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SAT: The Focus on Social Class

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Abstract

The relationship between ethnicity and Socio- Economic status with SAT scores is politically controversial. This study examines those relationships by adding a parent's occupational prestige and parent's educational variable set to about a third of the cases in an existing data set of 3000 Worcester High School Students that included their learning styles and their high school programs as well as ethnic codes. The SES-SAT relationship proved not to be very strong in Worcester, but race and ethnicity were strong predictors of SAT scores. Hence, race differences cannot be explained in terms of SES, but SES can largely be explained in terms of the level of challenge in the HS program of studies taken by the student.

Executive Summary

The Scholastic Assessment Test (SAT) has been a subject of constant debate. The test was intended to aid colleges in selecting entering freshmen by predicting their grades in the first year of college and help students in selecting colleges by predicting their ability to keep up with the academic load. Because it is widely used by college-bound students and colleges throughout the United States, it is important to study whether the SAT has biases against certain groups of students. This project is a continuation of a series of projects completed by other WPI students on the subject. In prior studies, much work was done to examine learning style biases in the SAT.

The first team that studied the relationship between learning styles and SAT performance consisted of David Kingsland, Charles McTague, and Benjamin Kibler. They used the Myers-Briggs Type Indicator (MBTI) as their learning style indicator. The MBTI determines an individual's personality using four dichotomies: Extraversion versus Introversion, Sensing versus Intuition, Thinking versus Feeling, and Judging versus Perceiving. From their study, it was found that students who are the Intuition type score significantly (over 100 points) higher on the SAT than their Sensing counterparts. This result matches that found by Isabel Myers, developer of the MBTI, and it was replicated in this study.

Another learning style study involved the Gordon Cognitive Style Indicator, which measures cognitive style by differentiation and association. Within association, individuals can be classified as a remote or local associator. David Kingsland's study revealed that remote associators scored higher on the SAT than local associators and this was replicated in this study.

There was another project, carried out by Keith McCormick that studied the effects of taking challenging high school classes on SAT performance. The result was that those students with more challenging curricula scored higher than those who look standard level classes. Again, these results were replicated here. The data set used for this project, however, is larger and more comprehensive than previous ones.

While the students who did previous projects carried out the important task of data collection, only those pieces of data required by the individual's project were compiled. One of the efforts of this project was to code the remaining surveys and combine all of the different data sets into one comprehensive file that covered the classes of 1997 to 1999. The variables available and used in this study included the MBTI, GCSI, high school preparation, gender, ethnic background, socio-economic status (SES) based on parents' occupational prestige, parents' educational level, student-reported social class, and student-reported self-rank of academic ability.

A study of the relationship between MBTI and SES showed that intuitives have an advantage over sensors regardless of social class; the 100+ point gap existed at all social classes. For the GCSI, the results are similar; regardless of social class, remote associators score significantly higher than local associators. The high school preparation variable yielded equally predictable results; regardless of social class, students with more challenging programs of study achieved higher scores. The gender study produced mixed results. Nationally, males tend to score consistently higher than females. In Worcester, the gap is very small. The results were misleading because females in Worcester also tend to take more challenging classes. This project was unable to explain the gender differences using SES because the high school program was not controlled and further examination is called for.

Another topic of controversy is the ethnic differences. This study produced results similar to those on a national level. Whites were the highest scoring group, followed by Asians, who are over 100 points behind. The lowest scoring groups were African-Americans and Hispanic Non-Whites. However, these differences can not be explained using SES. A look at the SAT score differences for math and verbal sections separately suggested that a large portion of the ethnic differences rested on language differences. This is especially true for the Asians, who scored much lower in the verbal section than on the math.

Other relationships, including the direct SES-SAT relationship, were examined in this project. It appears that students with the highest SES scored highest, but the differences among the rest of the groups were not very large. Overall, the SES-SAT relationship is not very strong in Worcester. Using parents' educational levels showed that the more educated the parents are, the higher the student's score is. The exception to this is in the students whose parents have doctorate degrees; they have scores comparable to students whose parents have associate degrees. Finally, use of variables involving students' self-reported social class and academic rank produced ironic results that suggest subjective answers may be unreliable.

This project laid some of the ground work for future, in-depth analysis by coding remaining surveys and collaborating existing data sets into one large, comprehensive data set. Because of time, not all of the questions revolving around the SES variable were answered, but it began to explore the SES variable's relationship to the other pertinent variables and points out what other areas need to be examined to fully understand all possible SAT biases.

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INTRODUCTION

Most students in the United States have to take a standardized exam that measures their academic abilities at one time or another. Most of those who plan to attend college have to sit through an infamous three-hour exam called the Scholastic Assessment Test (SAT). Originally designed to make college entrance examinations easier to administer in the mid-1920s, the SAT has been a subject of constant debate and criticism. Most students and parents do not realize that the SAT has any type of bias. It is natural for them to assume that since it is a nationally recognized and widely used exam, that the test will measure one's scholastic aptitude regardless of background, personality, gender, and other unique factors. There are numerous studies that suggest the opposite. At Worcester Polytechnic Institute, a series of Interactive Qualifying Projects has been done prior to this one that deals with various aspects of the SAT and this one focuses on possible socioeconomic status (SES) biases.

Previous projects focused a great deal on biases against personality types based on the Myers-Briggs Type Indicator (MBTI) and learning styles based on the Gordon Cognitive Style Indicator (GCSI). The MBTI measures type using four dichotomies or dimensions that are determined based on the individual's personal preferences; they are Extroversion-Introversion, Sensing-Intuitive, Thinking-Feeling, and Judging-Perceiving. A detailed explanation is provided in the literature review section; but simply speaking, a person can only be categorized as one or the other in each dimension. The Sensing-Intuitive (S-N) dimension is the one that received the most attention in all studies because students who are the intuitive type consistently score higher than their sensing counterparts by 100+ points. These results are similar to those in published literature and this project attempts to determine if such an advantage exists for students in every social class. The GCSI study is very similar.

Instead of the S-N dimension, the GCSI measures cognitive style by differentiation and association. In association, the individual is classified as either a high remote associator (remote), or a low remote associator (local). Here, the remotes also have an apparent advantage of about 100 points and the social class variable will be applied the same was as for the MBTI.

There are other factors that this project will examine in relation to the social class variable. They include level of preparation, gender, and ethnicity. From prior studies, it was established that students with more challenging curricula have higher SAT scores, males score slightly higher than females, and Caucasians score considerably higher than students with other ethnic backgrounds. This project will revisit these variables and look at them from an SES point of view.

The extent to which college bound students use their SAT scores to determine which schools to apply to and the extent to which colleges and universities use these scores to determine who gets accepted calls for a close study of the validity of such exams. It will be a long time before standardized exams are refined to the point where there is no bias, if that is even at all possible given the diversity of people in this country. In the mean time however, it helps students as well as colleges understand the biases so as to assist them in interpreting test scores. As this report will reveal, when it comes to testing, one size does not fit all.

BACKGROUND & LITERATURE REVIEW

History of the SAT

Simply put, the "purpose" of the Scholastic Assessment Test, originally called the Scholastic Aptitude Test, is to aid colleges in selecting entering freshmen by predicting their grades in the first year of college and help students in selecting colleges by predicting their ability to keep up with the academic load. "The founders of the College Board sought initially to standardize college admissions testing to overcome problems caused by colleges having different entrance requirements and examinations." (Crouse 16) In the late 1800s, prestigious colleges in the United States began administering entrance exams at off campus locations. Soon, other schools followed the trend. This presented logistical difficulties because the exams were written by the specific college and were administered only at certain dates in a year.

In those days, traveling to the test location and returning could take up to a week and this was not only costly, but also might mean that the students tested would miss classes at their high schools. In addition, because each college had a different exam, the high schools and the students had to devise specific preparation and instructional programs. The founders of the College Board, particularly Nicholas M. Butler at Columbia, saw this as a problem and wanted to create a standardized college entrance examination to be used by all colleges. Only thirty-five colleges initially used the board's examination instead of their own and the first test was administered in June 1901. (Crouse 18)

This proved to be good timing because the US population rose rapidly over the next two and a half decades and so did the total number of college enrollments. A large portion of the population increase was from immigrants and the prestigious colleges of the days wanted desperately to keep their homogenous upper-middle-class white student bodies intact.

Therefore, from the time the SAT was developed, it was already predisposed to socioeconomic and ethnic biases. "The [College] Board grew in influence partly as a result of leadership, political acumen, and power of the people behind it. It benefited mainly from its ability over the years to promote testing to fit important national trends and events." (Crouse 16) The nation's first mass intelligence test, the Army Alpha, emerged during the time of World War I and this was part of a national trend that influenced the growth of the popularity of standardized college entrance exams. The College Board first expressed an interest in intelligence tests for college admissions in 1919 and appointed a commission to develop the new test in 1925; the outcome was named the Scholastic Aptitude Test. The commission explicitly *tied* the SAT to intelligence test, though it made no claims that it *measures* general intelligence. However, by saying the SAT was *like* an intelligence test, the commission was able to divert the colleges' interest in intelligence testing to the SAT. (Crouse 22-23)

The SAT did not receive enthusiastic support by all colleges at first. The first SAT was administered in June 1926 and it was right after the outburst in population and college enrollments and the increases are becoming steadier. It was not until after World War II that candidate volumes increase substantially, leading to more widespread use of the SAT by colleges. The Educational Testing Service, ETS, came into existence in December 1947 as a non-profit organization. The College Board, by advance agreement, gave up most of its activities to ETS. With the end of World War II and the rising competition between Russia and the US in developing the latest technologies came the advocacy of human resource quality testing and this further increased the popularity of intelligence testing, causing ETS to grow. Then came the civil rights movement of the 1960s. ETS redirected the public opinion about the SAT by using it to provide equal opportunity to all. Their reasoning was that

"because the SAT is a uniform, color-blind test for predicting success, minority students and students from poor families would stand on an equal foot with white middle-class students" (Crouse 36) Ironically, at the same time, ETS also acknowledged that "impoverished backgrounds and different educational, cultural, and social opportunities will cause some groups to have lower average scores than others." (Crouse 36) For the past half-century, the debate about the SAT and its social and cognitive biases has been a hot topic in academia and the media. James Crouse is one of the authors who spoke against the SAT. Although he has a stronger point of view against the test compared to the mainstream SAT literature, his arguments does bring attention to many apparent biases that deserves to be studied. Currently, the most selective colleges in the United States continue to require SAT scores from their applicants as part of the credentials package for admissions decisions. In fact, most college-bound students view their SAT scores as the most important factor as evidenced in the number repeat test takers. This report serves as a part of a series of studies that attempts to explain the apparent biases in SAT performance among different social groups of students, using cognitive variables.

How Colleges & Students Use SAT Scores

Different colleges use SAT scores differently and to different extents. Many prestigious colleges in the United States are well known not only throughout the country, but also internationally. Many others are not so famous, but have a large student body capacity. In either case, a reasonably well-known school is likely to be receiving thousands of applications each year. It is highly likely that in most cases, the $50 application fee some of the students paid was for the data entry specialist to punch in the SAT score, GPA, and class rank to find out that it is below the cut-off values; if they are, then the application may end up in the reject pile before the rest of it is read. It is understandably unfortunate that not every

application can be reviewed in detail by the admission committee and the SAT is a "fairer" cut-off factor than the other data available because a certain GPA from one high school is not necessarily equivalent to the same GPA from another. For the smaller, less popular, and/or less selective schools, applicants may have a higher chance of having most or all parts of their applications reviewed by the admissions committee.

Admission officials are interested in predicting freshman grades as they are usually interested or hopeful in acquiring a freshman class capable of a certain academic performance level at the college. The SAT is not easily used to predict grades without first deriving a formula based on the college level academic history of past classes and their SAT scores. "SAT scores can provide important information only when they lead admissions officers to make admissions decisions they would not have made without SAT scores... for the vast majority of colleges, and admissions policy that ignores the SAT admits almost the same freshman class as an admissions policy that includes the SAT." (Crouse 6)

The SAT, however, can also be used to determine who gets into which college before the application process even begins. Many selective colleges try to maximize the academic quality of the applicants themselves so that they will have a pool of desirable students to choose from instead of encouraging everybody to apply and choosing the best from the resulting very large pool. They do this by giving all kinds of hints and signals to attract students with good academic credentials and deter those who may not be good performers in colleges. These are done through their catalogs and a "half or dozen or so widely read college handbooks to let prospective applicants know what kind of students they hope to enroll." (Crouse 6) It is not uncommon for colleges to publish their 25^{th}-75^{th} percentile SAT test scores in an effort to reduce the number of applicants that fall below that bottom 25% or below range. This, whether fortunate or not, works.

This directly relates to how students interpret and use their SAT scores. Prospective applicants are concerned with finding colleges that are suitable for them. High school guidance counselors frequently advise their college-bound students to choose several schools within their ability range, one or two dream schools that are tough to get into, and one or two safety schools that are relatively non-selective. This amounts to an average of five college applications per student at a price of about $50 each. If the application process alone costs students $250, it is understandable that the students and their parents are concerned with choosing the right schools. Otherwise, everybody would apply to Harvard and MIT just to see what happens! "Few applicants want to apply to colleges where they stand a good chance of being rejected or to enter colleges where they are likely to get a lot of F's. Students seldom apply to Harvard, for example, unless they have good grades and high SAT scores. This kind of self-selection also takes place elsewhere, so that American colleges attract mostly students who can handle the academic work." (Crouse 7) To add more to the process of college selection, students use their SAT scores, sometimes without knowing it, as a form of personal, self assessment. A straight-A high school student who may very well be praised constantly by teachers and envied by peers, may have his or her ego deflated in an instant when the SAT scores are not stellar. While it may the true that the high school's curriculum is comparatively easy, the student may be tested unfairly due to biases in the test.

Studies have also shown that the SAT, if removed from the college application process, may not have an adverse effect on the colleges' ability to select the right students for admission. At the same time, students may be able to benefit from not restricting themselves in the schools they're applying to because of SAT scores, thereby increasing their chances of getting into a prestigious school that would otherwise not have even considered.

> "The College Board and ETS both claim that college-bound students can use their SAT scores to help select a college appropriate to their level of ability. The board says: 'Students use the score reports they receive to help select colleges or universities suitable to their interests and abilities.' But the College Board and ETS have never tried to find out how prospective applicants use their score reports in deciding where to apply. Prospective college applicants know a lot about their own abilities and willingness to persist at academic work from their past grades and school experience. They may know even before they take the SAT that they have to work hard for their B's, and that they would have trouble in a demanding college. Or they may know that they have never cracked a book and have still gotten B's, and that they don't often meet people who seem better at learning that they are when they try. If the rationale for the SAT is that it helps applicants choose the 'right' colleges, we must ask again how much SAT scores add to the information that prospective applicants have accumulated about themselves in school. The College Board and ETS have not tried to do this." (Crouse 7)

Although the worthiness of the SAT itself has been the subject of great debate, it is unlikely colleges will eliminate it as an admission decision making factor in the near future. Having withstood the test of time by being around for most of the twentieth century, it will easily take another generation to determine it's usefulness and decide to keep it or refine it. Until then, the current studies must focus on how the test affects different groups of students. Whatever the case may be, if SAT is used, the applicant is bound to be affected by some bias and these biases must be explained.

Cognitive Biases

In an ideal world, the SAT would be completely un-biased and every test taker walks into the examination room with equal opportunity to do well. Unfortunately, such a test is virtually impossible, especially in the United States, due to the diversity of the student backgrounds. Among the factors that are constantly under scrutiny in the SAT debate are gender, ethnic background, non-native English speakers, socioeconomic status (SES),

general academic preparation, specific SAT preparation, and cognitive style. Much of the work done prior to this study revolved around cognitive biases. This refers to the way each student learns and understands things as well as the way they perceive the world. There are different ways to measure cognitive or learning style. One is the Myers-Briggs Type Indicator (MBTI) and another is the Gordon Cognitive Style Indicator (GCSI). Both of these indicators were administered to the Worcester Public School Classes of 1997-1999 as part of this study so as to research their effects on SAT performance. About 75% of the students in these classes participated, but only about half of each of these classes had taken the PSAT or SAT and not all of the information these students provided were complete. The PSAT and SAT score data was provided by the school district. An understanding of both type indicators is necessary to proceed with further studies.

MBTI

A student's MBTI type is determined by that individual's preferences in four dimensions. An individual's "psychological type" is directly related to how he or she reacts or performs in different situations, including taking standardized tests. Although most people don't know it, and those who do know don't think of it, people's minds work differently despite similar family backgrounds. In practice, however, people tend to assume the opposite; they unconsciously assume that other people's minds work on the same principles as their own. "All too often... the people with whom we interact do not reason as we reason, do not value the things we value, or are not interested in what interests us. The assumption of similarity, therefore, can promote misunderstanding of the motives and behaviors of people whose minds operate quite differently from our own." (MBTI Manual 21) Because of this, Isabel Briggs-Myers and Katherine Briggs developed the MBTI to measure personality type. "The types of mental processing presented [in the MBTI] were discovered by Carl Jung, the

Swiss pioneer in the field of psychology." (Lawrence 3) Jung called them psychological types and these were extended and interpreted by Isabel Myers. The MBTI has become one of the most widely used type indicators today. "The value of the theory underlying the Myers-Briggs Type Indicator (MBTI) personality inventory is that it enables us to expect specific differences in specific people and to cope with people and their differences more constructively that we otherwise could. Briefly, the theory is that much seemingly chance variation in human behavior in fact is not due to chance; it is the logical result of a few basic, observable preferences." (MBTI Manual 21)

There are four separate sets of preferences that the MBTI is based on, all of which are dichotomies: Extraversion versus Introversion, Sensing versus Intuition, Thinking versus Feeling, and Judging versus Perceiving. "An individual is assumed to have a preference for one of each pair of opposites over the other. The four preferences direct the characteristic use of perception and judgment by an individual." (MBTI Manual 24) The first and fourth dichotomies are classified as attitudes and orientations and the middle two dichotomies are classified as functions or processes.

Sensing and Intuition are also known as the two kinds of perception and are considered as irrational functions. Perception means "all the ways of becoming aware of things, people, events or ideas; it includes information gathering, the seeking of sensation or of inspiration, and the selection of a stimulus to attend to." (MBTI Manual 24) Sensing and Intuition are called irrational functions because they are "attuned to the flow of events and operate most broadly when not constrained by events and operate most broadly when not constrained by rational direction." (MBTI Manual 24) This also implies that such functions can not be controlled by the individual and as will be discussed later, are the functions that seem to have an adverse impact on performance in standardized examinations.

Thinking and Feeling are classified as the two kinds of judgment. Judgment means "all the ways of coming to conclusions about what has been perceived; it includes evaluation, choice, decision making, and the selection of a response after perceiving a stimulus." Rational functions "can be personally directed and are in accord with the laws of reason." (MBTI Manual 24) This implies that although a person may be classified as a thinker or a feeler, the individual can choose to be consciously aware of these functions as they affect their decision making. A feeler can be convinced to make a decision that is based more on logic than values if he knows it will be more beneficial; it would simply be a less preferred way of deciding and hence less common an outcome for him. Finally, the remaining sets of preferences are referred to in type theory as attitudes and orientations: Extraversion-Introversion and Judging-Perceiving. The concepts of extroversion and introversion are seen as complementary attitudes or orientations of energy to the inner world. This is not to say, however, that extroverts are outgoing and introverts are shy. "The nature and extent of differences between extraversion and introversion translate into profoundly different approaches to or orientations toward life." (MBTI Manual 25) Judging and Perceiving are classified as the two attitudes or orientations to the outer world and can be affected by a person's upbringing. A more detailed discussion of each dimension is included.

Sensing (S) vs. Intuition (N)

Sensing refers to a person's perception of the world based on his observations by his senses. It establishes what exists and leaves no doubt. "Because the senses can bring to awareness only what is occurring in the present moment, persons oriented toward Sensing tend to focus on the immediate experiences available to their five senses." (MBT Manual 24) When a child classifies a Granny Smith apple as green, he or she is sensing. "They therefore often develop characteristics associated with this awareness, such as enjoyment of the present

moment, realism, acute powers of observation, memory for the details of both past and present experiences, and practicality. Persons oriented to Sensing may become so intent on observing and experiencing the present moment that they do not sufficiently attend to future possibilities." (MBT Manual 24) It may also be difficult to convince a sensing type to believe in something that cannot be physically proven as they need the reassurance from their senses. In contrast, the intuitives are comparatively less interested in learning through physical experiences; they do not need that reassurance and therefore do not seek it. Instead, "intuitives listen for the intuitions that come up from their unconscious with enticing visions of possibilities." (Gifts Differing 57)

Intuition refers to a person's perception based on insight. It allows for better understanding of possibilities, meanings and relationships without actually seeing or physically experiencing them. Carl Jung characterized intuition as "perception by way of the unconscious. Intuition may come to the surface of consciousness as a 'hunch' or as a sudden discovery of a pattern in seemingly unrelated events. Intuition permits perception beyond what is visible to the senses, including possible future events. People who prefer Intuition may develop the characteristics that can follow from that emphasis and become imaginative, theoretical, abstract, future oriented, and original or creative. Persons oriented toward Intuition may also become so intent on pursuing possibilities that they overlook actualities." (MBTI Manual 24) From the definitions of these extremes, it is also important to realize that not every individual is classified as exclusively one or the other. The MBTI instrument simply classifies a person's tendencies and actually measures that tendency using a numerical score.

Thinking (T) vs. Feeling (F)

Simply stated, thinkers are more logical than feelers. Thinking types makes their decisions by way of linking ideas through logical connections as opposed to emotional feelings. They rely on principles of cause and effect to help them make their choices, which as a result tend to be more objective and impersonal. "The focus of attention of Thinking judgment is on the Sensing and Intuitive information relevant to making the particular decision at hand. Thinking judgment relies on impartiality and neutrality with respect to the personal desires and values of both the decision maker and the people who may be affected by the decision. Persons who are primarily oriented toward Thinking are likely to develop characteristics associated with this way of arriving at conclusions: analytical inclination, objectivity, concern with principles of justice and fairness, criticality, and impassive and dispassionate demeanor, and an orientation to time that is linear, that is, concerned with connections from the past through the present and toward the future." (MBTI Manual 24)

Feeling types, on the other hand, come to decisions in a more subjective fashion. It is not to say that they make choices based solely on their sixth sense and choose whatever their instinct tells them. Feelers do "think," but are not as hung up on technicality and logic. They weigh relative values and merits of the issues and rely on understanding of personal and group values. "Because values are subjective and personal, persons making judgments with the Feeling function are more likely to be attuned to the values and feelings of others as well as to their own values and feelings. They try to understand people and to anticipate and take into account the effects of the decision at hand on the people involved and on what are important to them. They have a concern with the human as opposed to the technical aspects of problems, a desire for affiliation, warmth, and harmony, and a time orientation that includes preservation of enduring values... Feeling types may be at a disadvantage when

asked to justify their judgments from the point of view of logic alone." (MBTI Manual 24-25) At the same time, people may find Feeling types easier to approach. The corporate boss who is a feeler is the type who focuses on keeping the employees' happy so as to benefit the company whereas the thinker boss would be more focused on earnings and other technical issues. Again, it must be reiterated that most people are not one extreme or the other.

Extroversion (E) vs. Introversion (I)

It is easy to understand how extroversion and introversion can be taken as synonymous to outgoing. Although to an extent, they are very similar, they are certainly not the same thing. Extroversion refers to those who prefer to talk things out and experiment hands-on immediately upon coming up with an idea. They do not reserve their thoughts to themselves and are not afraid of being embarrassed if they were wrong and nor are they concerned about other people stealing their ideas. Overall, they just want to be interactive. "In the Extroverted attitude, energy and attention flow out, or are drawn out, to the objects and people in the environment. The individual experiences a desire to act on the environment, to affirm its importance, to increase its effect. Persons habitually taking the Extraverted attitude may develop some or all of the characteristics associated with Extraversion: awareness of and reliance on the environment for stimulation and guidance; an eagerness to interact with the outer world; an action-oriented, sometimes impulsive way of meeting life; openness to new experiences; ease of communication and sociability.'" (MBTI Manual 26)

Introversion refers to the opposite. The introvert has the tendency to like to keep things to themselves. Instead of immediately trying out their new ideas by interacting with their surrounding people and environment, they prefer to think it through and "try it out" in their minds first. They take their time and make sure everything will work out before putting

anything into action. They polish their speeches before voicing their opinions. "In the Introverted attitude, energy is drawn from the environment toward inner experience and reflection. One desires to stay focused on the internal, subjective state, to affirm its value, and to maintain this focus as long as possible. The main interests of the Introverted type are in the world of concepts, ideas, and inner experiences. Persons habitually taking the Introverted attitude may develop some or all of the characteristics associated with Introversion: interest in the clarity of concepts, ideas, and recollected experiences more than on transitory external events or fleeting ideas; a thoughtful, contemplative detachment; an enjoyment of solitude and privacy; and a desire to 'think things out' before talking about them." (MBTI Manual 26).

Judging (J) vs. Perceiving (P)

Judging and Perceiving can be summarized as the amount of information a person seeks before taking any action. This can be confused with Sensing and Intuition because the sensing type is interesting is getting as much physical information or evidence as possible through his senses whereas the intuitive will come to trust their instincts in making conclusions before all possible evidence is acquired. The main difference to keep in mind, however, is that the sensing and intuitive dimensions are irrational and that the individuals do not consciously realize their tendencies where as the judging and perceiving dimensions are specific attitudes and orientations.

In the Judging attitude, a person is concerned with having a clear plan and set schedule so that everything would be predictable. "For Thinking Judging types, the decisions and plans are more likely to be based on logical analysis; for Feeling Judging types, the decisions and plans are more likely to be based on weighing and assessing values. But for both TJ and FJ people, who characteristically living in the Judging attitude, perception

tends to be shut off as soon as they have observed enough to make a decision." (MBTI Manual 26) Once enough information is received, the judging types would tend to organize their thoughts and come to their own conclusions.

In the Perceiving attitude, however, people will tend to suspend judgment and keep options open, while in the mean time they are comfortable with exploring possibilities spontaneously; the individual does not need to know what exactly will happen next and is willing to move on by following his curiosity. "For Sensing Perceiving types, the information is more likely to be the immediate realities in the environment, what is happening and is observable. For Intuitive Perceiving types the information is more likely to be new ideas, interesting patterns, and future possibilities. But for both SP and NP types, the Perceiving attitude is open, curious, and interested. Persons who characteristically live in the Perceiving attitude seem in their outer behavior to be spontaneous, curious, adaptable, and open to what is new and changeable. Their aim is to receive information as long as possible in an effort to miss nothing that might be important." (MBTI Manual 26) The spontaneity of perceiving individuals may cause others to mistake them to be indecisive and incapable of staying on course. These are other misunderstandings of human behavior sometimes cause problems in social, business, as well as educational settings, thus warranting the study of individual types.

Effects of Type

In terms of academic aptitude and achievement, verbal scores on the SAT tend to be consistently higher for Intuitive types as a group and sometimes also for Introverts and Perceiving types while math scores tend to be higher for Thinking types, as mentioned by Isabel Myers in her MBTI Manual. While occasional studies show preference for Introversion, Thinking, and Perceiving correlating with academic aptitude, the most

consistent patterns are found in the S-N dichotomy, which will also be a focal point in this study.

Isabel Myers speculated that, one of the reasons Intuitives perform better on standardized exams is that there is a time limit. Even though it was not proven, her theory raised enough concern for closer examination. "Although intelligence tests are usually speed tests for the sake of convenience, it is debatable whether speed has any rightful place in the basic concept of intelligence... The sensing child tends to read each question slowly and thoughtfully several times and, of course, answers fewer questions than the intuitive." (Gifts Differing 60) It is not unlikely to hear a friend complain about a poor performance on a test because he was being careful to answer each question correctly and resulted in not finishing. "Sensing often operates slowly in order to be sure, and Intuition is by definition a kind of perception that involves flashes of insight, hunches, and quick perception though impressions." (MBTI Manual 268) From studies done by Keith McCormick, it turns out that much of the S-N advantage lies in the fact that when a question on the exam is not clearly understood, the sensing students are more likely to choose the "attractors." These are wrong answers that are made to appear as though they are the right ones if the question is misunderstood.

Those who prefer sensing to intuition are interested primarily in actualities as opposed to possibilities. Since they depend on their five senses for perception, whatever comes directly from their own experience is trustworthy. What comes from other people indirectly though the spoken or written word is less trustworthy. (Gifts Differing 57) Intuitive types are more patient with the questions in the long, standardized tests... "They more quickly get the gist of an abstractedly worded sentence stem, record a possible answer by trusting their hunch, and move on to the next question. Sensing types also have hunches

but they tend not to trust them unless though practice they learn that these guesses can help them with time exercises presenting a wealth of complex material." (MBTI Manual 268) This goes back to the earlier discussion that it is difficult to convince a sensing type person to believe in something that can not be proven in the physical world, but if they practice trusting their hunches and see for themselves that it will result in a higher score, it will be something learned from experience and will therefore be trustworthy. But few SAT-preparation courses look into determining a student's type and customizing the program of study for them in such a way, resulting in a bias. According to Isabel Myer's theory, those "hunches" that both types get tend to be correct, and by trusting them, the intuitives have an advantage on the SAT for guessing while the sensing students rather skip the question to avoid a guessing penalty. This turned out to be wrong as the intuitives are actually more likely to skip because they know when to stop when they don't understand the question. Although neither student may fully understand the question on the exam or the answer to it, the intuitives are likely to score higher.

The S-N bias has been studied by Isabel Myers for a long time and her publications have several other explanations for it. One of those explanations is that the S-N dimension affects the student's interest in academics and the concern is that just because someone is not interested in studying does not necessarily mean that they are not intelligent or have low aptitude for learning. "On the average, sensing children have less scholastic interest than intuitive children. Sensing children also make lower scores on the average than intuitive children on intelligence tests and scholastic aptitude tests. It would be grossly mistaken but easy to conclude that sensing types are less intelligent; such tests do not take into account the legitimate choice between two rival techniques for the application of intelligence to life." (Gifts Differing 59)

It is not difficult to see that the skills required to do well on a standardized exam does not necessarily translate into success in the academia or in the working world. There are so many factors that affect success, supported by the number of large corporations began by college drop-outs, that it is not fair to judge a person's intellectual worthiness by an exam alone. "The proportion of intuitives varies widely from one educational level to another. It is particularly low among students in vocational and general high-schools courses, and at least twice as high in academic high-school classes and still higher in college, especially in very selective colleges. A sample of National Merit Finalists was 83% intuitives." (Gifts Differing 58) Some of the topics, such as some of the worded math problems, that students are tested on in the SAT may be the least interesting subjects to sensing students. A lack of interest early on may cause a student to neglect its study, resulting in inability to achieve a higher score. In such a case, the result is due to individual preference, and not necessarily aptitude.

The sensing student who chooses to study that math topic may learn it just as well as the intuitives. "The sensing children are accurate in simple computations as a rule because they are more careful than the intuitives; but when they reach algebra or problems presented in words, many of them have difficulty in seeing what to compute... Most of the intuitive children, who understand symbols, recognize the meaning of figures in the beginning and are ready to work on the problems without too much difficulty." (Gifts Differing 61) Whatever the case may be, none of the studies encountered involved seeing if the socioeconomic status variable is hidden in the score gap represented by a difference in type. This is one of the questions remained to be answered in this study, along with the one that involves determining the relationship between the apparent SAT score bias in students of different GCSI cognitive styles and their respective socioeconomic status.

GCSI

The intuitive advantage on the SAT has been established and examined widely, but there is a related apparent bias that is also based on cognitive style. Comparable to the MBTI is a cognitive measure known as the Gordon Cognitive Style Indicator (GCSI) and it consists of two components: a remote association test and a differentiation test. It was developed in the late 1960s by G. Gordon, who defined types according to this measure, distinguishing between high remote associators and low remote associators because the measure was not linear in its effects. The measure can estimate only where the threshold between high and low remote association ability lies for a given sample.

High remove associators are, in a way, very much like intuitives. "They are more adept at solving problems by ingenious, non-logical flashes of insight." (Kingsland 27) The remote associates test uses a word game to determine an individual's ability to connect concepts or ideas that are only remotely associated by identifying the relationship among them. According to David Kingsland, who did a project on learning style biases in the SAT in 1993, there is little or no correlation between remote association ability and high school grades.

The differentiation test measures the ability to differentiate between items and parts within an environment. High differentiators are capable of breaking down what they see into components, allowing them to better notice any differences, inconsistencies, and variations among items and situations. This sensitivity to subtle nuances allow them to recognize clues about the nature of a problem and use these clues to assist in the early stages of problem solving.

Low differentiators, however, tend to see the environment as a whole and my have preconceptions of it before taking a closer look at its actual details. They tend to concentrate on the similarities between items and situations and overlook the nuances so easily noticeable

to the high differentiators, making them vulnerable to organizational mindsets. On the other hand, low differentiators are likely to be productive workers, as they are less likely to be distracted by minute details or go off on tangents. Also, they are better at making generalizations and seeing the 'big picture.'" (Kingsland 27-28) The combination of an individual's differentiation and remote association tendencies classify that individual in a cognitive type as described by the following table.

Differentiation	Remote Association	Cognitive Type
High	High	Integrator
High	Low	Problem Finder
Low	High	Problem Solver
Low	Low	Implementor

A study of the correlations of these cognitive types and SAT scores was done by David Kingsland, whose report discusses the results in detail. The focus of this project with respect to the GCSI will be in the remote association dimension. The advantage that "remote" associator has over the "local" on the SAT is comparable to that of the intuitives over the sensing types and the SES variable will be examined in terms of these cognitive differences as well.

Other Factors

Although learning style has been a key variable throughout the SAT study, there are other important factors that can not be overlooked. Three of them are gender, ethnic background, and academic preparation. In the realm of this project, all of these factors will be studied in relation to the SES variable. Prior studies done in Worcester show that males have a slight advantage on the SAT over females and the national gap is even larger; Caucasians have an advantage over minorities, especially Hispanics and African Americans. And students who are taking more difficult classes also score higher on the SAT.

For years, critics questioned the SAT's impact on minority races, particularly African Americans. For a long time "ETS has been reluctant to tell the public how blacks perform on the SAT... College-bound whites and blacks in the United States have dramatically different SAT scores. The differences, which favor whites, create a very large credential gap." (Crouse 90) For reasons that need to be explored in this study, minorities score lower on the SAT than Caucasians with the same high school credentials, meaning having attended the same school and taken the same classes. The results "suggest that if colleges insist on blacks having SAT credentials equal to those of whites, most blacks will be rejected from selective colleges because their SAT scores are too low. The requirement that blacks have credentials equal to whites will crowd blacks into the least selective colleges and underrepresent them as a percentage of the white college-bound population at all except for the least selective colleges." (Crouse 90) If there is a correlation between ethnic background and socioeconomic status, one of those variables may disappear and what may have been explained as a racial bias may be a social class bias or vice versa.

For the academic preparation variable, it has been explained that the increase in elective courses in the high school curriculum causes a decrease in SAT scores. "A good deal of attention has been focused on the fact that fewer 'basic' courses are now being required of all students in high school, with many more 'electives' being introduced into the curriculum. This is asserted to be particularly true in the English and verbal skills area, and the evidence suggests that it is... Those schools that showed increases in these [elective] enrollments between 1971 and 1976 also showed larger than normal declines in SAT scores." (College Board 25-26) Again, it must be examined whether students of a lower socioeconomic status are more likely to take fewer challenging (AP or honors) core courses.

The SES variable has been of great interest in the SAT debate for a long time, but none of the prior studies in the Worcester Public School System provided a detailed analysis of its relation to the SAT due to various problems, focusing on data collection, coding, and collaboration with schools sensitive to criticism and reluctant to collect social class data. As a result, most of the other factors have been studied in detail and what is left is the task of determining whether it has been a hidden variable that would help explain the results of the other studies. However, the SES variable must not be overlooked as a stand-alone variable. The direct relationship between SES and SAT scores has been studied in the past by critics and analysts and needs to be examined here as well. According to ETS, "the introduction of tests resulted in a substantial increase in opportunities for educational advancement of low income students by providing a credible demonstration that many such students from schools without reputations for educational excellence could succeed in the demanding academic programs of the most selective institutions." (Crouse 122) This would be a more convincing position if the exam is not biased. Whether it is biased against students from low-income families, as many critics contend, remains to be determined. It is statistically unlikely that the SES variable has no correlation to the other variables. It is known to be a factor of concern in the SAT debate. Findings from all the prior IQP studies done by students will remain true, even if their meaning is altered by this research, but first, these studies and their results must be reviewed to see what we know about the factors that affect SAT score at the onset of this study.

Prior Studies

The study of SAT biases by WPI students began long ago. The first team that studied the relationship between learning styles and SAT performance consisted of David Kingsland, Charles McTague, and Benjamin Kibler. Although their study was done nearly a decade ago,

and the format of the SAT has changed since, they did lay the groundwork for all future studies on the subject. The purpose of the study that this team of three conducted was to test the theory that there are personality type biases in the SAT and the MBTI was main instrument in determining type. The team did the actual data collection themselves and ran into unexpected problems. They expected about half of the Worcester Public School System senior class of the time to have taken the SAT so as to give them 500 usable cases. But it turned out that even after including the junior class only 276 usable cases provided usable data. Despite the low number of cases, they proceeded with the study using the highest SAT score as the dependent variable and gained the following results:

Dimension	Cases (N)	Verbal Difference	Math Difference	Combined Difference
I-E	121 I 155 E	+13 (I)	+21 (I)	+34 (I)
S-N	136 S 140 N	+62 (N)	+46 (N)	+108 (N)
T-F	128 T 148 F	+17 (F)	+6 (T)	+11 (F)
J-P	108 J 168 P	+59 (P)	+43 (P)	+102 (P)

Table 1. Results from Kingsland, McTague, and Kibler Study

Kingsland also did a similar study using the GCSI with the following outcome:

Cognitve Style	Mean Verbal Score	Mean Math Score	Mean SAT Total
Integrator	405	440	845
Problem Finder	374	408	782
Problem Solver	444	513	957
Implementor	339	447	786

Table 2. Results from Kingsland GCSI Study

Clearly the MBTI dimension with the largest gap was the S-N dimension, with the intuitives scoring 108 points higher than their sensing counterparts. Similarly, in the GCSI

study, the Problem Solvers (High Remote Association, Low Differentiation) scored at least 100 points higher that all of the other types. After this initial pilot study, the College Board changed the format of the SAT and the interest of the WPI in further study depend on whether the results would have changed. Another team of three students, Daniel Batey, Paula Brezniak, and Ashwin Purohit, took the challenge of another pilot study. Unfortunately, they also ran into data collection problems and resulted in only a few more cases than their predecessors. Qualitatively, their results were similar, but the numerical differences were larger and this was quite possibly due to the fact that they used the first SAT score (instead of the highest one) as the dependent variable:

Dimension	Cases (N)	Verbal Difference	Math Difference	Combined Difference
I-E	98 I 148 E	+21 (E)	+5 (E)	+26 (E)
S-N	107 S 193 N	+91 (N)	+70 (N)	+161 (N)
T-F	114 T 132 F	+51 (F)	+16 (F)	+67 (F)
J-P	84 J 162 P	+64 (P)	+47 (P)	+111 (P)

Table 3. Results from Batey,Brezniak, and Purohit Study

Although the results from the two early studies were similar, the meager number of cases raised question about the reliability of the finding. Their samples were subject to challenge due to under-representation and self-selection. An attempt to replicate the result through a large scale study was carried out by John Pieper. In the first two studies, the switch in the dependent variable from highest SAT score to first SAT seemed to have caused the resulting advantage gaps to widen. It appeared that the first experience with the test is most valuable to the study, which led Pieper to decide to use the PSAT score in his study instead of the SAT. After another data collection effort that involved all four WPSS high

schools (Burncoat, Doherty, North, and South), a total of 1263 case of students who had taken the PSAT were acquired. Unfortunately, Pieper decided to drop the SES variable from his data assembly phase, making it difficult to recover for later studies. Pieper's analysis focused on only two of the four MBTI dimensions and the results are as follows:

Dimension	Verbal Difference	Math Difference	Combined Difference
S-N	+73 (N)	+49 (N)	+122 (N)
J-P	+8 (P)	+37 (P)	+45 (P)

Table 4. Results from Pieper Study

Although Pieper neglected the I-E and T-F dimensions, the result from the most important dimension for this study (the S-N dimension), provided reassurance that prior hypotheses were correct. The intuitives had a 122 point advantage. As mentioned in the discussion of the MBTI, even Isabel Myers had similar results, with the S-N dimension score gap being the most consistent.

Using the same data set, Keith McCormick carried out a study concurrently with Pieper in an attempt to examine whether the advantage that intuitives have would still manifest itself if the students' program of study was taken into consideration. It had been noted earlier that intuitive students tend to like to study and are therefore more likely to take high level courses in school and continue their education. McCormick knew this as well, based on Isabel Myer's work. Despite this generalization, there are, of course, sensing students taking difficult courses and going to college as well. It was of interest to see if the sensing and intuitive students within certain levels of course difficulty would display the same score gap as that presented by the previous studies. Since McCormick's study is more in-depth, involving each student's program of study, he wanted a dataset that was as complete as possible. If a case has any variables missing, he discarded it. The result was a

subset of Pieper's data set that consisted of only 448 juniors who had taken the PSAT. With the transcript data, McCormick separated the program difficulty into five categories: some AP, only honors, some honors, only college, and some college/all general and looked at the performance among sensing and intuitives within each category:

Program Challenge	Mean PSAT	S-N Dimension	# of Cases	Mean PSAT	Difference
Some AP	1107	N	49	1117	
		S	20	1083	34
Only Honors	973	N	46	1017	
		S	54	936	81
Some Honors	841	N	59	883	
		S	61	801	82
Only College	700	N	42	742	
		S	88	680	62
Some College/All General	643	N	3	610	
		S	23	648	-38

Table 5. Results from McCormick Study

The results indicate that the advantage gap still exists, especially in the mid-range categories. The gap is narrower with students who take some AP course and reversed with those who take some college/all general courses; however, this reverse gap can not be trusted because of the sample size. There were only three intuitives in this category.

The next logical step was to build on the study done by McCormick and examine the SES variable that was, for such a long time, completely neglected. Gerald Noble was the first to attempt to include this variable as the focal point of his study, but because nobody else before him needed the variable, it was never coded in any of the prior studies. Noble not only had to code the SES data from the surveys on hand, but also returned to North and Doherty for a follow-up in an attempt to acquire more cases from those who were absent or did not finish the survey during the first wave of data collection. He managed to get SES and MBTI data for 182 Doherty students and 187 North students. What appeared to be a marginally acceptable number of cases for statistical analysis was later to be reduced to a

ridiculously low number of usable cases due to the remaining data assembly required. The follow-up data never reached McCormick, resulting in him doing his analysis without it. As mentioned before, McCormick discarded all cases where the data was incomplete, including those that Noble followed up on. The result was that there were few cases common to both Noble's and McCormick's data sets. In fact the resulting data set after merging the two contained only 96 cases. Noble's study was supposed to be quite in-depth, examining the effects of SES within each of the sixteen MBTI type as well as academic preparation and this is almost a waste of time to do with only 96 cases. Noble did it anyway, but removed the T-F dimension, reducing the breakdown to eight categories. However, this averaged only about a dozen cases in each category, which is not enough to be statistically representative and this was without incorporating the SES variable into the study. A table with the results can be found in Noble's report. More relevant to this study, however, is the SES variable and Noble was able to dichotomize it into high for parents' occupational prestige score above 50 on a scale of 100 and low for those below 50. Without the need for transcript data, Noble was able to use 339 of the cases in his data subset. He incorporated the dichotomy into the average PSAT scores from students in Doherty and North and broke them down into Intuitives and Sensors as indicated below:

	PSAT Score High SES (>50)	**PSAT Score Low SES (<50)**	**SES Difference**
Intuitive	1059	1040	19
Sensing	936	935	1
Type Difference	123	105	

Table 6. Noble Study of S-N Dimension vs. SES

From this initial study, it appears that the SES variable is not a strong indicator in PSAT performance. There is a 19 point advantage for students in a higher socioeconomic status among the intuitives and a negligible difference among sensors. However, the same

study applied to cognitive style differences shows that the SES variable may have higher importance. Noble analyzed the math and verbal scores separately for each of the four cognitive styles:

PSAT Math Scores	High SES (>50)	Low SES (<50)	Difference
Integrator	446	424	22
Problem Solver	418	374	44
Problem Finder	398	381	18
Implementor	391	357	34

Table 7. Noble Study of GCSI vs. SES in PSAT Math Scores

PSAT Verbal Scores	High SES (>50)	Low SES (<50)	Difference
Integrator	464	454	10
Problem Solver	464	419	45
Problem Finder	424	413	11
Implementor	385	374	11

Table 8. Noble Study of GCSI vs. SES in PSAT Verbal Scores

As mentioned before, it was found that Problem Solvers scored 100 points higher than other types in earlier studies. It is interesting to see that it is also among this group that the SES variable causes the largest score gap. It should be interesting to redo this analysis with a larger, more representative data set to see if it disappears.

It is also worth mentioning that the last study completed on the SAT here at WPI was done by Benjamin Dean-Kawamura. His study focused on the effects of taking the SAT multiple times and whether the "practice" results in a significant score gain among students of different personality types. Because the results of his study are not directly related to the focus of this project, they will not be discussed in detail. The most important of his findings for the purposes of this project is that within the S-N dimension, about 40% of students gained more than 50 points on the SAT on their second tries and the results are independent of whether the students were sensing or intuitives. Because of this, future studies should try to use the same SAT trial (first, second, etc) for all cases to ensure truthful representation.

METHODOLOGY

Data Collection & Assembly

Since the data collection and some of the data assembly as been done by prior students, the SES variable can be studied without duplicating these efforts. However, the rest of the data assembly needs to be done since the SES variable has been neglected for so long. This was made more difficult since each project group assembled the data only to the point where it can be used for that particular project and everything is stored in different files, some of which are subsets of one another. There were also surveys containing the SES data for students from South and Burncoat that needed to be coded. Combining everything available into a comprehensive data set required a great deal of effort and was best split among different people, including work study students. The two other students who are also working on projects, took up portions of the data entry and assembly: Ben Dean-Kawamura, who did the Test-Retest Study; and Matthew Marino, who is concurrently studying the Class of 1999's transition to college. After merging everybody's data sets, a total of just under a thousand cases with SES data were available. Although not every case is complete with other variable data and usable for every analysis, frequency analyses on SPSS showed that there will still be enough cases for the purposes of my study for the results to be representative.

Pertinent Variables

Obviously, the SES variable is the focus of this study. However, all of the other pertinent variables need to be identified and made into usable format. In the SES data set, both parents' occupational prestige scores were coded, but not all of them were available because some students didn't fill in the surveys completely. After meeting with Matt Marino and Professor Wilkes, a decision was made to use the higher of the two parents' scores for each case and if one parent was missing, the other one was used. Those cases without scores

were dropped. This resulted in 999 cases with usable SES data. Another decision was also made to separate the parents' occupational prestige scores into five categories, and the top category separated again into two categories. The SES variable will be used to study more in-depth the results obtained by others in terms of PSAT and SAT scores in relation to MBTI and GCSI types, ethnicity, gender, and academic preparation. For the MBTI, the S-N dimension will be the focus of this study and for the GCSI, the remote association factor will be examined using SES data. For academic preparation, the same five categories used by McCormick will be used. If time allows, other MBTI dimensions will also be studied.

Hypothesis

Gerald Noble's results are the only basis I can make a hypothesis on in regards to the SES-SAT relationship. Although the literature supports a bias against low-income students, the income variable was not studied against the other variables pertinent to this study. It is quite clear that in terms of the MBTI, intuitives have an advantage over sensors and in the GCSI, remotes have an advantage over locals. But it remains to be seen whether these advantages can be explained by SES, and if so, to what extent. Even though Noble studied the correlations that will be repeated in this project, his results are questionable due to the small number of cases he had to work with. The only known result is the desired one. It is desirable for the outcome to be that the SES variable does not have a high enough correlation to explain the apparent advantages due to type, race, gender, or preparation. In such a case, the SES variable would simply disappear. Based on the results of Table 6 of this report, it is possible that this is true with the MBTI type advantage, at least in the S-N dimension. Although the same is not true for the GCSI, it is also an expectation that the apparent SES advantages displayed in Tables 7 and 8 will disappear when the SES is separated into more

categories. Because the rest of the variables have yet to be studied in prior projects, their results remains to be discovered.

ANALYSIS & FINDINGS

MBTI Analysis

The first variable of concern is the MBTI. Extensive work has been done by prior students and their results have been quite consistent. With a larger data set, an attempt to duplicate the prior results is called for. All test scores from this study refers to only the first trial of that particular test, namely the PSAT and SAT, and N refers to the number of cases. The PSAT is important in that it is normally the students' first encounter of an aptitude test and the SAT is important because it is the score that "counts" as far as entry into college is concerned. There has been a repeated pattern of SAT scores being an average of 70 points higher than the PSAT. Table 9a below is tabulated from 1285 cases from the classes of 1997, 1998, and 1999; it shows the mean PSAT and SAT scores for each MBTI Dimension.

Dimension		Combined PSAT Score	Advantage	Combined SAT Score	Advantage
E	Mean	81		877	
	N	751		649	
I	Mean	83	2	905	28
	N	534		420	
S	Mean	76		829	
	N	721		585	
N	Mean	89	13	960	131
	N	564		484	
T	Mean	80		875	
	N	754		623	
F	Mean	84	4	906	31
	N	531		446	
J	Mean	79		857	
	N	518		431	
P	Mean	84	5	910	53
	N	767		638	

Table 9a. MBTI Dimensions vs. Combined PSAT and SAT Scores

Although there is generally a score increase from the PSAT to the SAT, the advantages apparent in each dimension are comparable. However, the largest gap still lies in the S-N dimension, with the intuitives scoring 131 points higher than the sensors on the SAT. This is also the most consistent dimension; in previous studies, the J-P dimension showed a 100+ point gap in favor of the perceivers but it is reduced to 53 here. Naturally, the S-N dimension deserves more attention and relating it to the SES variable will be the focus of this section. Before moving on, however, an examination of the math and verbal scores separately is needed.

Dimension		PSAT - Verbal Score	Adv	PSAT - Math Score	Adv	SAT- Verbal Score	Adv	SAT- Math Score	Adv
E	Mean	41		40		443		434	
	N	751		751		649		649	
I	Mean	42	1	41	1	452	9	454	20
	N	534		534		420		420	
S	Mean	38		38		412		417	
	N	721		721		585		585	
N	Mean	46	8	44	6	488	76	472	55
	N	564		564		484		484	
T	Mean	40		40		436		439	
	N	754		754		623		623	
F	Mean	43	3	41	1	461	25	445	6
	N	531		531		446		446	
J	Mean	39		40		425		432	
	N	518		518		431		431	
P	Mean	42	3	41	1	461	36	449	17
	N	767		767		638		638	

Table 9b. MBTI Dimensions vs. PSAT/SAT Math and Verbal Scores

It appears, from Table 9b, that the gap between math verbal scores is bigger in all except for the E-I dimension. In the S-N dimension, intuitives have a 76 point advantage in the verbal section and a 55 point advantage in the math section of the SAT. The consistent

gap sizes between the PSAT and SAT scores reassure the data credibility. The next step is to incorporate the SES variable, which is separated into quintiles.

SES Categories	Dimension		Combined PSAT Score	Adv	Combined SAT Score	Adv
lowest 5th	S	Mean	70		784	
		N	71		46	
	N	Mean	80	10	889	105
		N	42		23	
second lowest 5th	S	Mean	75		821	
		N	58		41	
	N	Mean	88	13	942	121
		N	39		33	
middle 5th	S	Mean	74		822	
		N	63		46	
	N	Mean	84	10	952	130
		N	51		37	
second highest 5th	S	Mean	77		819	
		N	67		48	
	N	Mean	91	14	966	147
		N	50		45	
second 10th	S	Mean	79		837	
		N	38		30	
	N	Mean	91	12	992	155
		N	29		21	
top 10th	S	Mean	80		875	
		N	25		19	
	N	Mean	94	14	1028	153
		N	37		25	

Table 10. Sesning-Intuition Dimension within each SES Category

From Table 10, it is apparent that regardless of socioeconomic status, the intuitives still have a significant advantage over the sensors. However, this score gap is magnified with higher SES. With the smallest gap at 105 points for the lowest SES quintile, and the largest gap of 155 for the top SES quintile, this means students from higher income families have up

to an extra 50 points advantage. The mean SAT score of an intuitive in the bottom quintile is higher than that of a sensor in the top quintile. Because different sections of Worcester consist of a different mix of social classes, a analysis by school was done to see if that explains anything. From Table 11, however, it appears that the SAT performance of the different high schools is comparable, with the largest gap between Doherty (893) and North (846); There are 795 cases for the combined PSAT score and 565 cases for the combined SAT score.

School		Combined PSAT Score	Combined SAT Score
Doherty	Mean	80	893
	N	126	89
North	Mean	77	846
	N	162	99
Burncoat	Mean	77	878
	N	280	182
South	Mean	82	873
	N	227	195

Table 11. PSAT and SAT Scores for Each School

Logically, the next step is to repeat the analysis done for the MBTI for each of the different schools. However, because of the low number of cases, an in-depth analysis would not produce meaningful results. Table 12 on the next page shows the first step of seeing if the S-N bias exists in each school and the result is positive. Here, there are 773 cases of combined PSAT score and 545 cases for the combined SAT score. Burncoat students have the largest S-N gap of 149 points. All of the other differences are at least 100 points each and thus it is consistent with prior results. The next step was to determine if controlling the SES variable would yield the same results, but because the SES variable consists of quintiles, the results yielded only a few cases in each category and is therefore not enough to be

representative. However, all of the other tables support the fact that the S-N variable exists even when SES is controlled.

School	Dimension		Combined PSAT Score	Adv	Combined SAT Score	Adv
Doherty	S	Mean	78		816	
		N	39		29	
	N	Mean	88	10	968	152
		N	36		32	
North	S	Mean	73		799	
		N	105		61	
	N	Mean	84	11	917	118
		N	55		35	
Burncoat	S	Mean	72		815	
		N	159		101	
	N	Mean	87	15	964	149
		N	160		96	
South	S	Mean	78		816	
		N	115		108	
	N	Mean	88	10	952	136
		N	104		83	

Table 12. Sensing-Intuition Dichotomy within Each School

GCSI Analysis

In the GCSI analysis, the key variable is remote association. As mentioned in the literature review, prior studies revealed that Problem Solvers have the highest advantage. This however, is not true in this study and should not be a big surprise because the last results were from David Kingsland's study conducted in 1993. More importantly, the result shows a relationship to Kingsland's main finding, because as far as remote association is concerned, things haven't changed. The order of the two types of remote associators, "integrators" and "problem solvers," is all that failed to replicate from his small sample to this larger one,

which has 288 cases for the combined PSAT score and 187 cases for the combined SAT score.

Cognitive Style		Combined PSAT Score	Combined SAT Score
Implementor	Mean	72	784
	N	75	43
Problem Solver	Mean	83	904
	N	60	41
Problem Finder	Mean	77	855
	N	105	64
Integrator	Mean	87	951
	N	48	39

Table 13. GCSI Types by Mean PSAT and SAT Scores

From Table 13, it is clear that the Integrators have the highest mean score for both tests, followed by Problem Solvers who are about 50 points behind. Recall that those two cognitive styles are the ones with high remote association, which translate into the hint that remote associators have a score advantage.

Remote Associator		Combined PSAT Score	Combined SAT Score
Local Associator	Mean	75	827
	N	180	107
Remote Associator	Mean	85	927
	N	108	80

Table 14. Association vs. PSAT and SAT Scores

This is nothing new as it has been studied before and the results duplicated in Table 14. The table shows a 100 point advantage in favor of remote associators for both the PSAT and the SAT. The next area of interest lies in the SES variable.

SES Categories	Associator		Combined PSAT Score	Adv	Combined SAT Score	Adv
lowest 5th	Local Associator	Mean	70		785	
		N	41		19	
	Remote Associator	Mean	75	5	828	43
		N	12		5	
second lowest 5th	Local Associator	Mean	72		787	
		N	19		13	
	Remote Associator	Mean	88	16	933	146
		N	17		14	
middle 5th	Local Associator	Mean	74		837	
		N	31		19	
	Remote Associator	Mean	83	9	932	95
		N	18		10	
second highest 5th	Local Associator	Mean	76		827	
		N	39		26	
	Remote Associator	Mean	84	8	915	88
		N	27		23	
second 10th	Local Associator	Mean	80		899	
		N	25		15	
	Remote Associator	Mean	86	6	933	34
		N	17		15	
top 10th	Local Associator	Mean	80		828	
		N	25		15	
	Remote Associator	Mean	91	11	968	140
		N	17		13	

Table 15. Association within Each SES Category

Table 15 suggests no recognizable pattern between SES and association. The gap exists at every social class in favor of remote associators, but at randomly different magnitudes for different classes, ranging from 34 to 140 points on average. It is more

interesting to see that in the top quintile, there is a 34 point advantage, but the top 1/10th shows a 140 point advantage. At the same time, there are large gap of 146 points in the second lowest SES quintile. These variations suggest that either the SES variable is not relevant or there aren't enough cases but a closer look shows that as SES increase, so does the local associators' scores.

Preparation Analysis

The focus of this section is the effects of taking higher level courses on SAT performance. Again, Keith McCormick has done his project on this topic without the SES variable and with a smaller data set of 448 students from the class of 1997. Nevertheless, his results replicate with the larger data set; 1393 cases were available with PSAT scores and 1275 cases were available with SAT scores to generate Table 16 for the classes of 1997 to 1999.

Level of Preparation		Combined PSAT Score	Combined SAT Score
Mostly General	Mean	54	550
	N	15	3
Mostly College/Some General	Mean	64	692
	N	210	125
Mostly College/Some Honors	Mean	73	768
	N	497	482
Mostly Honors/Some College	Mean	91	958
	N	495	496
Some AP/All Honors	Mean	108	1119
	N	176	169

Table 16. Level of High School Preparation vs. PSAT and SAT Scores

The results from Table 16 that students taking more difficult classes are scoring progressively higher on the PSAT and SAT should be no surprise. The area of interest to this study is, of course, whether these results still hold true when the SES variable is controlled.

From Tables 17a and 17b, it can be seen that very few students in the Worcester high schools follow a curriculum of AP and Honors courses. With that said, within the lowest SES quintile, there are comparatively more students taking the lowest level classes than highest ones; but in general, most students follow middle-level curriculums regardless of socioeconomic status.

SES Categories	Level of Preparation		Combined PSAT Score	Combined SAT Score
lowest 5th	Mostly College/Some General	Mean	64	683
		N	25	11
	Mostly College/Some Honors	Mean	70	755
		N	52	34
	Mostly Honors/Some College	Mean	86	938
		N	35	28
	Some AP/All Honors	Mean	99	960
		N	5	4
second lowest 5th	Mostly General	Mean	50	
		N	1	
	Mostly College/Some General	Mean	63	679
		N	19	10
	Mostly College/Some Honors	Mean	72	775
		N	33	28
	Mostly Honors/Some College	Mean	95	1009
		N	32	30
	Some AP/All Honors	Mean	99	1002
		N	14	11
middle 5th	Mostly College/Some General	Mean	62	629
		N	17	7
	Mostly College/Some Honors	Mean	75	808
		N	45	28
	Mostly Honors/Some College	Mean	88	923
		N	45	44
	Some AP/All Honors	Mean	99	1074
		N	10	11

Table 17a. Level of Preparation within Each SES Category (Bottom 3 Fifths)

SES Categories	Level of Preparation		Combined PSAT Score	Combined SAT Score
second highest 5th	Mostly College/Some General	Mean	69	744
		N	23	11
	Mostly College/Some Honors	Mean	73	760
		N	47	41
	Mostly Honors/Some College	Mean	92	988
		N	36	34
	Some AP/All Honors	Mean	111	1150
		N	13	13
second 10th	Mostly College/Some General	Mean	64	690
		N	9	3
	Mostly College/Some Honors	Mean	78	800
		N	31	23
	Mostly Honors/Some College	Mean	90	939
		N	18	20
	Some AP/All Honors	Mean	114	1180
		N	9	7
top 10th	Mostly General	Mean	40	
		N	1	
	Mostly College/Some General	Mean	64	745
		N	8	4
	Mostly College/Some Honors	Mean	79	830
		N	21	19
	Mostly Honors/Some College	Mean	99	1058
		N	23	14
	Some AP/All Honors	Mean	104	1112
		N	12	10

Table 17b. Level of Preparation within Each SES Category (Top 2 Fifths)

It appears that regardless of SES, students taking the more challenging classes consistently score higher on the SAT. It can also be noted that there is a slight score increase with higher SES as well. However, there is not enough evidence to say that the higher the

social class, the more likely a student will score better because the second highest quintile scored higher than the top quintile and the SAT score increase is significant only when comparing students from different classes that are all taking AP and honors level classes. The scores for lower and middle level classes are not very different for students in different classes. With the exception of the top tenth in SES, students taking mostly college with some general classes score in the high 600s, students taking mostly college with some honors classes score close to 800 points, students taking mostly honors with some college courses score in the 900 range. Therefore, SES has little effect on SAT performance when students take a challenging curriculum.

Gender Analysis

An initial analysis summarized in Table 18 shows a 26 point advantage for males on the SAT, but a 1 point (negligible) advantage for females on the PSAT.

Gender		Combined PSAT Score	Combined SAT Score
male	Mean	79	889
	N	237	149
female	Mean	80	863
	N	312	245

Table 18. Gender vs. PSAT and SAT Scores

SES Categories	Gender		Combined PSAT score	Adv	Combined SAT score	Adv
lowest 5th	male	Mean	74	1	818	
		N	37		20	
	female	Mean	73		836	18
		N	59		39	
second lowest 5th	male	Mean	84	2	878	
		N	31		21	
	female	Mean	82		884	6
		N	42		37	
middle 5th	male	Mean	77		916	50
		N	41		26	
	female	Mean	79	2	866	
		N	52		40	
second highest 5th	male	Mean	79		886	
		N	41		29	
	female	Mean	85	6	916	30
		N	52		43	
second 10th	male	Mean	83		936	73
		N	28		17	
	female	Mean	83		863	
		N	31		26	
top 10th	male	Mean	89	4	1043	125
		N	20		15	
	female	Mean	85		918	
		N	37		24	

Table 19. Gender within Each SES Quintile

Whether the gender gap really exists is debatable because it is so small. With the assumption that the 26 point gap in the SAT is always true, an SES analysis was done. The results, tabulated in Table 19, are surprising. It was expected that the gap would be small in all classes, but instead, they were large and in favor of different genders. In the second decile, there is a 73 point advantage for males, but there is a 30 point advantage for females in the quintile just below it. Not only are the other results scattered over the different social classes, but the results for the SAT are inconsistent with those for the PSAT. If they were consistent, then a case could have been made that depending on specific family circumstances, males

and females tend to score differently on the SAT. Because of the inconsistency, however, the results appear to simply be random because the gender gap does not exist. However, it must be noted that the females in this sample were taking more challenging classes. This would have given them enough advantage over the males to close the gender gap. A gender analysis with the curricula controlled is called for before the SES variable is added.

Ethnicity Analysis

Ethnic biases are a sensitive area and thus a subject of constant debate. From the literature review, a bias against blacks has been discussed and appears to be true.

Ethnicity		Combined PSAT Score	Combined SAT Score
Native American	Mean	60	585
	N	4	2
Asian	Mean	78	820
	N	160	183
Hispanic N-W	Mean	64	675
	N	64	51
Hispanic W	Mean	69	774
	N	155	116
Black	Mean	70	771
	N	163	126
White	Mean	87	940
	N	975	816
Total	Mean	81	881
	N	1521	1294

Table 20. Ethnicity vs. PSAT and SAT Scores

Table 20 shows the mean PSAT and SAT scores for students of different races. Whites have the highest average score and they are a whopping 120 points ahead of the second highest group, which is Asian. Although the Native American mean score is the lowest, those results should not be used because there are only four cases for the PSAT and two for the SAT. The next lowest scoring group is the Hispanic non-white group, with a

mean SAT score of 675. Hispanic whites and Blacks have similar respective scores of 69 and 70 on the PSAT and 774 and 771 on the SAT. Adding the SES variable did not help explain these differences. With the exception of Whites, there is no pattern of a steady increase or decrease in score as SES is increased, as shown in Tables 21a and 21b.

SES Categories	Ethnicity		Combined PSAT score	Combined SAT score
lowest 5th	Asian	Mean	75	817
		N	23	20
	Hispanic N-W	Mean	62	642
		N	9	5
	Hispanic W	Mean	65	738
		N	18	9
	Black	Mean	66	791
		N	15	9
	White	Mean	79	880
		N	66	35
second lowest 5th	Asian	Mean	87	905
		N	13	12
	Hispanic N-W	Mean	59	643
		N	4	4
	Hispanic W	Mean	60	723
		N	7	4
	Black	Mean	74	850
		N	9	6
	White	Mean	84	911
		N	71	54
middle 5th	Asian	Mean	81	845
		N	12	11
	Hispanic N-W	Mean	63	580
		N	2	2
	Hispanic W	Mean	74	830
		N	14	11
	Black	Mean	69	787
		N	9	6
	White	Mean	81	918
		N	91	61

Table 21a. Ethnicity within Each SES Category (Bottom 3 Fifths)

SES Categories	Ethnicity		Combined PSAT score	Combined SAT score
second highest 5th	Asian	Mean	71	668
		N	6	5
	Hispanic N-W	Mean	69	670
		N	6	3
	Hispanic W	Mean	69	818
		N	11	8
	Black	Mean	68	727
		N	13	10
	White	Mean	87	946
		N	93	74
top 5th	Asian	Mean	93	837
		N	3	3
	Hispanic N-W	Mean	76	730
		N	2	1
	Hispanic W	Mean	62	720
		N	5	3
	Black	Mean	76	802
		N	12	10
	White	Mean	87	946
		N	51	36
top 10th	Native American	Mean		470
		N		1
	Asian	Mean	84	911
		N	9	8
	Hispanic W	Mean	72	923
		N	5	3
	Black	Mean	71	800
		N	10	7
	White	Mean	93	1016
		N	47	29

Table 21b. Ethnicity within Each SES Category (Top 2 Fifths)

In most cases, the order of performance among the races does not change with social class and the gaps between them vary only slightly. The differences in ethnic group by social class are not going to explain the ethnic differences in SAT scores. A closer examination of ethnic differences is warranted, beginning with math and verbal score comparisons.

Ethnicity		1st verbal score	1st math score	PSAT - 1st verbal score	PSAT - 1st math score
Native American	Mean	315	270	29	31
	N	2	2	4	4
Asian	Mean	376	443	36	42
	N	183	183	160	160
Hispanic N-W	Mean	345	329	32	32
	N	51	51	64	64
Hispanic W	Mean	397	378	35	34
	N	116	116	155	155
Black	Mean	394	377	35	35
	N	126	126	163	163
White	Mean	477	463	44	42
	N	816	816	975	975

Table 22. Ethnicity vs. PSAT/SAT Math and Verbal Scores

Because different ethnic backgrounds often mean different languages, students whose first language is non-English may be subject to scoring lower on the verbal section. This bias exists most apparently among the Asian students. While all of the other groups have verbal scores that are either identical or slightly greater than their math scores, the Asian students have verbal scores 67 points lower than their math scores. The language variable may be a better one to examine when trying to explain ethnic biases in the verbal SAT than SES.

SES Alone

Up until this point, the SES variable has been used to see if it serves to explain biases raised by other factors. In most cases, the analysis reveals that those biases exist within each social class. However, this study would not be complete if the direct relationship between SES and SAT is not examined because SES biases can be used to further explain previous findings by race on level of high school preparation as well.

SES Categories		Combined PSAT score	Combined SAT score
lowest 5th	Mean	74	822
	N	131	78
second lowest 5th	Mean	81	883
	N	104	80
middle 5th	Mean	79	882
	N	128	91
second highest 5th	Mean	82	892
	N	129	100
second 10th	Mean	83	896
	N	73	53
top 10th	Mean	87	950
	N	71	48
Total	Mean	80	883
	N	636	450

Table 23. SES Category vs. PSAT and SAT Scores

The pattern presented in Table 23 is similar to those presented in the analyses in this report that involved SES. The lowest fifth group has a comparatively lower (61 points) mean score than the rest, while the other four groups have roughly the same score. Further breakdown of the top quintile shows that the top 10^{th} has a 54 point advantage. This pattern manifested itself in the other tables. Although only the SES variable created from parents' occupational prestige scores were used in this study, there are other variables that give hint to what social status is that have yet to be examined, including parents' education. (Table on following page)

Father's Education		Combined PSAT score	Combined SAT score
Grade School	Mean	77	851
	N	78	51
High School	Mean	77	859
	N	229	149
Associate Degree	Mean	78	866
	N	82	57
Bachelor Degree	Mean	84	904
	N	168	130
Master's Degree	Mean	83	908
	N	68	54
Doctorate Degree	Mean	75	854
	N	32	20
Total	Mean	79	877
	N	657	461

Table 24. Father's Education vs. PSAT and SAT Scores

Table 24 shows that father's education is directly related to SAT performance, except for those with a doctorate, in which case the performance drops significantly.

Mother's Education		Combined PSAT score	Combined SAT score
Grade School	Mean	74	832
	N	105	67
High School	Mean	78	850
	N	228	153
Associate Degree	Mean	77	852
	N	127	88
Bachelor Degree	Mean	84	922
	N	164	127
Master's Degree	Mean	94	997
	N	47	39
Doctorate Degree	Mean	74	848
	N	22	16
Total	Mean	80	878
	N	693	490

Table 25. Mother's Education vs. PSAT and SAT Scores

The same analysis with mother's education level, shown in Table 25, reveals that this direct relationship is the same as that for father's education, but only qualitatively. It appears

that a student whose mother has a master's degree will score 89 points higher than a student whose father has a master's degree. Those students whose mothers have a bachelor's degree will also score 18 points higher than those whose father has the same level of education. This may suggest two things. One is that well educated women may be more likely to encourage their children to do well academically than men. The other is that many women prefer a spouse who is at least as well educated as they are whereas men are more likely to marry women who are less educated than they are. In the latter case, the mother's educational level would represent the minimum level for both parents. In the cases where the mother has a college degree, the father would have a college degree. Students who have two well educated parents may be much more likely to score better on standardized tests. These theories should be examined closely in future studies.

Social Status		Combined PSAT Score	Combined SAT Score
Lower Class	Mean	75	826
	N	33	22
Lower Middle Class	Mean	80	897
	N	165	106
Middle Class	Mean	78	856
	N	187	129
Upper Middle Class	Mean	81	888
	N	279	211
Upper Class	Mean	77	882
	N	14	9

Table 26. Self-Reported SES vs. PSAT and SAT Scores

Next, the students' self rank of their social status was used in Table 26. With the exception that the lower class group scored lower than the rest, these results show no recognizable pattern. It may be difficult for students to determine what their socioeconomic

status is, making these results unreliable; but their self report self image doesn't seem to be related to SAT performance.

Academic Self-Rank		Combined PSAT Score	Combined SAT Score
Poor	Mean	87	983
	N	20	18
Below average	Mean	79	901
	N	99	70
Average	Mean	75	825
	N	336	205
Above average	Mean	83	893
	N	238	185
Excellent	Mean	84	903
	N	58	46

Table 27. Academic Self-Rank vs. PSAT and SAT Scores

Finally, the students' self-rank of themselves in terms of academic ability was used. The results, presented in Table 27, are ironic. The group that ranked themselves as poor students have a mean score about 80 points higher than the rest! These results are unlikely to be true. Subjective self-rank answers are highly questionable and future researchers should be cautious when they look into this matter.

CONCLUSION

Compared to the variables from previous studies, especially the Sensing-Intuition dimension of the MBTI and level of high school preparation, SES does not have a very strong relationship to SAT performance. These variables were re-examined without SES to see if the results from the current, larger, more complete data set are the same as those obtained from previous projects.

The results for the MBTI proved to be the most consistent, especially for the S-N dimension. It can be concluded that the intuitives have a significant advantage over the sensors regardless of social class. The GCSI variable yielded similar results. Regardless of social class, remotes will have an advantage over the locals. The magnitude of the advantage is different within each social class, and this may be explained by the gradual increase in score by the locals as social class increases. In terms of preparation, a more in-depth analysis is needed to see if there is a correlation between SES and student curricula. But like before, the results obtained from previous studies still hold true qualitatively when the SES variable is controlled. In future studies, the examination of the effects of challenging high school classes of SAT performance within each social class is called for.

The gender variable also requires more examination. This study began with the expectation that males have a small advantage in the Worcester Public School system, which was true before the SES variable was added. But once SES was incorporated, the results are so irregular that no definite conclusion can be drawn. In theory, however, the gender gap does not exist. For future research, the high school program variable needs to be controlled before looking at gender differences because one gender may be more likely to take challenging classes than the other.

The variable that has the potential to be closely related to social class is ethnic background. It was a surprise, however, to see that controlling the SES variable had little effect on the apparent biases against minorities. Qualitatively, the biases remained the same within each social class and the quantitative effects are minor. An important discovery is the math advantage and/or verbal disadvantage that Asians have regardless of social class. This may be attributed to language differences and should be examined in future studies. If the ethnic differences exist only because of the verbal score, then perhaps the math score can be used to study other possible differences by controlling other variables such as SES.

Finally, the SES variable and related factors were analyzed directly against PSAT and SAT scores and there seems to be no significant advantage among the social classes, especially within the middle range. A question of whether the SES quintile developed from the parents' occupational prestige scores is a trustworthy variable was raised and an attempt to answer it was made by analyzing the parents' occupation variables. The conclusion is that in general, SAT scores rise with parents' occupation; the exception is the parents with doctorates, whose children score no differently from those of lowest education levels. Out of curiosity, the student-reported social class variable and the student academic self-rank variables were analyzed. The conclusion was that these variables produce ironic results and future researchers should be cautious about their use.

This project laid some of the ground work for future, in-depth analysis by coding remaining surveys and collaborating existing data sets into one large, comprehensive data set. Because of time, not all of the questions revolving around the SES variable was answered, but it began to explore the SES variable's relationship to the other pertinent variables and points out what other areas need to be examined to fully understand all possible SAT biases.

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