests typically used in independent schools for admission (ISEE) and to measure student performance while attending the institution (ERB) to identify areas of weakness in the classroom.
- ETS—Educational Testing Service. A nonprofit organization dedicated to providing testing solutions, assessment, test administration and scoring for an international market. ETS has developed tests such as the SAT and ISEE.
- SAT—Scholastic Aptitude Test, a college entrance exam used by colleges and universities nationwide.
- ACT—The American College Testing Program. Independent of the ETS, the ACT is a college entrance exam used by colleges and universities nationwide.
- College Entrance Examination Board—a nonprofit organization that administers tests such as the SAT and Advanced Placement Exam (AP).
- NACAC—National Association for College Admission Counseling. A professional organization that provides resources for those working with students seeking higher education.
- GPA—Grade point average measured by the cumulative result of a defined span of grading.

- Stanine—Standard nine. A scale with nine points to "provide a broader indication of achievement that is easy to understand and does not emphasize small differences between scores." (Assessment Literary Glossary, 2014)
- Middle School—grades six through eight.
- High School—grades nine through twelve.
- US News and World Report—A national magazine that annually ranks US colleges and universities.
- Princeton Review—A national publication that annually ranks US colleges and universities.

Limitations of the Study

The data gathered will be from one school including its current students, withdrawn, dismissed, expelled, and graduates. While useful, the study provides a snapshot of this school and no others. An attempt was made to solicit data from other schools with an underwhelming response. There are two reasons for this. One, schools gather data differently, and often on a limited basis. Many schools are not sophisticated to the extent where they electronically capture large amounts of data. Two, schools are reluctant to release their data even if there are no student identifiers attached.

Preliminary research indicates that very little is written regarding admission testing for independent schools, including research on correlations between tests

scores and student performance. Similarly, there is no research on the ISEE exam and it's correlation to student success. Thus, much of the literature review draws from information on college admission testing and student college success, assuming parallels between independent schools and colleges since independent schools and colleges possess a similar rigorous application and admission procedures.

The research for the study will use data spanning ten years. Limiting the study is the lack of control for variables such as teacher change over time, varying teaching styles, and difficulty in grading, all of which could more or less affect variability of the results.

Finally, another limiting factor is the school itself. It is located in a fairly affluent suburb of Los Angeles. The tuition is very high and its academic reputation on par with tuition. While lower performing students may attend the school, many of these students have resources available to them that might not be seen at smaller schools (enrollment currently surpassed 1,300). Also, the financial resources of many of our parents afford students private tutors and specialized programs that may not be available to schools located in lower-income areas. The school provides tutoring on several levels including an academic success program to help students with study and organization skills, National Honor Society students working one-on-one with students needing help, twice a week *business lunch tutoring* where students can get help from teachers in several areas, and finally math lab open to students during school and after school five days each week.

This would suggest that students have an advantage to improve their skills in areas of low performance which would possibly help them improve their GPA and show a lower correlation (or none at all) with ISEE test scores and their position at the end of freshman year. Similarly, students using test preparation strategies may have the same outcome by perhaps inflating the test scores.

Organization of the Remainder of the Study

This study is organized into five chapters. The first chapter defines the background of the study, a statement of the problem, the purpose of the study and its importance, definitions and terms for reader clarification, and limitations of the study. The second chapter is a literature review regarding student testing and admission decisions at both the independent school level and at colleges and universities, and research on the relationship between student test scores and academic success. The third chapter covers the methodology of the study including data selection and statistical analyses employed. The fourth chapter reviews the results and interpretation of the data. The fifth chapter of the study overviews the research and provides recommendations and conclusions.

Chapter 2: Review of Related Literature

Increasingly, families turn to private education for their K-12 children in the face of declining resources for public schools and the decline of quality in U.S. education over the years. Families seeking to provide their children with a better college preparatory education seem to have no better alternative than to turn away from underperforming public schools. In the researcher's observations, parents in search of a place of residence would look at the local school district in part to help determine whether their children would benefit from local public school attendance. Now it seems that house search is in part influenced by the proximity of a private and sometimes religious school with a fantastic academic reputation and a formidable wait list. According to the Center for Education Reform, a national assessment of education progress shows that 29 percent of eighth grade students scored at below basic levels in reading and 32 percent below basic levels in math (2005). Funding is a problem as well. California is a prime example: Per-pupil school spending in California, in constant 1999–2000 dollars, went from about $400 above the national average in 1969–1970 to over $600 below the national average in 1999–2000" (Arkes, J., Carroll, S. J., Flanagan, A., Krop, C., & Morrison, P. A. (2005). A recent Gallup Poll shows that parents surveyed indicated that lack of funding and overcrowded schools were the biggest problem facing education (Rose, L. C., 2006). The 35th poll suggests that ". . . Americans are still not confident about – or satisfied with – public education" (Public opinion of public schools, 2003, p. 52). With public education

suffering from decreased funding, parents affluent enough to invest in their children's future have turned to private education as a response to the discouraging trend in public education. And there are parents who believe that a privately educated student has the appearance of a more prepared, educationally enhanced student when an application appears before a university admission committee. Such opinions may be true in certain situations and among particular academic circles and certainly hold a great deal of weight when parents perceive how their child will be judged during the admission process. Similarly, applying to, and getting accepted into a college or university of perceived high quality is increasingly challenging.

> Everyone believes that the characteristics of high schools and the experiences of students in high school have much to do not only with immediate secondary school outcomes such as earning a diploma but also with the subsequent educational achievements of those who surmount the hurdle of high school graduation (Bowen, Chingos, and McPherson, 2009, p. 87).

Anything that has the appearance of increasing a student's chance of being accepted into a perceived high-quality college or university may be of paramount importance to parents and students alike. A student's entire future may depend on success at the academic level whether it be high school or college. Employment opportunities, the ability to earn a high salary and a future standard of living may all hinge on the successful completion of a well-rounded course of study. But what are all the factors

that help students be accepted into a highly regarded college or university? Obviously, grades can be considered a large factor in predicting success. However, many colleges and universities rely heavily on test scores as predictors of future academic success. In order for students to perform well on a rigorous standardized test that will insure acceptance at a well-regarded higher academic institution, many students and parents believe in the need for specialized attention necessary to learn not only how to study for such tests, but also have the foundation of learning that lends itself to high achievement in test performance.

Of course, the surest way of being accepted into an excellent college or university is through the preliminary education provided by an excellent secondary school. The rise in the importance of the secondary school education continues to play a significant part in establishing the admissibility of many students. And admission to such a college preparatory school is not guaranteed without a solid primary education and in many cases, entrance test scores. Without said entrance test scores, school admission officers would have to rely on more subjective success indicators such as grades and environmental influences on which to base admission decisions.

Since 1970, the number of students attending college full time more than tripled (State and Country Quick Facts, 2010). Additionally, there were approximately 1.5 million SAT test takers by college bound seniors (2002 college-bound seniors, 2006). Among those, five percent were seniors attending an independent school and

that group scored higher than public or religiously affiliated schools Fig 1. (College Board. 2006).

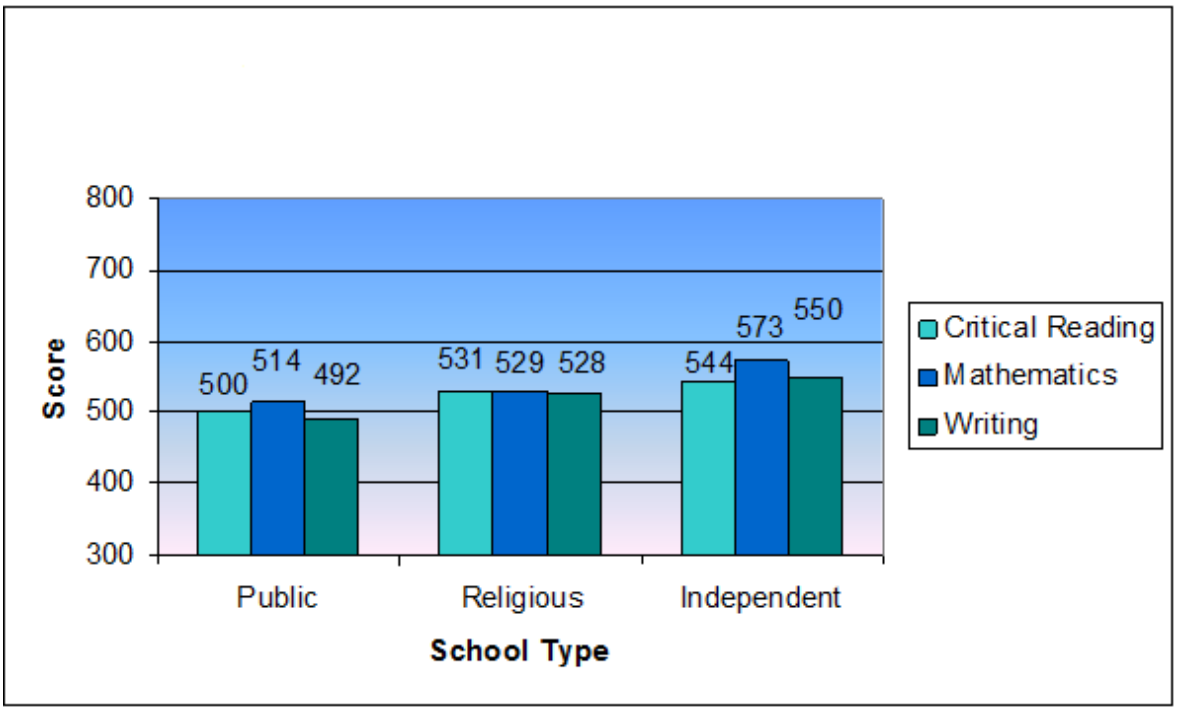

Figure 1. Comparison of 2006 SAT tests for college bound seniors

In many cases, private secondary education not only provides credibility on college applications, but it's been shown that students attending an independent school, on average, achieve greater success than those attending a public school (Values added, 2004). In researching top schools for their students, parents are not ambivalent to this trend and are cognizant to the benefits of an independent school education. There's a perception that an independent school education will not only provide the student with a sound educational background for future academic endeavors, but also prepare the student to lead an overall meaningful and productive

life. So, as top independent schools and top colleges become more competitive, entrance exams can play a significant role in the admission process.

Though a national decline in private schools reflects a national trend, there has been an increase of schools in California (*NAIS Facts at a Glance*, 2011). With the advent of more private schools to accommodate the demand for more privately educated students, competition between the many private schools resulted in the need for a competitive entrance exam. Such an exam serves a similar purpose to the SAT or ACT admission tests in helping college admission committees evaluate their prospective students. Historically, it's been suggested that high scores on college admission entrance tests have helped serve as predictors for college success. Similarly, independent schools wanted a test as well to assist in making admission decisions (E. Mangas, Personal Communication, March 8, 2007). But it remains to be seen if such a test is a reliable predictor for high school and subsequently, collegiate success.

Modeled after a collegiate admission exam, the ISEE has several areas developed to establish a student's competency in verbal and quantitative reasoning, reading, and math skills. Similar to the SAT and ACT exams, the ISEE hopes to support the importance of high test scores to correlate with success in high school. Historically, SAT and ACT scores have reliably predicted success in a collegiate environment (Camara, 2006). It is hoped that the ISEE serves a similar purpose in predicting a student's academic success.

Of course, test scores are not the only predictor in a student's academic success at any level. Some students are poor test takers but do well in the classroom. Some students are great test takers but struggle in the classroom. There are numerous factors that could contribute to a student's performance, yet there must be some instrument to measure a student's capacity to succeed. Test scores are often believed to be the best quantitative indicator available to help determine if a student will succeed in the next level of their educational experience.

Research on testing is controversial at best with debates rallying about the predictive qualities of testing and subsequent student academic performance. While there is no research available on the ISEE entrance testing for independent schools, there is a plethora of information available on SAT and ACT testing. And, the similarity of the ISEE test to the SAT and ACT tests is important in establishing a predictability model. Therefore, much of the literature review surrounds college entrance exam testing with parallels drawn for independent schools and their use of entrance test scores in order to predict academic success.

The topics addressed in the following pages include an overview of independent schools and the current situation, a brief history of the ISEE exam, a review of the history of testing in the United States, test score rankings, bias in testing, test preparation, the predictability of testing, independent school admission, learning differences, and the definition of sub score results.

History of Testing

To better understand the role admission testing plays in today's world, it is interesting to look back at the history of testing and how it has developed into the tool it has become today. It seems a gauge was needed to attempt to analyze the potential success of an incoming student. However, it doesn't answer the question as to why it was necessary to establish testing as a requirement for college applications. Couldn't prior student academic achievement alone provide the necessary qualifications for a college applicant? One would think that admission officers at a high school or college level could look back at the potential student's prior academic work to gauge how that student will perform at the next educational level, and to some degree decisions are made on this basis, but such predictors are not necessarily reliable due to the variability in the quality of school.

Though admission testing has its roots in Europe dating back to the mid-1800s, the use of admission testing did not appear in the United States until the early 1900s (Zwick, 2007). Due to the variety of admission tests employed at various universities at the time, a cohort of 12 northeastern universities formed the College Entrance Examination Board in 1900 to establish a standard by which schools evaluated applicants (Zwick, 2007). The standardized test evolved into the SAT in 1926 (Zwick, 2007). In its early stages, the tests were scored manually by the College Entrance Examination Board; however, advancements in technology introduced the Educational Testing Service (ETS) in 1947, offering mechanical scoring of tests,

revolutionizing the industry (Zwick, 2007). Just over a decade later, the American College Testing Program (ACT) appeared in the mix with abilities for electronic scanning (Zwick, 2007). Currently, "The SAT testing program is sponsored by the College Board; the tests are administered by ETS under a contract with the Board" (Zwick, 2007, p. 6). In addition, the College Board added a writing section for the SAT beginning with the class of 2006 (College Board, 2006).

Explained more completely in a later section, the ISEE was released in 1989 as a result of independent schools wanting a standard by which they could assess applicants that was also a valid measurement (E. Mangas, Personal Communication, March 8, 2007). Such a test theoretically establishes itself as a reliable predictor for secondary school and later collegiate academic success and becomes a lynchpin in the independent school application process. Independent school admission officers will come to rely on the ISEE as an important factor in the analysis of the applicant's preparation and potential for success.

For purposes of simplicity and lack of ISEE data correlation research, the main ideas and parallel comparisons with the ISEE focus on college entrance testing. The two admission processes face similar challenges. "Competitive colleges and universities rely on predictive measures to assess an applicant's future success in the academic environment. The credibility of your admission decisions by the academic community, to a large degree, must be substantiated by test scores" (P. Long, Personal Communication, February 24, 2011).

Testing in Undergraduate Admission

Certainly, competitive colleges and universities desire to attract and admit students whom they perceive have the ability to excel at their institution. Such a student not only becomes a valuable alumnus, but also in their post-academic careers. It sends a sign to employers that students with a degree from said university will contribute to the overall achievement of such an employee in the workplace. A university's reputation is often built on the success of well-established alumni. Establishing career success advertises to the corporate workplace the value of a degree from a given college or university.

Test scores, among other criteria are used to determine that potential ability. According to a study commissioned by the National Association for College Admission Counseling (NACAC), ". . . the degree to which standardized tests scores and other academic criteria are regarded as useful in a school's admission decisions depends entirely on the goal of the institution's admission policies, and, more broadly, on its educational mission" (Zwick, 2007, p. 9). If the previous statement is true, a paradox exists between the use of test scores that each college or university views according to their admission policy, school mission, and the perceived high importance that test scores have in admission across the universities and colleges in the United States. Teare comments that standardized tests are the common denominator among all the admission criteria available for schools ". . . because they give admission officers a way to measure candidates from all over the planet on at

least one common criterion for selection" (2004, para. 3). That is because GPAs vary from school to school. But schools also seek diversity. Whether cultural diversity, socioeconomic diversity, or even diversity of talent, all of these are important factors in admission decisions. Yet, standardized tests may too often be the deal maker or breaker when making decisions that involve largely noncognitive factors. And this makes sense; other than a prior school's grade point average, testing provides the only other quantitative means of evaluation which gives some form of validation in the face of the largely qualitative components of the application. Also, "Grading practices vary across teachers and high school, and standardized tests are essential to providing a measure of a student's achievement that is independent of grade" (Atkinson, 2001, para. 6). This is especially true for independent schools. Feeder schools include public, private, Christian, and home schools. A GPA does not necessarily suggest a student's true ability since it is a subjective measuring device. For examples, a 3.0 at one school may not be equivalent to a 3.0 at another. The inconsistency with student GPA is significant but it does provide some quantitative measure. So, test scores combined with prior performance provide a perceived solid foundation on which to base decisions, particularly for students at the far ends of the spectrum—low scorers and high scorers. It seems the applicants with the grades and test scores that appear merely average face the most scrutiny and perhaps the bias towards those factors having greater weight in the decision-making process. And when one looks at selective colleges and universities, the test scores may play a larger role

because ". . . they consider it desirable to admit candidates who are likely to be able to do the academic work required of them. Standardized tests, along with other criteria, are considered in an attempt to identify these candidates" (Zwick, 2007, p. 9).

Over 90 percent of college and universities in the United States require the SAT or ACT of their applicants, rating it the second highest factor in the decision process (second to high school GPA) (Zwick, 2007). However, "About 70 percent of four-year institutions reported that test scores were 'routinely considered in reaching an overall judgment regarding admissibility" (Zwick, 2007, p. 10). This would suggest that the use of test scores in the admission process is not only pervasive but significant.

Rankings and Test Scores

It is known that entrance testing plays a significant role in college and university admissions. However, add into this mix the phenomenon of college rankings. College rankings, although historically important in influencing the potential student's choice in schools have become increasingly significant in the decision making process not only for the student, but the parent(s) as well. The leading sources of rankings have students and parents looking at the numbers. It's easy to assume that a higher ranking indicates more competition gaining access, and in turn, higher test scores reported and ultimately required in the admission process. Numerous mediums including *US News and World Report* rank colleges annually based on a variety of factors that include test score averages as an indicator of selectivity

("What measures," 2014). Paying close attention to the number of low SAT admits becomes important because higher rankings can fuel a rise in applications. Unfortunately, "Love them or hate them, college rankings appeal to a culture that worships consumer choice and is seduced by prestige value" (Bliwise, 2001, p. 1). This "competition" plays a role with independent schools as well. Though not publicized to the extent that colleges and universities are scrutinized, independent schools face their community. Parents want to know a school's average SAT scores for graduating seniors. They compare them because they reflect a perceived value that the higher a school's test scores the better prepared students are for college and ultimately, admission into more competitive schools. Such a perception may not be accurate, yet the implication is significant enough to garner enough attention to bring it to the forefront of many parents and students minds. Parents often inquire about the average ISEE scores as well since it's reflective of the perceived quality of students accepted into the school. So, for schools at all levels, testing plays another important role as it balances decision making with the need to maintain score averages commensurate with or exceeding the competition.

Bias in Testing

Cultural bias, gender bias, racial bias—these are often hotly debated as significant factors in the differences in test scores among applicants. Some literature also suggests that family income and level of parent education play a role in giving students unfair advantage in testing. "One of the most persistent criticisms of the

SAT centers on the large differences in average performance for different gender, racial/ethnic, language, and socioeconomic groups" (Total Group, 2006).

The literature is quite varied, exposing both opinion and data. Some research opts for a foregone conclusion with little or no evidence to support. For example, the National Center for Fair & Open Testing states that "Because of the way the test is constructed, it rewards for strategic guessing, the highly-speeded pace, and cultural biases, the SAT denies African Americans, Latinos, Native Americans, and women equal opportunities for higher education" ("Ten Myths," 2007, p. 1). Yet, they offer no supporting references. In contrast, Sowell suggests that ". . . life itself is culturally biased. If you can't handle math and the English language, you are in big trouble" (Sowell, 2002, p. 156).

One group, the National Council of Teachers of English (NCTE), created a resolution that addresses some of the perceived injustices and/or mistrust of standardized testing. They proposed the following:

- the right to insist that standardized tests be adopted through an open, public process that considers the design and appropriateness of the test;
- the right to know before the test date the form of any given test;
- the right to experience a challenging curriculum that is not constrained by any given test;

- the right to know how the results of the test will be used;
- the right to arrange accommodations for documented learning differences and/or unforeseeable circumstances;
- the right to display competencies through various means;
- the right to an open process of review of test items and results;
- the right to challenge test scores and have them changed if they are incorrect; and
- the right to a process that corrects tests and/or individual items found to be invalid or unreliable ("Resolution," 2000, para. 2)

Yet another proponent of test taker's rights, Howard Berlak suggests that test takers need a bill of rights stating that one of the problems is "Students are being denied promotion, access to programs and schools, and being barred from receiving high school diplomas or graduation certificates based solely or primarily on standardized test scores. These students are disproportionately poor, of color and from immigrant families whose home language is not English" (2007, p. 1). It is evident that perceived high-stakes testing creates fervent opinion on both sides. The importance of test score results cannot be regarded lightly.

Looking at the actual data separates opinion from fact. Each year, the College Board publishes a Total Group Profile Report for college-bound seniors. In it they

report detailed descriptive statistics on a variety of subgroups that include demographic, gender, type of high school, and academic (Total Group, 2006).

The study looked at data for 1,465,744 test takers. The mean scores are reported with breakdowns for critical reading, mathematics, and writing. The first breakdown is by gender. Pundits suggest that males outperform females on the test. Results (Table 1) show that males outperform females in the critical reading test by very little, but more significantly in mathematics. However, in the writing assessment, females outperformed males by an average mean of 11 points.

Table 1.

SAT Mean Scores by Gender Comparison

SAT Reasoning Test	**Test-takers**	**Critical Reading**	**Mathematics**	**Writing**
	Number	Mean	Mean	Mean
Male	680,725	505	536	491
Female	785,019	502	502	502

Note: Adapted from College Board Total Group Profile Report (2006)

The report also looked at the type of high school and mean scores. Table. 2 shows that students attending independent schools score higher in all test areas than do students attending public or religiously affiliated schools, with a significant advantage in mathematics.

Table 2.

SAT Mean Scores by School Type Comparison

SAT Reasoning Test	**Test-takers**	**Critical Reading**	**Mathematics**	**Writing**
	Number	Mean	Mean	Mean
Public	1,118,762	500	514	492
Religiously Affiliated	149,805	531	529	528
Independent	73,619	544	573	550

Note: Adapted from College Board Total Group Profile Report (2006)

The demographic information for differences in means among ethnicity show some more striking differences. Most notably, white students outperformed all other ethnic groups in each test area with the exception of Asians who outscored Whites in mathematics. African American students score the lowest in all areas. All of this suggests that something is at play and further research is necessary to determine what would account for the disparity in mean scores.

Table 3.

SAT Mean Scores by Ethnicity Comparison

SAT Reasoning Test	**Test-takers**	**Critical Reading**	**Mathematics**	**Writing**
Test-takers who described themselves as:	Number	Mean	Mean	Mean
American Indian or Alaska Native	9,301	487	494	474
Asian, Asian American, or Pacific Islander	138,303	510	578	512
Black or African American	150,643	434	429	428
Mexican or Mexican American	64,019	454	465	452
Puerto Rican	19,008	459	456	448
Other Hispanic, Latino, or Latin American	68,734	458	463	450
White	825,921	527	536	519
Other	54,469	494	513	493
No response	135,346	487	506	482
Total	1,465,744	503	518	497

Note: Adapted from College Board Total Group Profile Report (2006)

Family income also appears to have an effect on SAT scores. Notice in Table 4 for each subtest, the higher the family income, the higher the score. But what explains the disparity of scores based upon income? As in many things, wealth provides opportunity and advantages that those without means are not afforded. Perhaps families with higher incomes have greater access to test preparation programs, financial access to personal tutoring, schools that offer SAT test preparation, and overall access to a better education which would increase a student's knowledge base even without test preparation. Students with lower family incomes likely live in areas of greater poverty, lending themselves to poorer education and limited access to test preparation programs both in and outside of school. Lower income families may also place less value on education, thus affecting student motivation and/or performance. Environment obviously plays an important part in determining educational potential.

Table 4.

SAT Mean Scores by Family Income Comparison

SAT Reasoning Test	**Test-takers**	**Critical Reading**	**Mathematics**	**Writing**
Family Income	Number	Mean	Mean	Mean
Less than $10,000	40,052	429	457	427
$10,000-$20,000	66,457	445	465	440
$20,000-$30,000	76,808	462	474	454
$30,000-$40,000	90,134	478	488	470
$40,000-$50,000	77,150	493	501	483
$50,000-$60,000	83,393	500	509	490
$60,000-$70,000	77,599	505	515	496
$70,000-$80,000	81,819	511	521	502
$80,000-$100,000	127,493	523	534	514
More than $100,000	225,869	549	564	543

Note: Adapted from College Board Total Group Profile Report (2006)

The group profile report also reported data on the highest level of parental education. The data in Table 5 suggests that the higher parental education, the higher the student scores and a higher number of test takers. Reasons for this may include increased parental involvement in student education because they themselves had an interest in higher education and place it as highly valued within the family structure. Simply, students learn by example. And, parents with a higher level of education also

know the advantages of having such an education and impress on their children the importance education plays in perceived financial and personal success. If the parent did not have the opportunity to experience the benefits of a top-level education, the knowledge of those benefits will be lost to them, and thus, not imparted to their children.

Table 5.

SAT Mean Scores by Parent Education Comparison

SAT Reasoning Test	**Test-takers**	**Critical Reading**	**Mathematics**	**Writing**
Highest level of parental education	Number	Mean	Mean	Mean
No high school diploma	55,809	418	445	418
High school diploma	404,206	467	478	460
Associate degree	110,310	484	493	474
Bachelor's degree	388,015	522	536	514
Graduate degree	350,271	558	571	552

Note: Adapted from College Board Total Group Profile Report (2006)

Though the College Board draws no conclusions based upon the evidence, it is clear that many factors contribute to a student's performance on the SAT. And though we see differences among gender and ethnic groups, a College Board representative insists that "The SAT is not culturally biased, and predictive studies

also demonstrate that the SAT is a strong predictor of success for all ethnic and racial groups" (Camara, 2006, para 5). Camara also indicates that "Research has shown that group differences on all these measures, including the SAT, are largely based on differences in the educational quality, courses completed and the academic rigor of courses" (2006, para. 5). However, pundits continue to portray the SAT as ". . . being culturally biased in ways that preclude many minority students from achieving high scores" (Alliance Viewpoint, 2001, p. 1).

Testing Predictability

Much of the research on student testing and performance is based on college entrance exams, specifically the SAT and ACT. The SAT has been in use since 1926 with more than two million students taking the test annually (Popham, 2006). Colleges use it in conjunction with other factors to determine admission. College entrance exams are believed to be predictors of success in college and therefore, play a role in the admissions decisions—often a very large role. Thus, "Despite the entrenchment of standardized admissions tests, questions have persisted about their precise function. Are these tests intended to measure specific academic achievements, or to assess intellectual aptitude?" (Zwick, 2007, p. 11). Similarly, what about the test's predictability? Popham points out that ". . . you must square the validity coefficient of .50 to get an accurate idea of how predictive an SAT or ACT score really is . . . and you end up with .25. This means that we can accurately predict only 25 percent of a college student's grades on the basis of the student's SAT or ACT

scores. Fully 75 percent of a college student's grade performance is explained by other factors, such as the student's motivation or study habits" (Popham, 2006, para. 10). Similarly, ". . . a strong predictor of children's school success is the educational attainment of their parents. The higher it is, the more parents read to them, inform and encourage them" (Samuelson, 2011, para. 9).

So, if some regard test predictability an underwhelming factor of student performance, why is it that "universities—and our society in general—believe that test scores are more important than tangible evidence of meaningful performance in the very areas for which the tests are alleged to predict success" (Williams, 1997, para. 3)? Similarly, Williams points out that "Faculty members and administrators alike are attracted by the apparent quantitative distinctions among applicant's scores, which suggest distinctions among applicant's competencies that often do not exist" (1997, para. 8).

To assist universities, the College Board offers an Admission Validity Study for schools who wish to identify predictors of students' future performance. The analysis typically includes factors such as high school GPA, high school rank, and standardized tests such at the SATI and SATII. However, they encourage schools to also include other variables they believe to be predictors of success at their institution. Similarly, the College Board offers an Admitted Class Evaluation Service. Also known as ACES, it "predicts how admitted students will perform at your institution generally and how successful they can be in specific classes" (Admitted class

evaluation service, n.d., para. 2). The variables analyzed include indicators from high school, standardized test scores, gender, ethnicity, demographics, and, in some cases, interview ratings (College Board, 2006). According to the College Board (ACES, 2011) the ACES benefits colleges with the following:

- Provide information on the most useful predictors of success at your institution.
- Provide information allowing you to narrow the number of factors considered in the admission process without loss of predictive ability.
- Provide optimal equations for predicting the success of future students.
- Provide a list of the students most at risk for dropping out.
- Provide a matched student-level data set for use in follow-up studies.

The College Board, ETS, and other researchers continue to conduct hundreds of validity studies that suggest ". . . students' performance on the SAT is related to: (a) high school grades and GPA, (b) the rigor of courses taken in high school, (c) students' self-perceptions of academic ability, (d) freshman and cumulative college GPA, (e) college grades in specific courses and the need for remediation when entering college, and (f) persistence and graduation" (Camara, 2006, para. 5). Unfortunately, none of these resources are available at the independent school level.

Upon looking at the literature about universities and testing, the same questions arise in independent school admissions. Independent schools approach the

acceptance process with the same awe with ISEE scores that make it the "be all and end all" of final decisions in most borderline cases. And, since there is little or no research on the predictability of the ISEE, school leaders venture blindly into admission committee, making assumptions about the decision-making value of the ISEE. This is precisely the purpose of this study—to examine students and GPAs, run descriptive statistics, and perform a regression analysis to show the precise correlation and predictability of students' ISEE scores and their performance in school as measured by end of year freshman GPA. Furthermore, the analysis will look at each portion of the ISEE test and return a correlation for each as a predictor since it cannot be assumed that each portion of the test measures student aptitude in the same ways. Perhaps one section of the test has a much higher predictability than another. Such results will certainly help in the admission process where students' mathematics and verbal scores show disparate results. It's curious to wonder if lower scores in the students mathematic scores have a greater effect on student performance than do lower scores in the verbal sections—or vice versa—or not at all. The data analysis will be limited to the school study site as described in the limitations section and the results will serve to establish the validity and help determine the necessity of the ISEE test relating to admission decisions.

Test Preparation

Students have many options available to prepare for college entrance exams. In the past, possibly students did not realize the importance test scores played in

potential admissibility and regarded them as just an instrument in measuring the overall knowledge. Perhaps at the advent of test score implementation, tests were not set up to measure a student's academic ability after cramming for a test, but rather capture an overall picture of the student's intellectual capability. "Some students do practice problems via the Internet, some work through exercises in practice books. Some students go so far as to pay for commercial forms of preparation" (Briggs, 2009, p. 4). And, as students apply to colleges and universities in an increasingly competitive environment (Bloom, 2010), students seek ways in which to bolster their applications. Similarly, for those applying to competitive independent schools there is no shortage of organizations offering some form of test preparation for the ISEE. A quick Google search reveals no fewer than 13 online test preparation ads for coaching or materials for the ISEE exam. For example, Kaplan, a national test preparation and admissions organization offers "complete preparation for the ISEE" and compels the reader further by stating, "A successful performance on the ISEE can open the door to an outstanding education for your child" (n.d.). And though it seems high school is a bit too early to ponder such things, "With increasing awareness of an increasingly competitive job market, parents of ambitious students are buying into the hype that admission into the nation's most competitive schools guarantees their children the success they've been reared for, (not to mention vying for the right to proudly associate their children with such name brand institutions)" (Bloom, 2010, para. 4). Success fosters success. A student achieving success in a testing

environment builds on the confidence learned and applies it to future life situations, including education. And success in education lends itself to overall praise in the work environment. A well-rounded foundation first grounded in the confidence of successful test completion will help the individual achieve gain confidence in reaching life goals.

In such a competitive admission environment at selective schools, test preparation, and more importantly, test coaching, is an approach to improve the only quantitative measure of an applicant other than a GPA. Test coaching can be defined as "Activities designed to prepare individuals, in a relatively short time, for taking tests and maximizing the scores obtained" (Test Coaching, 2010, para. 1). Anticipating maximization of test scores suggests the reason that so much attention is paid, though "The existing academic research base indicates that, on average, test preparation yields a positive but small effect on standardized admission test scores" (Briggs, 2009, p.1). However, ". . . when the effects of coaching are attributed to individual students who have been coached, these effects cannot be distinguished from measurement error" (Briggs, 2009, p. 17). But, as Briggs states, ". . .if marginal college admission decisions are made on the basis of very small differences in test scores, a small coaching effort might be practically significant after all" (2009, p. 17).

Indeed test preparation, if not deemed the end all to guaranteeing fantastic test results, has generated an entire business built on the parent or student's fear that without proper preparation, a poor test score and subsequent failure to be admitted to

a prestigious school may forever affect the student's future. Performing poorly on a test necessary for admission to a higher education institution very well may self-label the student as a failure not only to his or her self, but an abject failure to their parents and loved ones. The importance of succeeding on an important test becomes paramount to the student's life outlook. Perhaps a bit melodramatic, nonetheless, such fear-mongering has played its way into the lives of potential students. Right or wrong, this fear is a real factor in the environment surrounding secondary, post-secondary, and graduate education.

Whether all of these formulas for guaranteed test performance are actually contributing to the test results desired remains to be seen, yet test score preparation methods continue to play a role in the pre-admission process.

History of the ISEE Test

How has the ISEE become the industry standard for independent school admission testing? Compared to tests such as the SAT, the ISEE is relatively new, released in 1989 at the request of ERB school members whose applicants were taking the same exam multiple times, at multiple sites, compromising the validity of the test because students may have seen the same question multiple times (E. Mangas, Personal Communication, March 8, 2007). Thus, the ERB asked ETS (Educational Testing Service) to develop a test that ". . . could not be taken for practice, could only be taken once within a six-month period, and ERB would be responsible for registering and scoring the exam" (E. Mangas, Personal Communication, March 8,

2007). The greatest benefit of implementing the ISEE was that "All schools would be 'neutral' test sites—only offering the exam on their testing date, never running admissions activities on the day of the test—that way, families could test anywhere and send their scores anywhere" (E. Mangas, Personal Communication, March 8, 2007). Also included with the test is a 30-minute writing sample that is not scored, only sent to schools for review in the admission process (E. Mangas, Personal Communication, March 8, 2007). Writing results sent to schools aid in gleaning a more complete picture of each applicant. Scrutiny given to reading a student's essay can prove to be a useful tool in making an admission decisions if there is any debate on admissibility. And, if used well, the short essay can be a qualitative measure factoring into a largely quantitative process.

What is the ISEE? According to the ERB website (Independent school entrance examination, 2006):

> The Independent School Entrance Examination (ISEE) is a three-hour admission test for entrance into grades five through twelve. With many of the items written by independent school faculty under the guidance of Educational Testing Service, the test has three levels: a Lower Level for students currently in grades four and five who are candidates for admission to grades five and six, a Middle Level for students in grades six and seven who are candidates for admission to grades seven and eight, and an Upper Level for students

in grades eight to eleven who are candidates for admission to grades nine through twelve.

The ISEE consists of carefully constructed and standardized verbal and quantitative reasoning tests that measure a student's capability for learning, and reading comprehension and mathematics achievement tests that provide specific information about an individual's strengths and weaknesses in those areas. All levels include a timed essay written in response to an assigned topic. The essay is not scored, but a copy is forwarded to the recipient schools along with the Individual Student Report, which shows scaled scores, percentiles, and stanines (p. 53).

Table 6.

Details ISEE test categories, number of questions and time limit.

ISEE Lower Level (Candidates for grades 5 & 6)			ISEE Middle Level (Candidates for grades 7 & 8)			ISEE Upper Level (Candidates for grades 9-12)		
Test	**Number of Questions**	**Time Limit**	**Test**	**Number of Questions**	**Time Limit**	**Test**	**Number of Questions**	**Time Limit**
Verbal Reasoning	40	25 min.	**Verbal Reasoning**	40	20 min.	**Verbal Reasoning**	40	20 min.
Synonyms Sentence Completion			Synonyms Sentence Completion			Synonyms Sentence Completion		
Quantitative Reasoning Comprehension Interpretation/ Application Higher Order Thinking	35	35 min.	**Quantitative Reasoning** Comprehension Interpretation/ Application Higher Order Thinking	35	35 min.	**Quantitative Reasoning** Arithmetic/ Algebra/ Geometry Concepts/ Understanding Applications/ Higher Order Thinking Quantitative Comparison	35	35 min.
Reading Comprehension	36	40 min.	**Reading Comprehension**	40	40 min.	**Reading Comprehension**	40	40 min.

ISEE Lower Level (Candidates for grades 5 & 6)			ISEE Middle Level (Candidates for grades 7 & 8)			ISEE Upper Level (Candidates for grades 9-12)		
Test	**Number of Questions**	**Time Limit**	**Test**	**Number of Questions**	**Time Limit**	**Test**	**Number of Questions**	**Time Limit**
Mathematics Achievement	35	40 min.	**Mathematics Achievement**	45	45 min.	**Mathematics Achievement**	45	40 min.
Knowledge and Skills Computation/ Comprehension Applications			Knowledge and Skills Computation/ Comprehension Applications			Arithmetic/ Algebra/ Geometry Knowledge and Skills Computation/ Comprehension Applications		
Essay		30 min.	**Essay**		30 min.	**Essay**		30 min

Schools that administer the ISEE number about 400 with over 1,100 private or independent schools using the scores in their admission process, all part of the norming population (Mangas, Personal Communication, March 8, 2007). Though norms are established within the testing population, no research has been conducted to study the relationship between the ISEE sub-scores and student performance (Mangas, Personal Communication, March 8, 2007). Though, it should be noted that ". . . some of the finest college preparatory schools in the country." use the ISEE test in admissions (Webster, 2005, p. 2).

The ISEE and Independent School Admission

Like colleges and universities, private and independent schools use a variety of tools to evaluate applicants. Including entrance exams, schools often rely on prior grades, recommendations, and interviews, along with other noncognitive factors (Sawyer, 2010). However, it is difficult for independent schools to determine what weight to give to the ISEE scores without knowing the relationship between the scores and student performance, as measured by GPA, once enrolled at a school. These relationships could include GPA and/or grades earned in English or Mathematics courses. Even the College Board that administers the SAT advises to "Know enough about tests and test data to ensure that their proper uses and limitations are understood and applied" (Collegeboard.com, 2006, p. 9). But critics suggest that "The SAT is accused of relying on a narrow set of analytical skills for predicting whether student will do well in college, and discriminating against black and Hispanic students who persistently score lower on the test than do white students" (Gose, 2005, p. B8). While the statement is merely opinion, the same could be surmised for the ISEE exam.

With the ISEE test, it seems there is little known about the test and its uses and limitations. The College Board also warns that schools should "Evaluate test results and other information about applicants in the context of their particular background and experience, as well as the context of the programs they intend to pursue" (College.board.com, 2006, p. 9). So, in addition to the test scores, it may be important

to examine anecdotal information such as the perception of quality of the currently attended school, an applicant's family background (which can often be determined during the interview process), and perhaps the parents' educational level. Even the writing sample of the ISEE can be very revealing if schools take the time to read and evaluate each one. Depending on the number of applicants, many admission officers may not have the time necessary to make a thorough analysis of all applicants. Undoubtedly, tedious examination of an application, including thorough evaluation of outside mitigating factors, should be the net result of a painstaking review. However, how many schools have the resources to be so in-depth with the review process and how many categorize students according to test scores? Similarly, schools with a large volume of applications may find it impossible to evaluate each applicant individually, thus turning applicants into just numbers. This suggests the significance of understanding the relationship between quantitative measures and student academic success. Just because a student aces a test does not insure that the student will become a success in a new educational environment.

Evaluating a Range of Scores

The ISEE records four subtests: verbal reasoning, quantitative reasoning, reading comprehension, and mathematics achievement. Occasionally the scores vary dramatically within the similar subtests, though the school site typically observe scores within the same subtests generally in the same stanine. What could account for such a disparity when it occurs? This leaves clues that perhaps something may be amiss.

Even low scores can be accounted for by other factors. Cultural bias could contribute to low scores. For example, a head of school noticed that almost every student in an entire grade got the same question wrong on a standardized test. The question asked the students to put in order the steps to make a bed. What further analysis found was that the test question included a bedspread as one of the items. As it turns out, those students had never heard of a bedspread because they all had comforters, and not bedspreads, an item that was well known 20 years ago (Kelly, 2004). Kelly also notes that students ". . . can be distracted by any number of events in their lives" (2004, p. 44). Kelly suggests that one solution is for the testing companies to include individual item analysis with the testing results, showing the "types of questions missed, the number of those questions, and how this compared with the student's peers within the school or even throughout the country" (2004, p. 47). Unfortunately, the ISEE provides no statistics on local or national norms. The ERB already provides this information for schools testing students in various grades. The down side of this otherwise good idea is that it is very time consuming. Admission offices are busy enough during the recruiting season. Many admission committees are already over taxed in trying to evaluate the data they currently have. Reading through and evaluating a large stack of applications can take a tremendous toll on evaluators. A commitment of funding to hire additional staff to perform individual item analysis evaluation may be necessary in the process. For some, all of these things add up to one conclusion. "Although standardized testing is intended to give educators an idea

of a student's aptitude and academic strengths and weaknesses, test scores do not tell the entire story" (Kelly, 2004, p. 44). So, to what end are the scores useful? According to research, for students taking the SAT each year, ". . . some will produce SAT scores that are reflective of their true ability to succeed over time in college, and some will produce scores that are inaccurate in one way or another" (Hunter & Samter, 2000, p. 22). This suggests that test scores may be unreliable but widely and reluctantly accepted as a necessary component of applicant evaluation. They have become that necessary evil when a process does not have an irrefutable reliable means to gauge success.

But there are others who disagree. "Those in favor say that while standardized tests may not be perfect, they are useful in providing a reasonable measure of intellectual abilities and predicting a student's success in school" (Sallyport, 2002, para. 3). According to research at a Utah college, "Results indicated that only HSGPA and ACT scores were effective predictors of the two measures of college success" (Beecher & Fischer, 1999, p. 4). Also, researchers at ACT indicate that ". . . students who exceeded 'college readiness benchmark' scores on the ACT were more likely to persist than those who did not" (Zwick, 2007, p. 18). Trends in college admissions also show that from 1979 to 2000, ". . . admission tests scores were consistently second in importance" lead only by high school GPA (Breland, Cumming, Gernand, Maxey, & Trapani, 2000, p. ix). The report also shows that ". . . admission test scores show a steady increase in the percentage of institutions regarding them as 'Very

important"' (Breland et al, 2000, p. 15). Furthermore, with regard to standardized testing ". . . no other measure or scrap of information predicts academic success at the college level so well (Organ, 2001, p.1). But Organ also contends that ". . . you should add to the test score any other valuable information that provides incremental predictive power" (2001, p. 1).

Poor Test Takers and Learning Differences

Self-proclaimed poor test takers would likely argue that there is too much emphasis placed on test scores for school admission. It makes sense that a poor test taker may argue that an examination of their overall attributes is more reliable than individual test scores. There is more to a student than the ability to succeed in taking a test. Unfortunately, there is no rote way of attributing a percentage that a test score has in establishing the overall expected achievement attached to the student. Students are individuals not to be lumped in a group of poor test takers or great test takers. Whether due to learning differences, diagnosed disability, or merely poor testing skills, these test takers face challenges that could potentially affect life outcomes in education and possibly opportunities. Arguably though, ". . . it is important to remember that one's ability to deal with adversity now will help later in life when dealing with the many setbacks experienced in business and life. This may be advantageous when you consider that many skilled test takers have never had to experience this type of adversity" (Black, 2007, para 2).

But for legitimate diagnosed learning differences, the College Board allows for testing accommodations that include extended time, extended breaks, and how test materials are presented (Services for Students, 2011). Similarly the ACT offers extended time, self-paced testing, and spoken instructions, among other accommodations, for diagnosed conditions (ACT Test Accommodations, 2011).

But what can be said about non diagnosed learning differences? According to the Center for Assessment and Evaluation of Student Learning (Dietel, 2004):

> Not all learning difficulties are learning disabilities! Children develop at different rates, and sometimes what seems to be a learning disability may resolve as the child matures. Importantly, children who are English language learners are sometimes misidentified as having a learning disability, as are children from impoverished backgrounds or with severe problems at home that impact their preparation for school or their behavior (p. 1).

Poor test takers or those with learning difficulties face challenges where so much emphasis is placed on stellar test scores. Such students need to focus on schools that do not place such a high emphasis on test scores. Their best option may be to enter a competitive college after having successfully completed an articulated curriculum at a two-year college.

The Significance of Sub Score Testing Areas

While literature offers much discussion on the correlation of testing and student academic performance, it is essential to analyze what the subtests assess and the importance of the skills measured. Subscores help focus on test areas within larger generic academic regimens in order to gain a better picture of where students fall within more specific areas. The four ISEE testing areas: verbal reasoning, reading comprehension, quantitative reasoning, and mathematics achievement, seemingly provide insight into a student's relative strengths or weaknesses in a particular area. But what do these results mean in a student's education?

Verbal Reasoning and Reading Comprehension

Verbal reasoning is so broadly defined that the Educational Testing Service published an extensive research report ". . . to develop a framework for thinking about verbal reasoning in higher education" and ultimately were ". . . not able to develop a succinct definition of verbal reasoning . . ." (Burton, Kostin, VanEssen, & Welsh, 2009, p.1). And reading is tied to reasoning as "The overview of the cognitive literature of reading comprehension, critical reading, expertise, and reasoning that follows yields a collection of related conceptions of verbal reasoning, rather than a single coherent cognitive theory" (Burton, et al., 2009, p.5). Can this be reduced to say that we seek good thinkers and readers, among other things? No. But that is the essence, and for a college preparatory independent school those qualities are important for students to possess in order to perform well academically. A lack of these qualities may contribute to the detriment of a student's overall academic success.

The assumption of general admission tests is that there are fundamental academic skills that apply across a wide array of disciplines. Language skills in particular apply to all areas of instruction: Learning requires listening and reading, and demonstrating one's learning requires writing and speaking. The emphasis in verbal measures on higher level skills of critical reading is appropriate in higher education, where instruction is intended to produce independent students and practitioners.

Students with poor reading skills tend to lack an extensive vocabulary, have little history of being a reader, are literal readers, and break the reading down into words and sentences rather than understanding them within the context of the text (Burton, et al., 2009, p.8). Additionally, ". . . adept critical reading is one of the most useful aspects of verbal reasoning" (Burton, et al., 2009, p.6). "Critical reading is an analytic activity. The reader *re*reads a text to identify patterns of elements -- information, values, assumptions, and language usage-- throughout the discussion. These elements are tied together in an interpretation, an assertion of an underlying meaning of the text as a whole" (Kurland, 2000, para. 2). According to a colleague, "verbal reasoning is reading in context, and understanding fine shades of meaning of words, making meaning of sentence patterns, and decoding symbols back into words" (T. Fenderson, Personal Communication, February 11, 2011). Also, according to Fenderson, "We put language to thought. Readers who have the inability to see meaning because they are reading words and not decoding, are effectively not readers at all" (T. Fenderson, Personal Communication, February 11, 2011). Verbal

reasoning, critical reading, and comprehension are inextricably tied to student learning and academic performance and it is evident that one who is deficient in any of these areas will struggle with a curriculum where "All disciplines emphasize critical thinking, formulation and defense of ideas and the presentation of facts" ("Academics," n.d.).

Essentially, the successful student must do more than go through the motions of reading and processing words and ideas. They must be able to perceive the entire picture. Perceiving the entire picture and establishing that picture within the framework of smaller integrated views allows the student to visualize all the pieces to the puzzle and how they relate to one another as integral parts. The excellent academic performer takes the basic skills of reading, listening, and interpreting to a higher level and demonstrates the ability to apply these rules to an end product that demonstrates the student's ability to reason within the confines of simple words on paper and sounds of conversation. Verbal reasoning is the ability to take either the written word or a conversation and modify that simple structure of symbols or words into a successful compendium of meaning colored by the student's personal thoughts and environment. Without a solid base in verbal reasoning, the student would not be able to interpret the thoughts and ideas of others either through reading or conversation. Low ISEE test scores in this area might suggest that a particular student is not a good fit for an institution whose curriculum demands above average reasoning skills. Such a student would need to work to overachieve with the hope of treading water in a more challenging academic environment.

Observations

Entrance exams of any kind seem to be suspect across the board with many raising questions regarding their predictability, validity, bias, and perceived value. Regardless of how objective tests can be, results can still be looked at subjectively by any examiner. Though, there are those who argue otherwise. There must be some sort of established instrument that can be relied on to help predict the overall success that may be attributed to future outcomes, yet such a reliable measurement tool has yet to be systematically adopted. However, there is nothing to suggest that many schools are ready to eliminate testing from the admission process despite the controversy. "We will never devise the perfect test—a test that accurately assesses students irrespective of parental education and income, the quality of local schools, and the kind of community students live in" (Atkinson, 2001, para. 33). And despite the literature indicating cultural and gender bias, the importance of college rankings, test preparation strategies, poor test takers, and understanding what the scores mean, knowing and understanding one's entrance exam and how predictive and in what areas they are predictive for one's school population, aid in the making of more sound admission decisions.

Testing may also prove helpful in identifying and addressing potential weaknesses in admitted students. The literature suggests that a holistic approach to applicant evaluation might be most effective, but what do those test scores mean?

Chapter 3: Methodology

"Research is finding out what you don't already know. No one knows everything, but everybody knows something. However, to complicate matters, often what you know, or think you know, is incorrect" (Taflinger, 1996, p. 1). Therefore, this chapter covers the process and methodology addressing the purpose of the study. This chapter restates the purpose of the study and the problem, why it is important to the researcher and the relationship to this particular school site. The chapter also overviews the study design, the population used in the study, the data collection and analysis and a summary of the chapter.

Restatement of the Problem

Available literature on independent school entrance testing is extremely limited and literature on the ISEE exam is entirely absent. Most of the studies on testing relate to the use of the SAT exam in college entrance testing. While one could say testing is testing, one cannot assume that the same rules apply when comparing correlation results with SAT and ISEE results. Secondary school students are a completely different population from college-bound seniors. Also, because independent school admission can be very competitive, it is important to know and understand the tools schools use in their decision making and be more accountable for the role test scores may play in the decision process.

Restatement of the Purpose

Much research has been done on the correlations between SAT scores and student performance in college. However, research into independent school practices reveals little study having been done on test scores at this level. The test many independent schools use is the ISEE created by the ERB. To date, no research has been done on the correlation of ISEE test scores and student performance. The purpose of this study is to look closely at our school's historical entrance test scores and research how well they correlate with or *predict* students' success at our school, specifically with freshmen year-end grade point average. Finally, if findings show a relationship between any portion of the ISEE exam and student GPA, a regression formula can be created to "predict" a freshman year GPA based on the ISEE score inputs in an effort to assist in the admission decision-making process.

Research Questions

The research questions of this study are:

1. Is there a relationship between the ISEE Verbal Reasoning scores and student weighted cumulative GPA at the end of freshman year?
2. Is there a relationship between the ISEE Reading scores and student weighted cumulative GPA at the end of freshman year?
3. Is there a relationship between the ISEE Math scores and student weighted cumulative GPA at the end of freshman year?

4. Is there a relationship between the ISEE Quantitative reasoning scores and student weighted cumulative GPA at the end of freshman year??

Importance to the Researcher

Having been involved with the admission process for twenty-eight years, with seventeen in higher education, and eleven at an independent school, the researcher has observed the use of test scores in the applicant evaluation process. From experience, test scores that include the SAT, ACT, GRE, GMAT, and ISEE remain a pervasive part of how schools look at applicants and ultimately make an admission decision. True, schools look at variety of factors including essays, transcripts from other schools, recommendations, to name a few, but test scores and their apparent significance have always intrigued the researcher. And, with most of the researcher's experience having been at the graduate level, it was observed that the GRE and GMAT scores seemed to have little effect on a student's outcome, and that in fact, many students with lower scores not only succeeded in the program but went on to pursue very successful careers. So, this researcher's quest is to find the significance of test scores specific to her school in order to find a balance in the use of test scores in future admission processes because "The central task of educational research or investigation is to discover the nature of the relationship among educational variables" (Majidi, Personal Communication, Fall 2001).

The Study Site

The school is located in a northwest suburb of Los Angeles, a city with a population of about 124,000 (State and Country, 2010). It borders the Conejo Valley Unified School District, which has a student enrollment over 21,000 (Conejo Valley USD Facebook page, n.d.). The Conejo Valley Unified School District operates four high schools, four middle schools, and 19 elementary schools (Conejo Valley Unified School District, 2010). The elementary schools in the Conejo and surrounding districts provide a solid feeder base for the school.

Opened in the fall of 2000, the school is an independent, college preparatory, Christian day school, serving grades 6 through 12. Rigorous college preparatory academics integrate with athletics, the arts, and a Christian worldview to develop the whole student.

The school is a member of the Educational Records Bureau (ERB), the Association of Christian Schools International (ACSI), the California Association of Independent Schools (CAIS) the California Interscholastic Federation (CIF), National Honor Society (NHS), and California Scholastic Federation (CSF). It is accredited by the Western Association of Schools and Colleges (WASC).

Located on 18 acres, the high school campus consists of a 167,800 sq. ft. classroom, library, performing arts, athletic facility, and office complex (Campus, 2007). State-of-the-art facilities include 8 science labs, 3 computer laboratories, and video conferencing facilities. Each classroom has a TV monitor and access to satellite

TV, internet, and video on demand, with most having ceiling-mounted projectors or smart boards. The visual arts offer art studios, ceramics facilities, and a photography lab. Additional emphasis on the arts boasts a performing arts center containing a theatre classroom, choral room, band/orchestra room, dance room, television production rooms, a digital recording lab, and practice rooms. In the fall of 2009, a new seven acre middle school campus opened its doors. The 72,000 sq. ft. facility has grade level pod architecture, two science labs per grade level, visual and performing arts rooms, library, a computer lab. All the classrooms have ceiling-mounted projectors and some have smart board technology (Campus, 2007).

In 2010 the school added an international student boarding program and launched an online school.

The academic year consists of two semesters. Final grades are issued at the end of each semester. For all students, a grade report is issued at the end of each quarter, and determines eligibility for athletic and academic teams. Individual progress reports, which include written personal comments at designated times of the year, are issued near the middle of each quarter for both middle and high school students. The middle school operates six-day rotating schedule, with classes meeting at the varying times each day and elective and enrichment courses offered on alternating days. Each class period is 43-46 minutes in length. The day begins at 7:45 a.m. and ends at 2:30 p.m. The high school operates on a six-day rotating schedule that includes time for weekly Chapel, Assembly, Forum, and Advisory, with a split lunch period. Each class

period is 50 minutes long. The day begins at 8:00 a.m. and ends at 3:10 p.m.

Curriculum and school environment. According to the school's website, "The academic curriculum at OCS incorporates the whole student-mind, body, soul and spirit. In the academic environment at OCS, students will be challenged to think independently, open-mindedly, critically, and creatively" (Campus, 2007).

The high school offers a challenging academic program designed to prepare students to enter the most academically elite colleges and universities in the nation. "One hundred percent of . . . graduates receive admission to college, 99% attend college, and approximately 90% attend a four-year university" ("College Admission," n.d., p. 4). Sixteen Advanced Placement courses are offered, adding rigor to an already robust college preparatory program. Students may also select from an abundance of visual and performing arts electives.

The middle school offers a thorough, grade-appropriate academic curriculum with a core curriculum of English, math, science, history, Bible, and physical education. Sixth grade students are required to take art history. Seventh and eighth grade students are introduced to a foreign language. Eighth grade students take Algebra I, giving them the opportunity to begin high school with Geometry, and allowing for advanced-level math in the senior year. As an added academic preparation, every student participates in a science lab each week. Enrichment classes such as computers, geography, study skills, social etiquette, music appreciation, and public speaking integrate into the core curriculum to prepare students for the

academic rigor of high school. Additionally, students focusing on music and the arts have more than 20 options available.

Admission. The school selects students on the basis of academic record, ISEE test scores, essay, personal interview, faith, and teacher recommendations. It seeks students who desire to achieve in a demanding college preparatory environment, who are eager to participate in athletic and co-curricular programs, and who will be active, involved members of the school community. Grades, test scores, and Christian values are the most important factors in consideration. However, close attention is paid to recommendations, demonstrated leadership, extracurricular involvement, and the student/parent interview.

Efforts to attract a broad applicant pool include local print advertising, television commercials, direct mail, information sessions, Open House, various other events, and encouragement of campus visits and tours. The addition of an expanded summer program has also introduced families in the community to the school. As an added effort to promote diversity, the school has been certified and approved to admit non-immigrant students from countries throughout the world. This provides the ability to recruit and admit international students and facilitate issuance of their student visas, which enhances the ability to build a broader applicant pool. Applications are accepted beginning in October of the year prior to intended enrollment, with a February 1 deadline. Typically, the high school receives two

applications for every available space, and the middle school receives three for every available space.

Relationship to the Site

The researcher is academic dean of the school, overseeing testing, grading, advanced placement, master schedules, academic probation, and academic awards. Because the researcher is a member of the admissions committee, she ultimately reaps the rewards and the burden of those decisions.

Research Design

The population. Why not just one class of students?

"In practice, prediction equations based on data from one freshman class are applied to the test scores and/or high school GPAs of *future* applicants. Because students may differ over time in their test scores, high school GPAs, or college grades, predictive validity statistics developed from one year's data may misstate the strength of the relationship associated with actual use of such predictions" (Noble & Sawyer, 2002, para. 8).

For each student, the data extracted will include the ISEE scores in verbal reasoning, quantitative reasoning, reading comprehension, and mathematics achievement. Also gathered will be each student's 9th grade weighted cumulative GPA. Since many of the students matriculate from the middle school (grades six through eight) into the high school, there will be instances where the ISEE test scores are recorded prior to high school.

Data collection. Most of the data to be gathered is stored in the school's software system called Education Edge. Stored in various locations are the GPAs and ISEE scores. The data gathering of the ISEE scores will prove somewhat challenging since there has not been consistent recording of test data since the school's inception in 2000. Though much of the scores are stored in the computer system, the data were entered in at least three different locations and will need to be exported and then aggregated to form one complete list. It is vitally important to ensure the accuracy of the data collection for test scores because of the inconsistency of data storage over time. Occasionally, the ISEE scores will be available only on paper located in a student's cumulative file. These will not be included in the study. There may be instances where no test scores are available at all, though that number is expected to be small. The data will be kept in an Excel spreadsheet in keeping with the guidelines for the protection of human subjects.

Data analysis. Following the literature review, student historical data will be gathered to address the research questions.

1. Is there a relationship between the ISEE Verbal Reasoning scores and student weighted cumulative GPA at the end of freshman year?
2. Is there a relationship between the ISEE Reading scores and student weighted cumulative GPA at the end of freshman year?
3. Is there a relationship between the ISEE Math scores and student weighted cumulative GPA at the end of freshman year?

4. Is there a relationship between the ISEE Quantitative reasoning scores and student weighted cumulative GPA at the end of freshman year?

Having gathered the data, descriptive statistics will be run to determine measures of "central tendency" and "variability and variation" (McCall, 2000). The descriptive statistics will analyze the data by gender, individual ISEE scores and GPA. Following the descriptive statistics will be inferential statistics using multiple regression analysis (to simultaneously investigate the effect of several independent variables on a dependent variable) to determine correlation between the selected GPA and each individual ISEE score with a coefficient of .05 (Zikmund, 1994). If a relationship is shown, the researcher will reject the null and determine the strength of the relationship and to what extent changes in the independent variable (each ISEE score) can be attributed to the variability of the dependent variable (GPA). If there is no correlation between the variables, the researcher will accept the null hypothesis and indicate that there is no relationship between the dependent and independent variable. For each variable where the null is rejected the regression analysis will be run again with each variable added sequentially, accepting or rejecting the null until each of the four tests (if applicable) are included in the regression analysis and an equation developed to predict GPA based upon the correlating ISEE scores.

Validity. Validity is "the ability of a scale of measuring instrument to measure what is intended to be measured" (Zikmund, 1994, p. 342). For this research, the four ISEE type scores and freshmen cumulative weighted GPA become the

measurement data. Both are "specific and well-defined attributes" that would suggest content validity is met (Tashakkori &, Teddlie, 1998, p. 81). Though the numbers are objective measures, the researcher will employ the aid of colleagues in the mathematics department who can be considered experts in the field to review the data using "judgmental validation" (Tashakkori &, Teddlie, 1998, p. 81). The researcher will also conduct a review of the data for proper coding and any missing data and make corrections in the data base.

Furthermore, it is important to consider predictive validity since it is the foundation of the study to determine how well entrance test scores can predict end of year freshman GPA. "A high correlation would provide evidence for predictive validity -- it would show that our measure can correctly predict something that we theoretically think it should be able to predict" (Trochim, Criterion-Related Validity, 2006, para. 9).

Reliability. "Reliability is the degree to which the results of a measurement accurately represent the 'magnitude' or 'quality' of a construct" (Tashakkori &, Teddlie 1998, p. 82). Focusing solely on school site data, it is expected that the measurement can be repeated. But errors in measurement are bound to occur since the data is captured from a snapshot where a student may have performed below ability due to personal factors such as lack of sleep or illness. "Factors like these can contribute to errors in measurement that make the student's observed ability appear lower than their true or actual ability" (Trochim, Theory of Reliability, 2006, para. 4).

Summary

This chapter explored the methodology of the study including restatement of the problem, restatement of the purpose, and restatement of the research questions. The restatements were followed by the importance of the study to the researcher and a description of the study site, and the researcher's relationship to the site. Finally, the research design was described, followed by data collection methods and analysis of validity and reliability of the study.

Chapter 4: Research

The purpose of this study was to determine the relationship between new student entrance exam test scores and end of year freshman weighted (academic) GPA. The findings of the study answer the four research questions outlined in chapters one and three and provide descriptive statistics on the sample population of 566 students. In addition, four research questions were added by recommendation of the committee to find the relationship between ISEE sub scores and student grades in English and Mathematics. The data cover a period of seven years beginning in academic year 2005-2006.

Data Collection

The data were collected through exports from the school site's student information system. Seven extracts were performed to identify students who were new freshmen to the high school beginning with academic year 2011-2012 and extracted backwards year-by-year for seven years. A recent limitation of the study is the introduction of a formal tutoring program at the school site. The researcher determined that data gathered post 2012 may reflect inflated GPAs as a result of the program and would not reliably represent true data and potentially skew the results.

Great care was taken for each export to remove all students who attended the school site's middle school to improve the reliability of the statistical analysis since the test scores of those students were representative of sixth, seventh, or eighth grade

entrance testing. Entrance scores from this group are not representative of the same ninth grade testing as others in the population.

Data collected for each student included the four ISEE sub test scores, end of freshman year weighted GPA, gender, and freshman year English and mathematics course grade. Data collection methods were verified for reliability and accuracy by the school's student information systems expert and a resident statistical expert.

The Study

The research questions of this study are:

1. Is there a relationship between the ISEE Verbal Reasoning scores and student weighted cumulative GPA at the end of freshman year?
2. Is there a relationship between the ISEE Reading scores and student weighted cumulative GPA at the end of freshman year?
3. Is there a relationship between the ISEE Math scores and student weighted cumulative GPA at the end of freshman year?
4. Is there a relationship between the ISEE Quantitative reasoning scores and student weighted cumulative GPA at the end of freshman year?
5. Is there a relationship between mathematics course grades and ISEE Verbal Reasoning scores?
6. Is there a relationship between mathematics course grades and ISEE Reading scores?

7. Is there a relationship between mathematics course grades and ISEE Quantitative Reasoning scores?
8. Is there a relationship between mathematics course grades and ISEE Mathematics Achievement scores?

Each ISEE category: verbal reasoning, reading comprehension, quantitative reasoning, and mathematics achievement were run independently with WTD GPA in a regression analysis. The following describe the correlation results.

Is there a relationship between the ISEE Verbal Reasoning scores and student weighted cumulative GPA at the end of freshman year?

The regression equation is

WTD GPA = 2.23 + 0.176 Verbal Reasoning

Predictor	Coef	SE Coef	T	P
Constant	2.23281	0.09620	23.21	0.000
Verbal Reasoning	0.17559	0.01833	9.58	0.000

S = 0.691243 R-Sq = 14.0% R-Sq(adj) = 13.8%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	43.842	43.842	91.76	0.000
Residual Error	565	269.967	0.478		
Total		566	313.809		

Figure 2. Regression Analysis: WTD GPA versus Verbal Reasoning

As seen in Figure 2. Regression Analysis: WTD GPA versus Verbal Reasoning, the statistical analysis resulted in a P-value of less than alpha .05 indicating statistical

significance of the relationship between the dependent and independent variables The determination is to reject the null hypothesis.

Is there a relationship between the ISEE Reading scores and student weighted cumulative GPA at the end of freshman year?

The regression equation is

WTD GPA = 2.18 + 0.187 Reading

Predictor	Coef	SE Coef	T	P
Constant	2.17544	0.08969	24.26	0.000
Reading	0.18725	0.01702	11.00	0.000

S = 0.676331 R-Sq = 17.6% R-Sq(adj) = 17.5%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	55.365	55.365	121.04	0.000
Residual Error	565	258.444	0.457		
Total	566	313.809			

Figure 3. Regression Analysis: WTD GPA versus Reading

As seen in Figure 3. Regression Analysis: WTD GPA versus Reading, the statistical analysis resulted in a P-value of less than alpha .05 indicating statistical significance of the relationship between the dependent and independent variables The determination is to reject the null hypothesis.

Is there a relationship between the ISEE quantitative reasoning score and student weighted cumulative GPA at the end of freshman year?

The regression equation is

WTD GPA = 2.07 + 0.204 Quantitative Reasoning

Predictor	Coef	SE Coef	T	P
Constant	2.07086	0.09136	22.67	0.000
Quantitative Reasoning	0.20365	0.01702	11.96	0.000

S = 0.665706 R-Sq = 20.2% R-Sq(adj) = 20.1%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	63.421	63.421	143.11	0.000
Residual Error	565	250.388	0.443		
Total		566	313.809		

Figure 4. Regression Analysis: WTD GPA versus Quantitative Reasoning

As seen in Figure 4. Regression Analysis: WTD GPA versus Quantitative Reasoning, the statistical analysis resulted in a P-value of less than alpha .05 indicating statistical significance of the relationship between the dependent and independent variables The determination is to reject the null hypothesis.

Is there a relationship between the ISEE math achievement scores and student weighted cumulative GPA at the end of freshman year?

The regression equation is

WTD GPA = 1.97 + 0.217 Math Achievement

Predictor	Coef	SE Coef	T	P
Constant	1.97411	0.09436	20.92	0.000
Math Achievement	0.21719	0.01723	12.61	0.000

S = 0.658404 R-Sq = 22.0% R-Sq(adj) = 21.8%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	68.884	68.884	158.90	0.000
Residual Error	565	244.925	0.433		
Total		566	313.809		

Figure 5. Regression Analysis: WTD GPA versus Math Achievement

As seen in Figure 5. Regression Analysis: WTD GPA versus Math Achievement, the statistical analysis resulted in a P-value of less than alpha .05 indicating statistical significance of the relationship between the dependent and independent variables The determination is to reject the null hypothesis.

Having run regression analysis for each research question and rejecting the null for each, it was determined there is a weak positive relationship between each ISEE sub score and end of year freshman weighted GPA.

Having rejected the null for all research questions, all four sub scores were introduced in a multiple regression analysis to determine the relationship between the four sub scores and weighted GPA at the end of freshman year. The statistics yielded the following results:

The regression equation is:

WTD GPA = 1.57 + 0.108 Math Achievement + 0.0397 Verbal Reasoning + 0.0823 Reading + 0.0716 Quantitative Reasoning

Predictor	Coef	SE Coef	T	P
Constant	1.5690	0.1069	14.68	0.000
Math Achievement	0.10827	0.02433	4.45	0.000
Verbal Reasoning	0.03971	0.02239	1.77	0.007
Reading	0.08225	0.02165	3.80	0.000
Quantitative Reasoning	0.07156	0.02392	2.99	0.003

S = 0.629850 R-Sq = 29.0% R-Sq(adj) = 28.4%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	4	90.858	22.715	57.26	0.000
Residual Error	562	222.951	0.397		
Total		566	313.809		

Source	DF	Seq SS
Math Achievement	1	68.884
Verbal Reasoning	1	11.297
Reading	1	7.125
Quantitative Reasoning	1	3.552

Figure 6. Regression Analysis: WTD GPA versus Math Achievement, Verbal Reasoning, Reading, and Quantitative Reasoning

As seen in Figure 6. Regression Analysis: WTD GPA versus Math Achievement, Verbal Reasoning, Reading, and Quantitative Reasoning, the statistical analysis resulted in a P-value of less than alpha .05 indicating statistical significance of the relationship between the dependent and independent variables The determination is to reject the null hypothesis.

Additional Research

During the course of the preliminary oral defense, the committee suggested further research relating to ISEE scores and student performance in mathematics and English courses. Data were retrieved for student subjects that included freshman year mathematics and English courses. The mathematics courses include Algebra IA, Algebra IB, Geometry and Geometry Honors. The English courses include English 9 and English 9 Honors. The weighted GPA comprises such course grades. There were two ways to proceed with this portion of the study. The first was to analyze all the course grades for mathematics and English (independently) as dependent variables with a weight given for honors courses on a five-point scale. The second was to analyze mathematics and English grades separately for honors and non-honors with no weight given to determine a correlation with ISEE scores, if any. It was determined that using a weighted scale would more accurately yield reliable results.

Furthermore, at the final defense, the committee recommended that combining the four subscores into a composite number may reveal different results since the combined scores represent varying measurements. The results can be compared to the multiple regression analysis of the four subscores.

Research question 5: Is there a relationship between mathematics course grades and ISEE Verbal Reasoning scores?

All the course grades on an A through F scale were converted to a five-point scale according to Table 7:

Table 7.
Grade Point Values.

Grade	Unweighted Grade Points	Weighted Grade Points
A	4.0	5.0
A-	3.7	4.7
B+	3.3	4.3
B	3.0	4.0
B-	2.7	3.7
C+	2.3	3.3
C	2.0	3.0
C-	1.7	1.7
D+	1.3	1.3
D	1.0	1.0
D-	0.7	0.7
F	0.0	0.0

The regression equation is

Math Grade = 2.13 + 0.153 Verbal Reasoning

564 cases used, 3 cases contain missing values

Predictor	Coef	SE Coef	T	P
Constant	2.1293	0.1204	17.69	0.000
Verbal Reasoning	0.15296	0.02294	6.67	0.000

S = 0.860987 R-Sq = 7.3% R-Sq(adj) = 7.2%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	32.965	32.965	44.47	0.000
Residual Error	562	416.610	0.741		
Total	563	449.575			

Figure 7. Regression Analysis: Math Grade versus Verbal Reasoning

As seen in Figure 7. Regression Analysis: Math Grade versus Verbal Reasoning, the statistical analysis resulted in a P-value of less than alpha .05 indicating statistical significance of the relationship between the dependent and independent variables The determination is to reject the null hypothesis.

Research question 6: Is there a relationship between all mathematics course grades and ISEE Reading scores? All the course grades on an A through F scale were converted to a five-point scale according to Table 8:

Table 8.
Grade Point Values.

Grade	Unweighted Grade Points	Weighted Grade Points
A	4.0	5.0
A-	3.7	4.7
B+	3.3	4.3
B	3.0	4.0
B-	2.7	3.7
C+	2.3	3.3
C	2.0	3.0
C-	1.7	1.7
D+	1.3	1.3
D	1.0	1.0
D-	0.7	0.7
F	0.0	0.0

The regression equation is

Math Grade = 2.13 + 0.153 Reading

564 cases used, 3 cases contain missing values

Predictor	Coef	SE Coef	T	P
Constant	2.1312	0.1142	18.67	0.000
Reading	0.15278	0.02167	7.05	0.000

S = 0.857298 R-Sq = 8.1% R-Sq(adj) = 8.0%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	36.528	36.528	49.70	0.000
Residual Error	562	413.047	0.735		
Total	563	449.575			

Figure 8. Regression Analysis: Math Grade versus Reading

As seen in Figure 8: Regression Analysis: Math Grade versus Reading, the statistical analysis resulted in a P-value of less than alpha .05 indicating statistical significance of the relationship between the dependent and independent variables The determination is to reject the null hypothesis.

Research question 7: Is there a relationship between all mathematics course grades and ISEE Quantitative Reasoning scores? All the course grades on an A through F scale were converted to a five-point scale according to Table 9:

Table 9.
Grade Point Values.

Grade	Unweighted Grade Points	Weighted Grade Points
A	4.0	5.0
A-	3.7	4.7
B+	3.3	4.3
B	3.0	4.0
B-	2.7	3.7
C+	2.3	3.3
C	2.0	3.0
C-	1.7	1.7
D+	1.3	1.3
D	1.0	1.0
D-	0.7	0.7
F	0.0	0.0

The regression equation is

Math Grade = 1.72 + 0.230 Quantitative Reasoning

564 cases used, 3 cases contain missing values

Predictor	Coef	SE Coef	T	P
Constant	1.7184	0.1112	15.46	0.000
Quantitative Reasoning	0.23031	0.02071	11.12	0.000

S = 0.809751 R-Sq = 18.0% R-Sq(adj) = 17.9%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	81.074	81.074	123.65	0.000
Residual Error	562	368.501	0.656		
Total	563	449.575			

Figure 9. Regression Analysis: Math Grade versus Quantitative Reasoning

As seen in Figure 9: Regression Analysis: Math Grade versus Quantitative Reasoning, the statistical analysis resulted in a P-value of less than alpha .05 indicating statistical significance of the relationship between the dependent and independent variables The determination is to reject the null hypothesis.

Research question 8: Is there a relationship between mathematics course grades and ISEE Mathematics Achievement scores? All the course grades on an A through F scale were converted to a five-point scale according to Table 10:

Table 10.
Grade Point Values.

Grade	Unweighted Grade Points	Weighted Grade Points
A	4.0	5.0
A-	3.7	4.7
B+	3.3	4.3
B	3.0	4.0
B-	2.7	3.7
C+	2.3	3.3
C	2.0	3.0
C-	1.7	1.7
D+	1.3	1.3
D	1.0	1.0
D-	0.7	0.7
F	0.0	0.0

The regression equation is

Math Grade = 1.72 + 0.224 Math Achievement

564 cases used, 3 cases contain missing values

Predictor	Coef	SE Coef	T	P
Constant	1.7239	0.1175	14.68	0.000
Math Achievement	0.22356	0.02144	10.43	0.000

S = 0.818705 R-Sq = 16.2% R-Sq(adj) = 16.1%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	72.879	72.879	108.73	0.000
Residual Error	562	376.697	0.670		
Total		563 449.575			

Figure 10. Regression Analysis: Math Grade versus Math Achievement

As seen in Figure 10. Regression Analysis: Math Grade versus Math Achievement, the statistical analysis resulted in a P-value of less than alpha .05 indicating statistical significance of the relationship between the dependent and independent variables The determination is to reject the null hypothesis.

Research question 9: Is there a relationship between English course grades and ISEE Verbal Reasoning scores? All the course grades on an A through F scale were converted to a five-point scale according to Table 11:

Table 11.
Grade Point Values.

Grade	Unweighted Grade Points	Weighted Grade Points
A	4.0	5.0
A-	3.7	4.7
B+	3.3	4.3
B	3.0	4.0
B-	2.7	3.7
C+	2.3	3.3
C	2.0	3.0
C-	1.7	1.7
D+	1.3	1.3
D	1.0	1.0
D-	0.7	0.7
F	0.0	0.0

The regression equation is

English Grade = 1.72 + 0.258 Verbal Reasoning

Predictor	Coef	SE Coef	T	P
Constant	1.7218	0.1395	12.35	0.000
Verbal Reasoning	0.25835	0.02658	9.72	0.000

S = 1.00213 R-Sq = 14.3% R-Sq(adj) = 14.2%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	94.910	94.910	94.51	0.000
Residual Error	565	567.411	1.004		
Total	566	662.321			

Figure 11. Regression Analysis: English Grade versus Verbal Reasoning

As seen in Figure 11. Regression Analysis: English Grade versus Verbal Reasoning, the statistical analysis resulted in a P-value of less than alpha .05 indicating

statistical significance of the relationship between the dependent and independent variables The determination is to reject the null hypothesis.

Research question 10: Is there a relationship between English course grades and ISEE Reading scores? All the course grades on an A through F scale were converted to a five-point scale according to Table 12:

Table 12.
Grade Point Values.

Grade	Unweighted Grade Points	Weighted Grade Points
A	4.0	5.0
A-	3.7	4.7
B+	3.3	4.3
B	3.0	4.0
B-	2.7	3.7
C+	2.3	3.3
C	2.0	3.0
C-	1.7	1.7
D+	1.3	1.3
D	1.0	1.0
D-	0.7	0.7
F	0.0	0.0

The regression equation is

English Grade = 1.58 + 0.287 Reading

Predictor	Coef	SE Coef	T	P
Constant	1.5808	0.1287	12.28	0.000
Reading	0.28684	0.02443	11.74	0.000

S = 0.970730 R-Sq = 19.6% R-Sq(adj) = 19.5%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	129.91	129.91	137.86	0.000
Residual Error	565	532.41	0.94		
Total	566	662.32			

Figure 12. Regression Analysis: English Grade versus Reading

As seen in Figure 12. Regression Analysis: English Grade versus Reading, the statistical analysis resulted in a P-value of less than alpha .05 indicating statistical significance of the relationship between the dependent and independent variables The determination is to reject the null hypothesis.

Research question 11: Is there a relationship between English course grades and ISEE Quantitative Reasoning scores? All the course grades on an A through F scale were converted to a five-point scale according to Table 13:

Table 13.
Grade Point Values.

Grade	Unweighted Grade Points	Weighted Grade Points
A	4.0	5.0
A-	3.7	4.7
B+	3.3	4.3
B	3.0	4.0
B-	2.7	3.7
C+	2.3	3.3
C	2.0	3.0
C-	1.7	1.7
D+	1.3	1.3
D	1.0	1.0
D-	0.7	0.7
F	0.0	0.0

The regression equation is

English Grade = 1.68 + 0.261 Quantitative Reasoning

Predictor	Coef	SE Coef	T	P
Constant	1.6807	0.1364	12.32	0.000
Quantitative Reasoning	0.26105	0.02542	10.27	0.000

S = 0.993883 R-Sq = 15.7% R-Sq(adj) = 15.6%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	104.21	104.21	105.50	0.000
Residual Error	565	558.11	0.99		
Total	566	662.32			

Figure 13. Regression Analysis: English Grade versus Quantitative Reasoning

As seen in Figure 13. Regression Analysis: English Grade versus Quantitative Reasoning, the statistical analysis resulted in a P-value of less than alpha .05 indicating

statistical significance of the relationship between the dependent and independent variables The determination is to reject the null hypothesis.

Research question 12: Is there a relationship between English course grades and ISEE Math Achievement scores? All the course grades on an A through F scale were converted to a five-point scale according to Table 14:

Table 14.
Grade Point Values.

Grade	Unweighted Grade Points	Weighted Grade Points
A	4.0	5.0
A-	3.7	4.7
B+	3.3	4.3
B	3.0	4.0
B-	2.7	3.7
C+	2.3	3.3
C	2.0	3.0
C-	1.7	1.7
D+	1.3	1.3
D	1.0	1.0
D-	0.7	0.7
F	0.0	0.0

The regression equation is

English Grade = 1.59 + 0.272 Math Achievement

Predictor	Coef	SE Coef	T	P
Constant	1.5904	0.1420	11.20	0.000
Math Achievement	0.27197	0.02592	10.49	0.000

S = 0.990491 R-Sq = 16.3% R-Sq(adj) = 16.2%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	108.02	108.02	110.10	0.000
Residual Error	565	554.31	0.98		
Total	566	662.32			

Figure 14. Regression Analysis: English Grade versus Math Achievement

As seen in Figure 14. Regression Analysis: English Grade versus Math Achievement, the statistical analysis resulted in a P-value of less than alpha .05 indicating statistical significance of the relationship between the dependent and independent variables The determination is to reject the null hypothesis.

Research question 13: Is there a relationship between the end of year freshman weighted GPA and a composite number of the four ISEE subscores. Figure 15 reflects the results of the regression analysis.

The regression equation is

WTD GPA = 1.57 + 0.0759 Composite ISEE

Predictor	Coef	SE Coef	T	P
Constant	1.5666	0.1065	14.71	0.000
Composite ISEE	0.075922	0.005071	14.97	0.000

S = 0.630607 R-Sq = 28.4% R-Sq(adj) = 28.3%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	89.129	89.129	224.13	0.000
Residual Error	565	224.681	0.398		
Total	566	313.089			

Figure 15. Regression Analysis: WTD GPA versus Composite ISEE

As seen in Figure 15. Regression Analysis: WTD GPA versus Composite ISEE, the statistical analysis resulted in a P-value of less than alpha .05 indicating statistical significance of the relationship between the dependent and independent variables The determination is to reject the null hypothesis.

Chapter 5: Conclusions

The ability of an admission committee of any school to determine the effectiveness of entrance test scores remains an ongoing debate. All current research focuses on SAT and ACT data and correlation to end of year freshman GPA. According to Strauss (2012):

> We all know that many college admissions offices imbue SAT and ACT scores with importance. At schools that are deluged with tens of thousands of applications, numbers matter, so these scores can play an outsized role in admission decisions. That means these scores can affect where individual students get to go to school. Yet significant research shows that SAT and ACT scores don't really tell us anything meaningful about a student's future, either academically or in the work world (p. 5).

As described in Chapter Two, the significance and use of entrance testing remains debatable. The research in this study aims to find the relationship between test scores and student performance to aid in future decision making in the admission process. This chapter presents the results of data analysis and makes recommendations for application and further research.

Chapter Structure

The remainder of this chapter begins with a restatement of the problem, the purpose of the study, a restatement of the research questions, and finally important conclusions and further recommendations.

Available literature on independent school entrance testing is extremely limited and literature on the ISEE exam is nonexistent. Most of the studies on testing relate to the use of the SAT and ACT exams in college entrance testing. While one could say testing is testing, one cannot assume that the same rules apply when comparing correlation results with SAT and ISEE results. Secondary school students are a different population from college-bound seniors. Also, because independent school admission can be very competitive, it is important to know and understand the tools schools use in their decision-making process and how these tools can be held accountable for the extent to which test scores play a role.

Much research has been done on the correlations between SAT and ACT scores and student performance in college. However, research into independent school practices reveals little has been done at this level. The test many independent schools use is the ISEE created by the ERB. To date, no research has been done on the correlation of ISEE test scores and student performance. The purpose of this study was to look closely at the school's historical entrance test scores and conduct research to determine how well they correlate with or *predict* students' success at the site school, specifically with freshmen end of year weighted grade point average.

Finally, if findings show a relationship between any portion of the ISEE exam and student GPA, a regression formula will be created to *predict* a freshman year GPA based on the ISEE score inputs in an effort to assist in the admission decision-making process.

Research Questions

There were four original research questions relating to the relationship between ISEE subscores and end of year freshman weighted GPA. However, at the recommendation of the researcher's committee, more research questions were added at the conclusion of chapter three. The research questions of this study are:

1. Is there a relationship between the ISEE Verbal Reasoning scores and student weighted cumulative GPA at the end of freshman year?
2. Is there a relationship between the ISEE Reading scores and student weighted cumulative GPA at the end of freshman year?
3. Is there a relationship between the ISEE Math scores and student weighted cumulative GPA at the end of freshman year?
4. Is there a relationship between the ISEE Quantitative reasoning scores and student weighted cumulative GPA at the end of freshman year?
5. Is there a relationship between mathematics course grades and ISEE Verbal Reasoning scores?
6. Is there a relationship between mathematics course grades and ISEE Reading scores?

7. Is there a relationship between mathematics course grades and ISEE Quantitative Reasoning scores?
8. Is there a relationship between mathematics course grades and ISEE Mathematics Achievement scores?
9. Is there a relationship between English course grades and ISEE Verbal Reasoning scores?
10. Is there a relationship between English course grades and ISEE Reading scores?
11. Is there a relationship between English course grades and ISEE Quantitative Reasoning scores?
12. Is there a relationship between English course grades and ISEE Math Achievement scores?
13. Is there a relationship between the end of year freshman weighted GPA and a composite number of the four ISEE subscores.

Results of Data Analysis

Research Question 1: Is there a relationship between the ISEE Verbal Reasoning scores and student weighted cumulative GPA at the end of freshman year?

As seen in Chapter Four, Figure 2. Regression Analysis: WTD GPA versus Verbal Reasoning, the statistical analysis resulted in the following:

P-value = 0.0000

Alpha = .05.

P-value is less than alpha. Reject the null.

R^2 = 14.0%

The regression equation is WTD GPA =2.23 + 0.176 * verbal reasoning score.

The results indicate there is a weak positive relationship between a student's verbal reasoning score and end of year freshman weighted GPA. The R^2 value indicates that 14.0 percent of the variability of the weighted GPA can be explained by the ISEE verbal reasoning score. The statistical analysis also revealed that observations of the independent variable showed to have a larger influence for higher scores than for low scores (see Figure 16.) Therefore, except for the very low and very high scores, (1 and 9) the Verbal Reasoning ISEE score seems to have little effect on a student's end of year weighted cumulative freshman GPA.

The lowest correlation of all ISEE scores analyzed against weighted GPA, Verbal Reasoning seems to play a lesser role in the prediction of overall academic success and may not be a good predictor when considering admission decisions.

Obs	Verbal Reasoning	WTD GPA	Fit	SE Fit	Residual	St Resid	
2	9.00	4.4600	3.8131	0.0788	0.6469	0.94	X
14	9.00	4.0200	3.8131	0.0788	0.2069	0.30	X
16	2.00	4.1700	2.5840	0.0622	1.5860	2.30R	
133	9.00	3.9000	3.8131	0.0788	0.0869	0.13	X
188	1.00	2.5400	2.4084	0.0789	0.1316	0.19	X
287	4.00	1.5400	2.9352	0.0344	-1.3952	-2.02R	
292	7.00	1.5000	3.4619	0.0467	-1.9619	-2.84R	
296	4.00	1.1400	2.9352	0.0344	-1.7952	-2.60R	
297	4.00	1.3000	2.9352	0.0344	-1.6352	-2.37R	
303	3.00	1.2800	2.7596	0.0468	-1.4796	-2.15R	
304	8.00	1.9200	3.6375	0.0621	-1.7175	-2.49R	
310	5.00	1.7200	3.1108	0.0290	-1.3908	-2.01R	
312	5.00	1.6000	3.1108	0.0290	-1.5108	-2.19R	
313	5.00	1.2000	3.1108	0.0290	-1.9108	-2.77R	
316	6.00	4.6700	3.2863	0.0343	1.3837	2.00R	
320	9.00	4.1700	3.8131	0.0788	0.3569	0.52	X
323	9.00	4.5400	3.8131	0.0788	0.7269	1.06	X
332	9.00	4.4000	3.8131	0.0788	0.5869	0.85	X
367	9.00	4.5000	3.8131	0.0788	0.6869	1.00	X
373	9.00	4.1200	3.8131	0.0788	0.3069	0.45	X
381	2.00	4.0200	2.5840	0.0622	1.4360	2.09R	
386	9.00	3.9400	3.8131	0.0788	0.1269	0.18	X
443	2.00	3.9800	2.5840	0.0622	1.3960	2.03R	
456	3.00	4.1400	2.7596	0.0468	1.3804	2.00R	
491	5.00	1.6300	3.1108	0.0290	-1.4808	-2.14R	
550	6.00	1.6800	3.2863	0.0343	-1.6063	-2.33R	
552	5.00	1.6700	3.1108	0.0290	-1.4408	-2.09R	
560	9.00	4.0200	3.8131	0.0788	0.2069	0.30	X
566	9.00	3.0600	3.8131	0.0788	-0.7531	-1.10	X

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.

Figure 16. Unusual observations

Research Question 2: Is there a relationship between the ISEE Reading scores and student weighted cumulative GPA at the end of freshman year?

P-value = 0.0000

Alpha = .05.

P-value is less than alpha. Reject the null.

R^2 = 17.6%

The regression equation is WTD GPA =2.18 + 0.187 * reading.

The results indicate there is a weak positive relationship between a student's reading score and end of year freshman weighted GPA. The R^2 value indicates that 17.6 percent of the variability of the weighted GPA can be explained by the ISEE reading score. The statistical analysis also revealed that observations of the independent variable showed to have a larger influence for lower scores than for higher scores. (see Figure 17.) Therefore, except for the very low and very high scores, (1 and 9) the Reading ISEE score seems to have a lesser effect on a student's end of year weighted cumulative freshman GPA, though slightly more than the Verbal Reasoning score.

Put in place in the last year is an Analytical Reading course for students with a low ISEE Reading score, it is hoped that a focus on reading comprehension will help with students entering with poor reading scores. Not enough data is available to determine the success of the plan and its students. An analysis will be done next year to determine if the course is a viable alternative for freshmen flagged with a reading deficiency.

Obs	Reading	WTD GPA	Fit	SE Fit	Residual	St Resid	
39	1.00	3.0000	2.3627	0.0737	0.6373	0.95	X
96	9.00	3.1200	3.8607	0.0738	-0.7407	-1.10	X
103	1.00	3.0700	2.3627	0.0737	0.7073	1.05	X
165	1.00	2.3300	2.3627	0.0737	-0.0327	-0.05	X
181	6.00	1.9400	3.2990	0.0331	-1.3590	-2.01R	
194	5.00	1.6600	3.1117	0.0284	-1.4517	-2.15R	
199	8.00	2.0000	3.6735	0.0585	-1.6735	-2.48R	
204	1.00	2.2800	2.3627	0.0737	-0.0827	-0.12	X
216	8.00	2.1300	3.6735	0.0585	-1.5435	-2.29R	
219	5.00	1.7400	3.1117	0.0284	-1.3717	-2.03R	
225	1.00	1.8800	2.3627	0.0737	-0.4827	-0.72	X
229	1.00	2.0200	2.3627	0.0737	-0.3427	-0.51	X
231	7.00	1.9000	3.4862	0.0444	-1.5862	-2.35R	
234	1.00	2.2800	2.3627	0.0737	-0.0827	-0.12	X
287	5.00	1.5400	3.1117	0.0284	-1.5717	-2.33R	
292	7.00	1.5000	3.4862	0.0444	-1.9862	-2.94R	
296	3.00	1.1400	2.7372	0.0443	-1.5972	-2.37R	
297	3.00	1.3000	2.7372	0.0443	-1.4372	-2.13R	
303	3.00	1.2800	2.7372	0.0443	-1.4572	-2.16R	
304	7.00	1.9200	3.4862	0.0444	-1.5662	-2.32R	
306	1.00	1.8500	2.3627	0.0737	-0.5127	-0.76	X
310	5.00	1.7200	3.1117	0.0284	-1.3917	-2.06R	
312	5.00	1.6000	3.1117	0.0284	-1.5117	-2.24R	
313	6.00	1.2000	3.2990	0.0331	-2.0990	-3.11R	
314	6.00	1.8300	3.2990	0.0331	-1.4690	-2.17R	
316	6.00	4.6700	3.2990	0.0331	1.3710	2.03R	
321	9.00	4.2800	3.8607	0.0738	0.4193	0.62	X
325	9.00	4.2300	3.8607	0.0738	0.3693	0.55	X
332	9.00	4.4000	3.8607	0.0738	0.5393	0.80	X
333	9.00	4.3800	3.8607	0.0738	0.5193	0.77	X
356	5.00	4.4800	3.1117	0.0284	1.3683	2.02R	
474	9.00	2.2000	3.8607	0.0738	-1.6607	-2.47R	X
490	7.00	1.9200	3.4862	0.0444	-1.5662	-2.32R	
503	1.00	3.1200	2.3627	0.0737	0.7573	1.13	X
522	1.00	2.7200	2.3627	0.0737	0.3573	0.53	X
525	1.00	3.2200	2.3627	0.0737	0.8573	1.28	X
542	1.00	2.1200	2.3627	0.0737	-0.2427	-0.36	X

Obs	Reading	WTD GPA	Fit	SE Fit	Residual	St Resid	
548	1.00	2. 9800	2.3627	0.0737	0.6173	0.92	X
560	9.00	4.0200	3.8607	0.0738	0.1593	0.24	X
566	9.00	3.0600	3.8607	0.0738	-0.8007	-1.19	X

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.

Figure 17. Unusual observations

Research Question 3: Is there a relationship between the ISEE quantitative reasoning score and student weighted cumulative GPA at the end of freshman year?

P-value = 0.0000

Alpha = .05.

P-value is less than alpha. Reject the null.

R^2 = 20.2%

The regression equation is WTD GPA =2.07 + 0.204 * quantitative reasoning. The results indicate there is a weak positive relationship between a student's quantitative reasoning score and end of year freshman weighted GPA. The R^2 value indicates that 20.2 percent of the variability of the weighted GPA can be explained by the ISEE quantitative reasoning score. The statistical analysis also revealed that observations of the independent variable showed to have a larger influence for higher scores than low scores (see Figure 18.) Therefore, except for the very low and very high scores, (1 and 9) the Quantitative Reasoning ISEE score have a larger effect on a student's end of year weighted cumulative freshman GPA, more so than the Verbal Reasoning and Reading scores.

Not anticipated, the Quantitative Reasoning scores on the ISEE seem to have a greater effect on student performance than the two verbal scores and it will be so noted at future admission committee meetings to watch for low scores and make decisions with the proper acumen.

Obs	Quantitative Reasoning	WTD GPA	Fit	SE Fit	Residual	St Resid	
40	9.00	3.0800	3.9037	0.0719	-0.8237	-1.24	X
89	9.00	3.1400	3.9037	0.0719	-0.7637	-1.15	X
115	1.00	2.8000	2.2745	0.0753	0.5255	0.79	X
130	9.00	3.6800	3.9037	0.0719	-0.2237	-0.34	X
179	9.00	3.1200	3.9037	0.0719	-0.7837	-1.18	X
181	6.00	1.9400	3.2928	0.0318	-1.3528	-2.03R	
226	6.00	1.8500	3.2928	0.0318	-1.4428	-2.17R	
236	5.00	1.6800	3.0891	0.0280	-1.4091	-2.12R	
240	1.00	2.1000	2.2745	0.0753	-0.1745	-0.26	X
241	7.00	2.1600	3.4964	0.0426	-1.3364	-2.01R	
243	7.00	2.0300	3.4964	0.0426	-1.4664	-2.21R	
275	1.00	2.6700	2.2745	0.0753	0.3955	.60	X
287	6.00	1.5400	3.2928	0.0318	-1.7528	-2.64R	
292	4.00	1.5000	2.8855	0.0337	-1.3855	-2.08R	
296	4.00	1.1400	2.8855	0.0337	-1.7455	-2.63R	
297	3.00	1.3000	2.6818	0.0455	-1.3818	-2.08R	
303	3.00	1.2800	2.6818	0.0455	-1.4018	-2.11R	
310	5.00	1.7200	3.0891	0.0280	-1.3691	-2.06R	
313	3.00	1.2000	2.6818	0.0455	-1.4818	-2.23R	
326	2.00	4.0700	2.4782	0.0599	1.5918	2.40R	
333	9.00	4.3800	3.9037	0.0719	0.4763	0.72	X
338	9.00	4.4500	3.9037	0.0719	0.5463	0.83	X
339	9.00	4.4500	3.9037	0.0719	0.5463	0.83	X
346	9.00	4.5400	3.9037	0.0719	0.6363	0.96	X
351	3.00	4.0200	2.6818	0.0455	1.3382	2.01R	
352	2.00	4.0700	2.4782	0.0599	1.5918	2.40R	
356	5.00	4.4800	3.0891	0.0280	1.3909	2.09R	
361	3.00	4.1200	2.6818	0.0455	1.4382	2.17R	
386	9.00	3.9400	3.9037	0.0719	0.0363	0.05	X
478	7.00	2.0700	3.4964	0.0426	-1.4264	-2.15R	
490	8.00	1.9200	3.7001	0.0566	-1.7801	-2.68R	

Obs	Quantitative Reasoning	WTD GPA	Fit	SE Fit	Residual	St Resid	
502	1.00	3.2800	2.2745	0.0753	1.0055	1.52	X
523	9.00	3.3400	3.9037	0.0719	-0.5637	-0.85	X
550	6.00	1.6800	3.2928	0.0318	-1.6128	-2.43R	
552	6.00	1.6700	3.2928	0.0318	-1.6228	-2.44R	

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.

Figure 18. Unusual observations

Research Question 4: Is there a relationship between the ISEE math achievement scores and student weighted cumulative GPA at the end of freshman year?

P-value = 0.0000

Alpha = .05.

P-value is less than alpha. Reject the null.

R^2 = 22.0%

The regression equation is WTD GPA =1.97 + 0.217 * math achievement.

The results indicate there is a weak positive relationship between a student's Math Achievement score and end of year freshman weighted GPA. The R^2 value indicates that 22.0 percent of the variability of the weighted GPA can be explained by the ISEE Math Achievement score. The statistical analysis also revealed that observations of the independent variable showed to have a larger influence for higher scores than low scores.

The observations where the independent variable showed a large influence showed that, for the most part, the higher score of 9 has a greater influence on results

than a lower score of 1. This may suggest that the higher scores have a greater predictive value than lower ones. But the lower influence of lower scores could be due to intervention measures that support student success (see Figure 19.). Therefore, except for the very low and very high scores, (1 and 9) the Math Achievement ISEE score seems to have the greatest effect on a student's end of year weighted cumulative freshman GPA, more so than the other three scores.

With a 22.0 R^2 value, the relationship between Math Achievement scores and freshman end of year weighted GPA has the greatest correlation of all four ISEE scores. As mentioned for the Math Achievement research question, it was unexpected that this category would produce the result of having the greatest effect on student performance. Anecdotally, the researcher and colleagues believed that verbal and reading skills would play a more important role in student success and it appears that mathematical skills play a greater role.

Obs	Math Achievement	WTD GPA	Fit	SE Fit	Residual	St Resid	
19	9.00	4.0000	3.9288	0.0705	0.0712	0.11	X
150	7.00	2.1700	3.4944	0.0411	-1.3244	-2.02R	
157	1.00	2.7300	2.1913	0.0781	0.5387	0.82	X
180	8.00	2.2800	3.7116	0.0551	-1.4316	-2.18R	
181	7.00	1.9400	3.4944	0.0411	-1.5544	-2.37R	
194	5.00	1.6600	3.0600	0.0279	-1.4000	-2.13R	
261	9.00	3.0600	3.9288	0.0705	-0.8688	-1.33	X
287	6.00	1.5400	3.2772	0.0306	-1.7372	-2.64R	
292	5.00	1.5000	3.0600	0.0279	-1.5600	-2.37R	
296	3.00	1.1400	2.6257	0.0474	-1.4857	-2.26R	
297	4.00	1.3000	2.8429	0.0349	-1.5429	-2.35R	
303	4.00	1.2800	2.8429	0.0349	-1.5629	-2.38R	
310	6.00	1.7200	3.2772	0.0306	-1.5572	-2.37R	
313	4.00	1.2000	2.8429	0.0349	-1.6429	-2.50R	
326	3.00	4.0700	2.6257	0.0474	1.4443	2.20R	
332	9.00	4.4000	3.9288	0.0705	0.4712	0.72	X
339	9.00	4.4500	3.9288	0.0705	0.5212	0.80	X
346	9.00	4.5400	3.9288	0.0705	0.6112	0.93	X
348	9.00	4.3000	3.9288	0.0705	0.3712	0.57	X
363	1.00	3.8200	2.1913	0.0781	1.6287	2.49R	X
367	9.00	4.5000	3.9288	0.0705	0.5712	0.87	X
378	3.00	3.9400	2.6257	0.0474	1.3143	2.00R	
386	9.00	3.9400	3.9288	0.0705	0.0112	0.02	X
408	9.00	3.8000	3.9288	0.0705	-0.1288	-0.20	X
430	9.00	3.9500	3.9288	0.0705	0.0212	0.03	X
437	9.00	3.6300	3.9288	0.0705	-0.2988	-0.46	X
477	7.00	2.1200	3.4944	0.0411	-1.3744	-2.09R	
490	7.00	1.9200	3.4944	0.0411	-1.5744	-2.40R	
550	5.00	1.6800	.0600	0.0279	-1.3800	-2.10R	
554	9.00	4.4000	3.9288	0.0705	0.4712	0.72	X
560	9.00	4.0200	3.9288	0.0705	0.0912	0.14	X

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.

Figure 19. Unusual observations

Though not a research question, the researcher wanted to know, is there a relationship between all four ISEE sub scores and end of year freshman GPA?

The regression equation is WTD GPA=1.57 + 0.0397 * verbal reasoning + 0.0823 * reading + 0.0716 * quantitative reasoning + 0.108 * math achievement.

Though there is a weak positive relationship between the four sub scores and freshman year weighted GPA, the R^2 value suggests that 29.0 percent of the variability of end of year freshman weighted GPA can be explained by the four combined ISEE sub scores. Therefore, while still low, the combined scores suggest a variability of 29.0 percent which should not go unnoticed. It should be taken into consideration during the admission process as an added quantitative variable that remains consistent among other factors. At the very least, the results may be used to target potential lower-performing students and direct them to the tutoring program or place them in classes designed to bolster skills in a particular area.

Combining the ISEE sub scores does not seem to yield results that suggest higher or lower scores have a large influence on student outcome at the end of freshman year (see Figure 20).

Obs	Subscores	WTD GPA	Fit	SE Fit	Residual	St Resid	
78	5.00	2.2200	3.6021	0.0554	-1.3821	-2.20R	
149	4.00	2.6200	3.0447	0.1098	-0.4247	-0.68	X
150	7.00	2.1700	3.5993	0.0483	-1.4293	-2.28R	
178	8.00	2.2800	3.5414	0.0576	-1.2614	-2.01R	
181	3.00	1.9400	3.3689	0.0747	-1.4289	-2.28R	
231	5.00	1.9000	3.2425	0.0519	-1.3425	-2.14R	
240	4.00	2.1000	2.8343	0.1063	-0.7343	-1.18	X
243	5.00	2.0300	3.4116	0.0464	-1.3816	-2.20R	
287	4.00	1.5400	3.2181	0.0410	-1.6781	-2.67R	
292	7.00	1.5000	3.2503	0.0609	-1.7503	-2.79R	
296	4.00	1.1400	2.5857	0.0518	-1.4457	-2.30R	
297	4.00	1.3000	2.6224	0.0483	-1.3224	-2.11R	
303	3.00	1.2800	2.5827	0.0496	-1.3027	-2.07R	
304	8.00	1.9200	3.3616	0.0647	-1.4416	-2.30R	
310	5.00	1.7200	3.1862	0.0334	-1.4662	-2.33R	
312	5.00	1.6000	2.8981	0.0361	-1.2981	-2.06R	
313	5.00	1.2000	2.9088	0.0562	-1.7088	-2.72R	
314	5.00	1.8300	3.1602	0.0352	-1.3302	-2.12R	
326	3.00	4.0700	2.4851	0.0610	1.5849	2.53R	
363	5.00	3.8200	2.4195	0.0836	1.4005	2.24R	
394	8.00	3.2200	2.9545	0.1073	0.2655	0.43	X
452	6.00	3.8800	3.4378	0.1060	0.4422	0.71	X
474	7.00	2.2000	3.6662	0.0718	-1.4662	-2.34R	
477	7.00	2.1200	3.4455	0.0574	-1.3255	-2.11R	
478	6.00	2.0700	3.4513	0.0430	-1.3813	-2.20R	
490	5.00	1.9200	3.6737	0.0651	-1.7537	-2.80R	
550	6.00	1.6800	3.1070	0.0533	-1.4270	-2.27R	

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.

Figure 20. Unusual observations

Research question 5: Is there a relationship between mathematics course grades and ISEE Verbal Reasoning scores?

P-value = 0.0000

Alpha = .05.

P-value is less than alpha. Reject the null.

R^2 = 7.3%

The regression equation is Math Grade = 2.13 + 0.153 Verbal Reasoning.

There is a very weak positive relationship between a student's mathematics grade and ISEE verbal reasoning score. Verbal Reasoning scores seem to play a little role in the effect upon students' mathematics grades at any course level, though the score should not be dismissed and should be taken into consideration in the total evaluation of the student.

The observations where the independent variable showed a large influence showed that, for the most part, the higher score of 9 has a greater influence on results (see Figure 21.).

Obs	Verbal Reasoning	Math Grade	Fit	SE Fit	Residual	St Resid	
2	9.00	3.3000	3.5059	0.0985	-0.2059	-0.24	X
9	4.00	4.7000	2.7411	0.0430	1.9589	2.28R	
14	9.00	3.7000	3.5059	0.0985	0.1941	0.23	X
16	2.00	4.3000	2.4352	0.0779	1.8648	2.17R	
133	9.00	4.0000	3.5059	0.0985	0.4941	0.58	X
188	1.00	2.3000	2.2822	0.0988	0.0178	0.02	X
191	6.00	1.0000	3.0470	0.0428	-2.0470	-2.38R	
192	5.00	0.7000	2.8940	0.0363	-2.1940	-2.55R	
193	6.00	1.3000	3.0470	0.0428	-1.7470	-2.03R	
237	5.00	1.0000	2.8940	0.0363	-1.8940	-2.20R	
238	5.00	0.7000	2.8940	0.0363	-2.1940	-2.55R	
239	3.00	0.7000	2.5881	0.0586	-1.8881	-2.20R	
240	4.00	0.7000	2.7411	0.0430	-2.0411	-2.37R	
241	7.00	0.7000	3.2000	0.0584	-2.5000	-2.91R	
246	7.00	1.3000	3.2000	0.0584	-1.9000	-2.21R	

Obs	Verbal Reasoning	Math Grade	Fit	SE Fit	Residual	St Resid	
287	4.00	0.0000	2.7411	0.0430	-2.7411	-3.19R	
295	4.00	0.0000	2.7411	0.0430	-2.7411	-3.19R	
296	4.00	.0000	2.7411	0.0430	-1.7411	-2.02R	
297	4.00	1.0000	2.7411	0.0430	-1.7411	-2.02R	
313	5.00	0.7000	2.8940	0.0363	-2.1940	-2.55R	
316	6.00	5.0000	3.0470	0.0428	1.9530	2.27R	
320	9.00	3.7000	3.5059	0.0985	0.1941	0.23	X
323	9.00	4.7000	3.5059	0.0985	1.1941	1.40	X
327	5.00	4.7000	2.8940	0.0363	1.8060	2.10R	
332	9.00	4.3000	3.5059	0.0985	0.7941	0.93	X
339	5.00	5.0000	2.8940	0.0363	2.1060	2.45R	
346	7.00	5.0000	3.2000	0.0584	1.8000	2.10R	
367	9.00	4.3000	3.5059	0.0985	0.7941	0.93	X
373	9.00	3.3000	3.5059	0.0985	-0.2059	-0.24	X
386	9.00	4.0000	3.5059	0.0985	0.4941	0.58	X
477	7.00	1.0000	3.2000	0.0584	-2.2000	-2.56R	
478	6.00	1.3000	3.0470	0.0428	-1.7470	-2.03R	
513	6.00	1.3000	3.0470	0.0428	-1.7470	-2.03R	
536	6.00	1.3000	3.0470	0.0428	-1.7470	-2.03R	
550	6.00	1.0000	3.0470	0.0428	-2.0470	-2.38R	
560	9.00	4.0000	3.5059	0.0985	0.4941	0.58	X
566	9.00	3.0000	3.5059	0.0985	-0.5059	-0.59	X

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.

Figure 21. Unusual observations

Research question 6: Is there a relationship between mathematics course grades and ISEE Reading scores?

P-value = 0.0000

Alpha = .05.

P-value is less than alpha. Reject the null.

R^2 = 8.1%

The regression equation is Math Grade = 2.13 + 0.153 Reading.

There is a very weak positive relationship between a student's mathematics grade and ISEE Reading score. The Reading scores play an apparent insignificant role in the effect upon students' mathematics grades at any course level. However, the score should not be dismissed and should be taken into consideration in the total evaluation of the student in the admission process.

The observations where the independent variable showed a large influence showed that, for the most part, the higher score of 9 and lower score of 1 have a greater influence on results (see Figure 22).

Obs	Reading	Math Grade	Fit	SE Fit	Residual	St Resid	
39	1.00	3.7000	2.2840	0.0939	1.4160	1.66	X
96	9.00	2.7000	3.5062	0.0939	-0.8062	-0.95	X
103	1.00	3.3000	2.2840	0.0939	1.0160	1.19	X
165	1.00	3.3000	2.2840	0.0939	1.0160	1.19	X
191	6.00	1.0000	3.0479	0.0421	-2.0479	-2.39R	
192	4.00	0.7000	2.7424	0.0421	-2.0424	-2.39R	
193	7.00	1.3000	3.2007	0.0564	-1.9007	-2.22R	
199	8.00	1.3000	3.3535	0.0744	-2.0535	-2.40R	
204	1.00	3.0000	2.2840	0.0939	0.7160	0.84	X
225	1.00	1.7000	2.2840	0.0939	-0.5840	-0.69	X
229	1.00	1.7000	2.2840	0.0939	-0.5840	-0.69	X
234	1.00	2.3000	2.2840	0.0939	0.0160	0.02	X
237	5.00	1.0000	2.8951	0.0361	-1.8951	-2.21R	
238	3.00	0.7000	2.5896	0.0564	-1.8896	-2.21R	
239	5.00	0.7000	2.8951	0.0361	-2.1951	-2.56R	
240	6.00	0.7000	3.0479	0.0421	-2.3479	-2.74R	
241	6.00	0.7000	3.0479	0.0421	-2.3479	-2.74R	
243	6.00	1.3000	3.0479	0.0421	-1.7479	-2.04R	
246	6.00	1.3000	3.0479	0.0421	-1.7479	-2.04R	
287	5.00	0.0000	2.8951	0.0361	-2.8951	-3.38R	
295	5.00	0.0000	2.8951	0.0361	-2.8951	-3.38R	
306	1.00	2.3000	2.2840	0.0939	0.0160	0.02	X
313	6.00	0.7000	3.0479	0.0421	-2.3479	-2.74R	

Obs	Reading	Math Grade	Fit	SE Fit	Residual	St Resid	
314	6.00	1.3000	3.0479	0.0421	-1.7479	-2.04R	
316	6.00	5.0000	3.0479	0.0421	1.9521	2.28R	
321	9. 00	3.7000	3.5062	0.0939	0.1938	0.23	X
325	9.00	3.7000	3.5062	0.0939	0.1938	0.23	X
332	9.00	4.3000	3.5062	0.0939	0.7938	0.93	X
333	9.00	4.3000	3.5062	0.0939	0.7938	0.93	X
338	7.00	5.0000	3.2007	0.0564	1.7993	2.10R	
339	6.00	5.0000	3.0479	0.0421	1.9521	2.28R	
346	6.00	5.0000	3.0479	0.0421	1.9521	2.28R	
474	9.00	2.0000	3.5062	0.0939	-1.5062	-1.77	X
477	5.00	1.0000	2.8951	0.0361	-1.8951	-2.21R	
478	6.00	1.3000	3.0479	0.0421	-1.7479	-2.04R	
490	7.00	1.3000	3.2007	0.0564	-1.9007	-2.22R	
503	1.00	3.0000	2.2840	0.0939	0.7160	0.84	X
513	6.00	1.3000	3.0479	0.0421	-1.7479	-2.04R	
522	1.00	2.0000	2.2840	0.0939	-0.2840	-0.33	X
525	1.00	3.3000	2.2840	0.0939	1.0160	1.19	X
542	1.00	2.0000	2.2840	0.0939	-0.2840	-0.33	X
548	1.00	2.0000	2.2840	0.0939	-0.2840	-0.33	X
550	4.00	1.0000	2.7424	0.0421	-1.7424	-2.03R	
560	9.00	4.0000	3.5062	0.0939	0.4938	0.58	X
566	9.00	3.0000	3.5062	0.0939	-0.5062	-0.59	X

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.

Figure 22. Unusual observations

Research question 7: Is there a relationship between mathematics course grades and ISEE Quantitative Reasoning scores?

P-value = 0.0000

Alpha = .05.

P-value is less than alpha. Reject the null.

R^2 = 18.0%

Math Grade = 1.72 + 0.230 * Quantitative Reasoning.

There is a weak positive relationship between a student's mathematics grade and ISEE Quantitative Reasoning score. Again, as in the observations for ISEE Quantitative Reasoning scores and their relationship to overall student performance, the correlation to mathematics courses grades is unexpectedly higher than for verbal and reading scores of students.

The observations where the independent variable showed a large influence showed that, for the most part, the higher score of 9 and lower score of 1 have a larger influence on results (see Figure 23).

Obs	Quantitavie Reasoning	Math Grade	Fit	SE Fit	Residual	St Resid	
40	9.00	3.7000	3.7912	0.0875	-0.0912	-0.11	X
78	7.00	1.7000	3.3306	0.0519	-1.6306	-2.02R	
89	9.00	4.0000	3.7912	0.0875	0.2088	0.26	X
115	1.00	2.3000	1.9487	0.0917	0.3513	0.44	X
120	2.00	4.0000	2.1790	0.0728	1.8210	2.26R	
130	9.00	4.0000	3.7912	0.0875	0.2088	0.26	X
179	9.00	2.7000	3.7912	0.0875	-1.0912	-1.36	X
191	5.00	1.0000	2.8699	0.0342	-1.8699	-2.31R	
192	4.00	0.7000	2.6396	0.0411	-1.9396	-2.40R	
197	7.00	1.3000	3.3306	0.0519	-2.0306	-2.51R	
236	5.00	1.0000	2.8699	0.0342	-1.8699	-2.31R	
237	4.00	1.0000	2.6396	0.0411	-1.6396	-2.03R	
239	3.00	0.7000	2.4093	0.0554	-1.7093	-2.12R	
240	1.00	0.7000	1.9487	0.0917	-1.2487	-1.55	X
241	7.00	0.7000	3.3306	0.0519	-2.6306	-3.26R	
243	7.00	1.3000	3.3306	0.0519	-2.0306	-2.51R	
275	1.00	2.0000	1.9487	0.0917	0.0513	0.06	X
287	6.00	0.0000	3.1003	0.0388	-3.1003	-3.83R	
295	4.00	0.0000	2.6396	0.0411	-2.6396	-3.26R	
296	4.00	1.0000	2.6396	0.0411	-1.6396	-2.03R	
313	3.00	0.7000	2.4093	0.0554	-1.7093	-2.12R	
333	9.00	4.3000	3.7912	0.0875	0.5088	0.63	X
338	9.00	5.0000	3.7912	0.0875	1.2088	1.50	X

Obs	Quantitavie Reasoning	Math Grade	Fit	SE Fit	Residual	St Resid	
339	9.00	5.0000	3.7912	0.0875	1.2088	1.50	X
346	9.00	5.0000	3.7912	0.0875	1.2088	1.50	X
386	9.00	4.0000	3.7912	0.0875	0.2088	0.26	X
477	6.00	1.0000	3.1003	0.0388	-2.1003	-2.60R	
478	7.00	1.3000	3.3306	0.0519	-2.0306	-2.51R	
490	8.00	1.3000	3.5609	0.0689	-2.2609	-2.80R	
502	1.00	4.0000	1.9487	0.0917	2.0513	2.55R	X
504	2.00	4.0000	2.1790	0.0728	1.8210	2.26R	
523	9.00	3.7000	3.7912	0.0875	-0.0912	-0.11	X
532	7.00	1.7000	3.3306	0.0519	-1.6306	-2.02R	
543	5.00	1.0000	2.8699	0.0342	-1.8699	-2.31R	
550	6.00	1.0000	3.1003	0.0388	-2.1003	-2.60R	

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.

Figure 23. Unusual observations

Research question 8: Is there a relationship between mathematics course grades and ISEE Mathematics Achievement scores?

P-value = 0.0000

Alpha = .05.

P-value is less than alpha. Reject the null.

R^2 = 16.2%

Math Grade = 1.72 + 0.224 * Math Achievement.

There is a weak positive relationship between a student's mathematics grade and ISEE Mathematics Achievement score. Though not as statistically significant as the ISEE Quantitative Reasoning score, the Mathematics Achievement score has the second most significant effect upon student mathematics grades of the four subscores.

The observations where the independent variable showed a large influence showed that, for the most part, the higher score of 9 and lower score of 1 have a larger influence on results (see Figure 24).

Obs	Math Achievement	Math Grade	Fit	SE Fit	Residual	St Resid	
19	9.00	4.3000	3.7360	0.0877	0.5640	0.69	X
157	1.00	2.7000	1.9475	0.0972	0.7525	0.93	X
180	8.00	1.7000	3.5124	0.0685	-1.8124	-2.22R	
191	6.00	1.0000	3.0653	0.0382	-2.0653	-2.53R	
192	4.00	0.7000	2.6182	0.0435	-1.9182	-2.35R	
197	7.00	1.3000	3.2889	0.0511	-1.9889	-2.43R	
237	5.00	1.0000	2.8417	0.0348	-1.8417	-2.25R	
238	3.00	0.7000	2.3946	0.0591	-1.6946	-2.08R	
239	3.00	0.7000	2.3946	0.0591	-1.6946	-2.08R	
240	5.00	0.7000	2.8417	0.0348	-2.1417	-2.62R	
241	5.00	0.7000	2.8417	0.0348	-2.1417	-2.62R	
243	6.00	1.3000	3.0653	0.0382	-1.7653	-2.16R	
261	9.00	3.7000	3.7360	0.0877	-0.0360	-0.04	X
287	6.00	0.0000	3.0653	0.0382	-3.0653	-3.75R	
295	5.00	0.0000	2.8417	0.0348	-2.8417	-3.47R	
310	6.00	1.3000	3.0653	0.0382	-1.7653	-2.16R	
313	4.00	0.7000	2.6182	0.0435	-1.9182	-2.35R	
316	7.00	5.0000	3.2889	0.0511	1.7111	2.09R	
332	9.00	4.3000	3.7360	0.0877	0.5640	0.69	X
339	9.00	5.0000	3.7360	0.0877	1.2640	1.55	X
346	9.00	5.0000	3.7360	0.0877	1.2640	1.55	X
348	9.00	4.7000	3.7360	0.0877	0.9640	1.18	X
363	1.00	2.7000	1.9475	0.0972	0.7525	0.93	X
367	9.00	4.3000	3.7360	0.0877	0.5640	0.69	X
386	9.00	4.0000	3.7360	0.0877	0.2640	0.32	X
408	9.00	4.0000	3.7360	0.0877	0.2640	0.32	X
430	9.00	4.3000	3.7360	0.0877	0.5640	0.69	X
437	9.00	3.3000	3.7360	0.0877	-0.4360	-0.54	X
477	7.00	1.0000	3.2889	0.0511	-2.2889	-2.80R	
478	6.00	1.3000	3.0653	0.0382	-1.7653	-2.16R	
490	7.00	1.3000	3.2889	0.0511	-1.9889	-2.43R	
502	2.00	4.0000	2.1711	0.0775	1.8289	2.24R	
504	2.00	4.0000	2.1711	0.0775	1.8289	2.24R	

Obs	Math Achievement	Math Grade	Fit	SE Fit	Residual	St Resid	
543	6.00	1.0000	3.0653	0.0382	-2.0653	-2.53R	
550	5.00	1.0000	2.8417	0.0348	-1.8417	-2.25R	
551	6.00	1.3000	3.0653	0.0382	-1.7653	-2.16R	
554	9.00	3.7000	3.7360	0.0877	-0.0360	-0.04	X
560	9.00	4.0000	3.7360	0.0877	0.2640	0.32	X

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.

Figure 24. Unusual observations

Research question 9: Is there a relationship between English course grades and ISEE Verbal Reasoning scores?

P-value = 0.0000

Alpha = .05.

P-value is less than alpha. Reject the null.

R^2 = 14.3%

English Grade = 1.72 + 0.258 * Verbal Reasoning.

There is a weak positive relationship between a student's English grade and ISEE Verbal Reasoning score. Thought the research reflects a moderate effect on student performance in English courses related to Verbal Reasoning scores, the results should be noted in admission committee evaluations and be considered in English placement upon admission.

The observations where the independent variable showed a large influence showed that, for the most part, the higher score of 9 and lower score of 1 have a larger influence on results (see Figure 25.).

Obs	Verbal Reasoning	English Grade	Fit	SE Fit	Residual	St Resid	
2	9.00	5.0000	4.0469	0.1142	0.9531	0.96	X
14	9.00	4.0000	4.0469	0.1142	-0.0469	-0.05	X
133	9.00	3.3000	4.0469	0.1142	-0.7469	-0.75	X
188	1.00	2.0000	1.9802	0.1144	0.0198	0.02	X
288	5.00	1.0000	3.0136	0.0421	-2.0136	-2.01R	
292	7.00	1.0000	3.5302	0.0677	-2.5302	-2.53R	
296	4.00	0.7000	2.7552	0.0498	-2.0552	-2.05R	
297	4.00	0.7000	2.7552	0.0498	-2.0552	-2.05R	
302	8.00	1.3000	3.7886	0.0901	-2.4886	-2.49R	
304	8.00	1.3000	3.7886	0.0901	-2.4886	-2.49R	
313	5.00	0.0000	3.0136	0.0421	-3.0136	-3.01R	
314	5.00	0.0000	3.0136	0.0421	-3.0136	-3.01R	
315	4.00	0.0000	2.7552	0.0498	-2.7552	-2.75R	
320	9.00	5.0000	4.0469	0.1142	0.9531	0.96	X
323	9.00	5.0000	4.0469	0.1142	0.9531	0.96	X
326	3.00	5.0000	2.4969	0.0679	2.5031	2.50R	
332	9.00	5.0000	4.0469	0.1142	0.9531	0.96	X
367	9.00	4.7000	4.0469	0.1142	0.6531	0.66	X
373	9.00	4.7000	4.0469	0.1142	0.6531	0.66	X
386	9.00	4.0000	4.0469	0.1142	-0.0469	-0.05	X
443	2.00	4.3000	2.2385	0.0902	2.0615	2.07R	
491	5.00	1.0000	3.0136	0.0421	-2.0136	-2.01R	
550	6.00	1.0000	3.2719	0.0497	-2.2719	-2.27R	
551	4.00	0.7000	2.7552	0.0498	-2.0552	-2.05R	
552	5.00	0.0000	3.0136	0.0421	-3.0136	-3.01R	
560	9.00	3.7000	4.0469	0.1142	-0.3469	-0.35	X
566	9.00	3.3000	4.0469	0.1142	-0.7469	-0.75	X

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.

Figure 25. Unusual observations

Research question 10: Is there a relationship between English course grades and ISEE Reading scores?

P-value = 0.0000

Alpha = .05

P-value is less than alpha. Reject the null.

R^2 = 19.6%

English Grade = 1.58 + 0.287 * Reading.

There is a weak positive relationship between a student's English grade and ISEE Reading score. Of the four ISEE sub scores, the Reading score research results showed the most significance in relationship to student English course grades in the freshman year. As with the Verbal Reasoning scores, these scores should be carefully observed when making admission decisions and may be well used in student placement into freshman English in addition to diagnostic testing.

The observations where the independent variable showed a large influence showed that, for the most part, the higher score of 9 and lower score of 1 have a larger influence on results (see Figure 26).

Obs	Reading	English Grade	Fit	SE Fit	Residual	St Resid	
39	1.00	3.0000	1.8676	0.1058	1.1324	1.17	X
96	9.00	2.7000	4.1623	0.1059	-1.4623	-1.52	X
103	1.00	2.7000	1.8676	0.1058	0.8324	0.86	X
165	1.00	2.0000	1.8676	0.1058	0.1324	0.14	X
204	1.00	1.7000	1.8676	0.1058	-0.1676	-0.17	X
216	8.00	1.7000	3.8755	0.0839	-2.1755	-2.25R	
225	1.00	1.7000	1.8676	0.1058	-0.1676	-0.17	X
229	1.00	1.7000	1.8676	0.1058	-0.1676	-0.17	X
234	1.00	1.7000	1.8676	0.1058	-0.1676	-0.17	X
288	6.00	1.0000	3.3018	0.0475	-2.3018	-2.37R	
292	7.00	1.0000	3.5886	0.0637	-2.5886	-2.67R	
295	5.00	1.0000	3.0150	0.0408	-2.0150	-2.08R	
302	6.00	1.3000	3.3018	0.0475	-2.0018	-2.06R	
304	7.00	1.3000	3.5886	0.0637	-2.2886	-2.36R	
306	1.00	1.3000	1.8676	0.1058	-0.5676	-0.59	X

Obs	Reading	English Grade	Fit	SE Fit	Residual	St Resid	
313	6.00	0.0000	3.3018	0.0475	-3.3018	-3.41R	
314	6.00	0.0000	3.3018	0.0475	-3.3018	-3.41R	
315	4.00	0.0000	2.7281	0.0475	-2.7281	-2.81R	
317	5.00	5.0000	3.0150	0.0408	1.9850	2.05R	
321	9.00	5.0000	4.1623	0.1059	0.8377	0.87	X
322	5.00	5.0000	3.0150	0.0408	1.9850	2.05R	
325	9.00	5.0000	4.1623	0.1059	0.8377	0.87	X
326	4.00	5.0000	2.7281	0.0475	2.2719	2.34R	
328	5.00	5.0000	3.0150	0.0408	1.9850	2.05R	
331	5.00	5.0000	3.0150	0.0408	1.9850	2.05R	
332	9.00	5.0000	4.1623	0.1059	0.8377	0.87	X
333	9.00	5.0000	4.1623	0.1059	0.8377	0.87	X
345	4.00	4.7000	2.7281	0.0475	1.9719	2.03R	
354	3.00	4.7000	2.4413	0.0636	2.2587	2.33R	
363	4.00	4.7000	2.7281	0.0475	1.9719	2.03R	
474	9.00	1.7000	4.1623	0.1059	-2.4623	-2.55R	X
503	1.00	3.0000	1.8676	0.1058	1.1324	1.17	X
522	1.00	2.7000	1.8676	0.1058	0.8324	0.86	X
525	1.00	3.3000	1.8676	0.1058	1.4324	1.48	X
542	1.00	1.7000	1.8676	0.1058	-0.1676	-0.17	X
548	1.00	2.3000	1.8676	0.1058	0.4324	0.45	X
552	3.00	0.0000	2.4413	0.0636	-2.4413	-2.52R	
560	9.00	3.7000	4.1623	0.1059	-0.4623	-0.48	X
566	9.00	3.3000	4.1623	0.1059	-0.8623	-0.89	X

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.

Figure 26. Unusual observations

Research question 11: Is there a relationship between English course grades and ISEE Quantitative Reasoning scores?

P-value = 0.0000

Alpha = .05.

P-value is less than alpha. Reject the null.

R^2 = 15.7%

English Grade = 1.68 + 0.261 * Quantitative Reasoning.

There is a weak positive relationship between a student's English grade and ISEE Quantitative Reasoning score. Although weak, the relationship between English course grades and Quantitative Reasoning ISEE scores requires further scrutiny as explained in recommendations for future research. There is more of a relationship than expected prior to the research.

The observations where the independent variable showed a large influence showed that, for the most part, the higher score of 9 and lower score of 1 have a larger influence on results (see Figure 27.).

Obs	Quantitative Reasoning	English Grade	Fit	SE Fit	Residual	St Resid	
40	9.00	3.0000	4.0301	0.1073	-1.0301	-1.04	X
89	9.00	2.7000	4.0301	0.1073	-1.3301	-1.35	X
115	1.00	2.7000	1.9417	0.1125	0.7583	0.77	X
130	9.00	3.3000	4.0301	0.1073	-0.7301	-0.74	X
179	9.00	2.0000	4.0301	0.1073	-2.0301	-2.05R	X
240	1.00	1.7000	1.9417	0.1125	-0.2417	-0.24	X
275	1.00	2.3000	1.9417	0.1125	0.3583	0.36	X
288	6.00	1.0000	3.2470	0.0475	-2.2470	-2.26R	
296	4.00	0.7000	2.7249	0.0504	-2.0249	-2.04R	
313	3.00	0.0000	2.4638	0.0679	-2.4638	-2.48R	
314	5.00	0.0000	2.9859	0.0418	-2.9859	-3.01R	
315	3.00	0.0000	2.4638	0.0679	-2.4638	-2.48R	
317	5.00	5.0000	2.9859	0.0418	2.0141	2.03R	
322	5.00	5.0000	2.9859	0.0418	2.0141	2.03R	
324	5.00	5.0000	2.9859	0.0418	2.0141	2.03R	
326	2.00	5.0000	2.2028	0.0894	2.7972	2.83R	
331	5.00	5.0000	2.9859	0.0418	2.0141	2.03R	
333	9.00	5.0000	4.0301	0.1073	0.9699	0.98	X
334	4.00	5.0000	2.7249	0.0504	2.2751	2.29R	
336	5.00	5.0000	2.9859	0.0418	2.0141	2.03R	
338	9.00	4.7000	4.0301	0.1073	0.6699	0.68	X

Obs	Quantitative Reasoning	English Grade	Fit	SE Fit	Residual	St Resid	
339	9.00	4.7000	4.0301	0.1073	0.6699	0.68	X
346	9.00	4.7000	4.0301	0.1073	0.6699	0.68	X
351	3.00	4.7000	2.4638	0.0679	2.2362	2.26R	
352	2.00	4.7000	2.2028	0.0894	2.4972	2.52R	
354	3.00	4.7000	2.4638	0.0679	2.2362	2.26R	
361	3.00	4.7000	2.4638	0.0679	2.2362	2.26R	
363	3.00	4.7000	2.4638	0.0679	2.2362	2.26R	
386	9.00	4.0000	4.0301	0.1073	-0.0301	-0.03	X
502	1.00	3.0000	1.9417	0.1125	1.0583	1.07	X
523	9.00	2.7000	4.0301	0.1073	-1.3301	-1.35	X
550	6.00	1.0000	3.2470	0.0475	-2.2470	-2.26R	
551	5.00	0.7000	2.9859	0.0418	-2.2859	-2.30R	
552	6.00	0.0000	3.2470	0.0475	-3.2470	-3.27R	

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.

Figure 27. Unusual observations

Research question 12: Is there a relationship between English course grades and ISEE Math Achievement scores?

P-value = 0.0000

Alpha = .05.

P-value is less than alpha. Reject the null.

R^2 = 16.3%

English Grade = 1.59 + 0.272 Math Achievement.

There is a weak positive relationship between a student's English grade and ISEE Math Achievement score. As stated for the Quantitative Reasoning ISEE score results, the relationship between English course grades and Mathematics Achievement

ISEE scores requires further scrutiny as explained in recommendations for future research. There is more of a relationship than expected prior to the research.

The observations where the independent variable showed a large influence showed that, for the most part, the higher score of 9 and lower score of 1 have a larger influence on results (see Figure 28.).

Obs	Math Achievement	English Grade	Fit	SE Fit	Residual	St Resid	
19	9.00	4.0000	4.0381	0.1061	-0.0381	-0.04	X
157	1.00	2.0000	1.8623	0.1174	0.1377	0.14	X
261	9.00	2.3000	4.0381	0.1061	-1.7381	-1.76	X
297	4.00	0.7000	2.6782	0.0525	-1.9782	-2.00R	
313	4.00	0.0000	2.6782	0.0525	-2.6782	-2.71R	
314	5.00	0.0000	2.9502	0.0420	-2.9502	-2.98R	
315	4.00	0.0000	2.6782	0.0525	-2.6782	-2.71R	
322	5.00	5.0000	2.9502	0.0420	2.0498	2.07R	
326	3.00	5.0000	2.4063	0.0713	2.5937	2.63R	
331	4.00	5.0000	2.6782	0.0525	2.3218	2.35R	
332	9.00	5.0000	4.0381	0.1061	0.9619	0.98	X
339	9.00	4.7000	4.0381	0.1061	0.6619	0.67	X
346	9.00	4.7000	4.0381	0.1061	0.6619	0.67	X
348	9.00	4.7000	4.0381	0.1061	0.6619	0.67	X
351	4.00	4.7000	2.6782	0.0525	2.0218	2.04R	
352	4.00	4.7000	2.6782	0.0525	2.0218	2.04R	
354	4.00	4.7000	2.6782	0.0525	2.0218	2.04R	
363	1.00	4.7000	1.8623	0.1174	2.8377	2.89R	X
367	9.00	4.7000	4.0381	0.1061	0.6619	0.67	X
386	9.00	4.0000	4.0381	0.1061	-0.0381	-0.04	X
408	9.00	3.7000	4.0381	0.1061	-0.3381	-0.34	X
430	9.00	3.7000	4.0381	0.1061	-0.3381	-0.34	X
437	9.00	3.7000	4.0381	0.1061	-0.3381	-0.34	X
461	2.00	4.3000	2.1343	0.0936	2.1657	2.20R	
551	6.00	0.7000	3.2222	0.0461	-2.5222	-2.55R	

Obs	Math Achievement	English Grade	Fit	SE Fit	Residual	St Resid	
552	4.00	0.0000	2.6782	0.0525	-2.6782	-2.71R	
554	9.00	4.7000	4.0381	0.1061	0.6619	0.67	X
560	9.00	3.7000	4.0381	0.1061	-0.3381	-0.34	X

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.

Figure 28. Unusual observations

Research question 13: Is there a relationship between the end of year freshman weighted GPA and a composite number of the four ISEE subscores. Chapter 4, Figure 15 reflects the results of the regression analysis.

P-value = 0.0000

Alpha = .05.

P-value is less than alpha. Reject the null.

R^2 = 28.4%

WTD GPA = 1.57 + 0.0759 Composite

There is a weak positive relationship between a student's end of freshman year weighted GPA and the composite ISEE scores (each added for a total "score"). The adjusted R^2 value (29%) for the regression analysis between the WTD GPA versus Math Achievement, Verbal Reasoning, Reading, and Quantitative Reasoning, is similar to the results of research question 13. However, according to Shires, "While the individual scores have some limited predictive power, the aggregate score does better. It could be that it accounts for the fact that the freshman year GPA is a composite of the various skills measured by the individual scores and could be seen as

a useful tool for admissions while the low scores could be a signal for targeting remediation (M. Shires, Personal Communication, June 25, 2014).

Furthermore, "If two scores are highly correlated, say math and quant, they contain almost exactly the same explanatory info. So overall, the explanatory power of the info is stable (because they contain the same info)—thus the adj R^2 is stable and reflects the overall predictiveness of the model… Thus the predictive value of any one of the coefficients is low because they will vary A LOT with small modifications to the model. So the overall adj R2 is informative, but the specific coefficients in the MLR are not as useful (M. Shires, Personal Communication, June 25, 2014).

Conclusions

Entrance testing for colleges has seen an ongoing debate regarding the relationship between test scores and student academic success. The same challenges face independent K-12 schools who use the ISEE in addition to other factors such as transcripts from prior schools, interview results, an essay, and recommendations, among other factors. A great deal of research has been done regarding the relationship between SAT and ACT scores and student academic performance. But little research has been done to correlate ISEE scores and student performance in K-12 independent schools.

There is a debate regarding the value of the test scores in admissions at the researcher's school but there is no national or local research available to assist in the debate. The purpose of the study was to draw historical data from the school's

student records to determine the relationship between test scores and end of year freshmen weighted GPA. The importance of the study is to help the admission committee understand its applicants and the value of test scores in the admission decision-making process.

In all of the instances of regression analysis regarding ISEE scores and end of year freshman weighted GPA, results indicated a weak positive relationship. In addition, unusual observations of the data suggested that lower and higher scores had a greater influence on the results—meaning that scores of 1 and 9 might be more precise predictors.

For the future, it is not likely that the ISEE results will be eliminated from the evaluation process despite their lower predictive value. Their use shall be more of component of a holitistic view of each applicant, taking into account the very high and low scores and evaluating all others in combination with other factors such as performance at a prior school and recommendations. Though its effectiveness has proven statistically weak, it provides another quantifiable measure in the assessment process for admission but caution should be taken in its overuse.

Limitations of the Study

As described in Chapter 1, the limitations of the study are:

1. The study was limited to one school site despite the efforts to gather data from other schools. Because the study was focused solely on one school's population, the results cannot be extrapolated to a general population.

2. No research is available on the relationship between the ISEE and student academic performance. Therefore, it is a challenge to draw any conclusions or provide comparisons other than within the study school site. Thus, much of the literature review was drawn from studies regarding the SAT and/or ACT in relationship to college academic performance.
3. The lack of constants such as teachers, curriculum, and student demographics could influence the study and be found as confounding variables that affect student outcomes.
4. The study site is located in a relatively affluent region that affords students outside assistance in test preparation and tutoring. Test preparation measures can inflate student entrance scores. Similarly, independent tutoring that assists students with their studies my also inflate a student's grades and GPA, creating an outcome that does not necessarily reflect a student's true capability of outcome.
5. The school site provides academic resources that include peer tutoring, math help, executive functioning help, and organization skills coaching. Additionally, a formal tutoring program was introduced in 2011 that has had a significant positive effect on student achievement. Though this new program was not a variable in this study, it will be a factor in any future school site studies. All of these variables can positively influence student outcomes that may reflect a lower correlation of student performance in relation to ISEE scores.

The Value of This Study

It is important to consider all aspects of potential student attributes when evaluating applicants. Required test scores are just one portion of the applicant resume. It is vital to assess the validity of test scores as they relate to student success results. Whether the test scores correlate dramatically to student success or only fractionally to positing student outcomes, the results of such a study have a dramatic impact on evaluating admission demographics.

This study has shown that ISEE test results play an important part in evaluating potential students. Although a high correlation between ISEE test scores and student performance has not been established, the limited correlation noted has still emphasized the importance of the ISEE test scores and student performance and should not go unnoted. In other words, it is important still to place some merit on positive test score results. Admission officers should not dismiss high ISEE scores when considering applicants. Similarly, relatively low ISEE scores should not cause admission officers to dismiss out of hand those students not scoring well. Other nonacademic factors can have a bearing on student success in addition to test scores. Childhood upbringing, student motivation, parent participation, and environmental factors may have a dramatic effect on the student's success.

The value of understanding the relationship between test scores and student GPAs or grades in English or Math classes lets administrator's know the potential hazard for failure. This allows for planning to set up a structure to help a student

succeed by placement into a particular class or through other interventions such as tutoring before a significant problem is identified by failing grades.

Most surprising about this study is the greater statistical significance of Quantitative Reasoning and Math Achievement scores relating to student success. In evaluating the correlation between ISEE test score results in student performance the researcher was intrigued to see the relatively high influence of Quantitative Analysis and Math Achievement scores in providing a higher statistically significant impact on overall student success and in English and Mathematics grades than similar Verbal Reasoning and Reading tests scores. Although neither result set can be ignored, it is interesting to see the higher correlation of Math Achievement and Quantitative Reasoning scores contributed to more student achievement than test scores in the Verbal Reasoning and Reading components even in English grades.

Recommendations for Educational Institutions

Institutional research can prove revealing and is encouraged to help set benchmarks and form curriculum change in addition to helping to form policy in the admission process. Institutional isolation can be limiting. However, knowing one's constituents and the relationship of their attributes and outcomes can prove valuable in the absence of other research. It is recommended that independent schools conduct their own research while demanding that a national or regional study be

conducted in a manner that is seen with SAT and ACT score reporting in an effort to access more revealing results of testing correlation studies.

In constructing this study, the researcher learned that the test scores are not necessarily the best indicator to predicting student success, but they are indeed a factor to be taken into consideration. As mentioned prior, many other attributes can affect student performance. Not easily measured or even known at the time of evaluation, admission decisions are a delicate balance of qualitative and quantitative measures.

In conclusion, the researcher suggests that other institutions when weighing the result of this study, place some importance on ISEE test results, but not rely on these results as the end all indicator for student academic success. Admission officers or committees should not dismiss but still pay attention to ISEE test results when evaluating applicants. Special attention should be given to the Quantitative Reasoning and Math Achievement scores (in the absence of a school's own self-study) because of their higher correlation to student success. Although the Verbal Reasoning and Reading results should not be ignored, a higher emphasis should still be placed on the Math Achievement and Quantitative Reasoning scores and their predictive weight. However, the qualitative factors in the admission process still provide a significant portion of the student applicant profile. It should also be noted that the test scores can also be an indication of the need for intervention upon admission of students with lower test scores.

Recommendations for Future Research

While the research in this study was limited to one school site, future research that includes local, regional, and national data as ISEE scores relate to student academic performance would assist education professionals in assessing the value of entrance testing for independent K-12 schools. This research would clearly need to be performed by the testing institution with full participation from a large number of independent schools and could take many years to implement.

In the short term, conducting a school study that includes other variables that affect student performance may include ethnicity, gender, GPA from prior institutions, highest level of education of parents, family income, home ownership, and school intervention factors.

As with all correlation studies, it is important for the researcher to minimize as many influencing variables that may not be intended to relate to the study.

Summary

The conversation and debate regarding entrance testing of any kind will continue for years to come. The significance of research is the rich information it provides to institutions in decision-making about future candidates.

This school site research indicates that there is a weak positive correlation between student entrance exam scores and student performance by the end of freshman year. The school will use the research conclusions as a guideline for admission decisions and use caution in proceeding in the overuse of test scores as a

large mitigating factor. It is known that there is a relationship but that decision-makers must take into account the entire student. The research outcomes seem a forgone conclusion supported by decades of college admission studies. But for this site, it is a confirmation of how to proceed in the future rather than make decisions in the absence of the school study and eliminates annual debates about the value of testing. It also provides for information regarding student weaknesses and may roll out of new process for intervention which had not been identified prior.

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APPENDIX A

Pepperdine Institutional Review Board Approval

April 29, 2014
Nan Papenhausen

Protocol #: E0414D03
Project Title: An Independent School Entrance Testing as a Predictor of Student Academic Success
Dear Ms. Papenhausen:
Thank you for submitting your application, *An Independent School Entrance Testing as a Predictor of Student Academic Success,* for exempt review to Pepperdine University's Graduate and Professional Schools Institutional Review Board (GPS IRB). The IRB appreciates the work you and your faculty advisor, Dr. Stephens, have done on the proposal. The IRB has reviewed your submitted IRB application and all ancillary materials. Upon review, the IRB has determined that the above entitled project meets the requirements for exemption under the federal regulations (45 CFR 46 - http://www.nihtraining.com/ohsrsite/guidelines/45cfr46.html) that govern the protections of human subjects. Specifically, section 45 CFR 46.101(b)(2) states:
(b) Unless otherwise required by Department or Agency heads, research activities in which the only involvement of human subjects will be in one or more of the following categories are exempt from this policy:
Category (2) of 45 CFR 46.101, research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: a) Information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and b) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.
Your research must be conducted according to the proposal that was submitted to the IRB. If changes to the approved protocol occur, a revised protocol must be reviewed and approved by the IRB before implementation. For any proposed changes in your research protocol, please submit a **Request for Modification Form** to the GPS IRB. Because your study falls under exemption, there is no requirement for continuing IRB review of your project. Please be aware that changes to your protocol may prevent the research from qualifying for exemption from 45 CFR 46.101 and require submission of a new IRB application or other materials to the GPS IRB.

A goal of the IRB is to prevent negative occurrences during any research study. However, despite our best intent, unforeseen circumstances or events may arise during the research. If an unexpected situation or adverse event happens during your investigation, please notify the GPS IRB as soon as possible. We will ask for a complete explanation of the event and your response. Other actions also may be required depending on the nature of the event. Details regarding the timeframe in which adverse events must be reported to the GPS IRB and the appropriate form to be used to report this information can be found in the *Pepperdine University Protection of Human Participants in Research: Policies and Procedures Manual* (see link to "policy material" at http://www.pepperdine.edu/irb/graduate/).

Please refer to the protocol number denoted above in all further communication or correspondence related to this approval. Should you have additional questions, please contact Kevin Collins, Manager of the Institutional Review Board (IRB) at gpsirb@peppderdine.edu. On behalf of the GPS IRB, I wish you success in this scholarly pursuit.

Sincerely,

Thema Bryant-Davis, Ph.D.

Chair, Graduate and Professional Schools IRB

cc: Dr. Lee Kats, Vice Provost for Research and Strategic Initiatives

Mr. Brett Leach, Compliance Attorney

Dr. Ron Stephens, Faculty Advisor