By Jim Rubin

Judging Our Students- Keeping it Just:

The Theorem of Intellectual Measure

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Introduction

Institutions of higher learning serve as a portal, through which opportunities for life, and potential for social evolution are intrinsically bound. The decision of who is allowed to pass through this portal is not only a defining moment for the individual student, but also a significant portent towards the fulfillment of social justice on which this nation was founded. At the front lines of this issue are admission officers, who through their leadership have the power to advocate for equal access to students of different incomes, genders, ethnicities, and socioeconomic circumstances (Fetter et. al., 2006). However, regardless of the personal integrity and idealism of an individual officer, there are policies and guidelines that dictate by what criteria these decisions will be made, which originate from the executive administrators of the institution. It is the purpose of this article to argue for an adjustment in the criteria for admission based on the Theorem of Intellectual Measure.

The Theorem

Assessments of intellectual acumen rely upon a measure of knowledge acquired relative to opportunities available in the attainment of that knowledge.

Intelligence

It should come as no surprise that the first university was founded by one of the first philosophers to define intelligence. In 387 B.C.E. Plato founded a school of science and philosophy famous for written dialogues between two or more students debating philosophical issues (World Book, 1991).

The fact that Plato started a university to train students towards that goal speaks volumes about his recognition of the importance that education, environment and opportunity play in the process. Plato makes special reference to a situation when Socrates, his famed teacher, taught a slave geometry simply by asking questions. There are several lessons from this story. One is that students can learn without any input of knowledge, another is that the capacity to learn needs to be stimulated through a supportive environment (Indiana University, 2003).

In spite of disparateness in theories of intelligence from modern day educators, three themes run concurrent in one or more combination for virtually all theories: (1) the capacity to learn; (2) the total knowledge acquired; and (3) the ability to adapt successfully to a changing environment (Woolfolk, 2004). Sternberg's (1998) definition relates to the mental abilities necessary for adaptation to, as well as shaping and selection of, any environmental context. Sternberg's postulate is closely aligned with Plato and broadens the more limited view of measuring only accumulated knowledge. This more expansive view of intelligence supports the basis for this article.

Measuring Knowledge/Standardized Tests

The terms standardized testing, assessments, and testing instrument, as referred to by this author, are defined as a set of questions administered to students on a nationwide basis for the purpose of determining what a person knows about a certain subject area. Administration procedures and scoring are the same for all test takers with these tests, making it possible to compare scores within and among all participating jurisdictions (National Commission on Testing and Public Policy, 1990).

Construct validity refers to the extent to which a measure correctly operationalizes the concepts being studied (Gall et al., 2003). There is legitimate doubt about the ability of a test to truly capture the essence of a person's knowledge (Erwin, 2005). However, an assumption is made within the context of this paper that a degree of literacy is revealed in spite of limitations.

The increased pace of cultural diversity in the past several decades makes intelligence and the need to recognize it, an increasingly important facet of the social fabric. While standardized tests continue to strive for a valid measure of accumulated knowledge and have achieved some proficiency in doing so, the ability to directly measure skills related to intelligence remains an elusive goal. However, the standardized test does show an element of intelligence indirectly.

Assuming that construct validity is not an issue, the score on a standardized test shows the degree to which an individual responded to the educational environment. This value is based on the degree of knowledge accumulated, related to the environmental support during the attainment of that knowledge. Instead of measuring intelligence directly, it is measuring a reflection of intelligence as it relates to one aspect of a complex environment. However limited this may

be in judging the broader concept of intelligence it has validity when applied to the smaller scope of education and the likelihood of future success in educational settings.

It is not the intent of this study to gauge how well standardized tests measure the educational component of intellect; presently it remains a viable tool because of the convenience and value of issuing one test to large groups (Madaus et al., 2000). The fact that all students take the same test in a structured setting that strives for conformity, allows valid comparisons to be made between students.

Any test given at a specified time is hoping to achieve a snapshot of knowledge accumulated to date (Erwin, 2005). While the goal of achieving assessment objectivity has still not come to fruition (Hursh, 2005), the possibility of success still lies within the realm of theoretical possibility (Chudowsky et al., 2003). Knowledge, regardless of how fluid in nature, has been built on past experience and exists in some format in the present. With further refinement of structuring questions and format, the idea of tapping into that information with a greater degree of construct validity seems possible.

There has been a level of dissent from notable educators about the ineffectiveness of using one measure of assessment to make judgment concerning admission and school performance.

Current Trends

Each day the demand to use standardized testing seems to grow exponentially (Hursh, 2005). In addition to the federally mandated testing in grades three through eight, recent trends indicate national testing standards for higher education is a possibility in the not-too-distant future (Dillon, 2006).

There has been a level of dissent from notable educators about the ineffectiveness of using one measure of assessment to make judgment concerning admission and school performance (Sedlacek, 2003; Sternberg, 1998). One important concern relates to the increased cultural and socioeconomic diversity in our schools and the potential for not meeting an acceptable level of construct validity necessary for testing a heterogeneous student body (Hursh, 2005). Another concern revolves around the construct being measured and its relationship to admission criteria. An examination of these two issues will help build the framework for understanding the logic behind the suggestions presented for adjusting admission procedures.

Philosophy v. Practice

Cases like *Regents of Univ. of Cal. v. Bakke* (1978) and *Grutter v. Bollinger* (2003) indicate there is jurisprudence from the Supreme Court dictating a social need to represent minorities in our universities, based on the realization that the country is on a path towards increased diversity. By 2008, the percentage of Hispanics is projected to represent 21 percent of the public school enrollment, an increase of 9 percent in 14 years. The percentage of whites on the other hand, will decrease 11 percent in the same time frame and will represent 56 percent of the public school enrollment by 2008 (College Board, 2003).

The foresight of these court decisions recognizes the important role that universities have in training leaders for a wide range of social needs. Open doors to minorities is an important part of university admission policy in light of these concerns, as reflected by Justice O'Connor's opinion in *Grutter v. Bollinger*: "More broadly, the Law School seeks a mix of students with varying backgrounds and experiences who will respect and learn from each other."

In spite of a clear directive from the Supreme Court, there are several current trends that rebuke these ideals. One issue is African American and Hispanic enrollment in California colleges, which shows a disparity in the extent of participation related to eligibility. Students from these ethnic groups are meeting minimum admission requirements in greater numbers but do not enroll at an equal pace (California, 2006). Questions concern why these students are not pursuing higher educational options when they are qualified to do so. The relationships between admission criteria, the selection process, and how they relate to these groups are at issue.

Another current practice that exacerbates supporting diversity is the policy of ranking colleges based on six-year graduation performance rates (Olivas, 2002). Statistics show that students from the highest quartile of socioeconomic status are six times more likely to graduate college compared with students from the lower quartile. For institutions desiring to improve their rating and receive benefits accordingly, there is little incentive to support poorer students who might need additional resources for success.

A recent decision by the City University of New York's (CUNY) Board of Trustees to phase out remedial coursework at all of the system's city colleges is yet another example of current university trends that discriminate against students

with lower test scores (Richardson, 2005). CUNY's historical mission is clear on a policy to support a diverse student clientele, including students from different cultural backgrounds and those from lower socioeconomic status. This new policy clearly limits the potential for students from these groups to achieve upward mobility through higher education. With the increasing diversity of student bodies, improving access and academic performance for minorities should be a priority (Hurtado, 2005).

Admission Decisions

An institution of higher education needs students who have a capacity to learn at the collegiate level. Given the increase in the numbers of university applicants, many schools base admission judgments on standardized test scores and high school academic records (Sanoff, 2006). However, evaluating environmental adaptation, a main component of intelligence, is not fully represented through this data.

For students who score at the highest percentage of testing ranges there is little doubt about a future capacity to excel; excellence in accumulated knowledge speaks to either extreme motivation or gifted intellect. However, consider a student who had every possible resource and opportunity for educational support with a score just above the median range on a national standardized test, compared to a student with sparse educational resources who scored just below the median level. On the surface it may appear that the first student is a better choice for admission based on his greater degree of accumulated knowledge. Making this comparison, however, makes the assumption that both candidates were exposed to equal opportunities and the student scoring higher, through a greater capacity and motivation to learn, has achieved a higher standard. On further scrutiny, the score on the standardized test may actually reveal differences in educational opportunities better than useful comparisons of intellectual capabilities (Kim et al., 2004).

Given the diversity of educational opportunity in current college applicants, it is necessary to apply an environmental adjustment to the scores to determine what is really indicated by the aforementioned score differential (Campbell, 1996). If the second student was raised in a non-English speaking country with parents of limited formal education, the scores may reveal more than comparisons of knowledge. The level of academic proficiency attained under these circumstances could indicate a substantially higher motivational drive compared to the first student, as well as a greater capacity to learn in a non-supportive environment. In addition, achievement under adverse conditions hints at a capacity for flexibility and creativity, given the level of learning achieved relative to the paucity of support and resources available. To the degree that flexibility and creativity are honed through experience, it is logical to assume that a person who was not challenged by limited resources in their educational environment might not acquire a comparable level of these attributes.

The ability to succeed in environmentally non-supportive environments is aligned with the characteristics of someone who meets the stated definition of highly intelligent (Sternberg, 1998). Students who fit this category show adaptation to an environment that other students have found antithetical to learning and a capacity to successfully react to and ameliorate a challenging situation. To the degree that colleges are interested in admitting motivated, flexible, creative, and determined students, the student with lower test scores might be a better choice.

Students who score in the lower tier of standardized testing present additional considerations for admission administrators. One issue concerns a standardized testing instrument that does not relate to the background schema of the student. This may be true for certain racial and cultural groups, as well as students who were raised in impoverished economic conditions. This raises relevancy issues concerning what the test scores indicate (Boaler, 2003). Another issue is a lack of ability to focus and read for extended periods of time. This skill is acquired through the development of good study habits over years of experience. The fact that this skill has not been developed to a proficient level may or may not correlate with the desire and capacity to learn in the future, especially considering changes in living conditions and maturation (Messick, 1993). Students in this category present the greatest risk for college admission officers due to the uncertainty of making a successful transition to college. This makes careful scrutiny a necessary component of the decision making process.

Factors Affecting Academic Success

Research identifies several factors that correlate with student success. One is the degree of rigor in the high school curricula, overshadowing SAT scores (Horn, 2001). A related study by Haycock, Jerald and Huang (2001) compared the quality of teaching and environment between blacks and whites. Middle school black students were twice as likely to have teachers that did not support development of lab skills and were four times as likely to receive little to no assessment using hands-on activities. Blacks were twice as likely not to be challenged with data-analysis in science classes, less likely to have a teacher who participated in professional development the previous year, less likely to have a teacher

with certified competency, four times as likely to have rooms with little or no access to running water, and much less likely to have the necessary materials for conducting basic science projects. Horn (2001) concludes that socioeconomic status correlates strongly with the opportunity to participate in and complete a curriculum of high standards.

Research also identifies socioeconomics as a factor related to academic achievement (Hursh, 2005; Yang et al., 2004). In a meta-analysis of more than 200 studies, the average correlation between family economics and achievement was .22 at the individual level, and .73 at the group level (White, 1982). While many factors can be attributed to environments that do not provide rich educational opportunities, it is the link with socioeconomics that provides a consistently strong, more easily measured variable.

Measuring SES

The procedure for measuring socioeconomic status (SES) has been linked to three main variables: social capital (the network of family and social relationships); cultural capital (the relationship of family to cultural and educational experiences); and economic capital (family economic status and power) (Becker et. al., 1979).

Using a formula, we can adjust SAT scores by running correlations with measures of socioeconomic status and derive a value that compensates for differences in educational opportunity. This is a negative relationship, in that high SAT scores that correlate with low socioeconomic status will result in a higher measure of overall intellect and rank compared with the consideration of SAT scores alone. Low SAT scores that correlate with high socioeconomic status will result in a lower rank compared to SAT scores alone.

The first scenario suggests a student with little support and resources who has managed to show a high level of accumulated knowledge. According to the aforementioned rationale for judging intelligence, this student is awarded a higher rank compared to a student who has been given a full complement of educational resources and achieved a similar SAT score. This is due to achieving comparable scores under less favorable circumstances.

The second scenario suggests a student who has been given every chance to succeed, but has not achieved high marks on the SAT. This student deserves a lower rank compared with students who have similar SAT scores from lower socioeconomic means. In this case one questions whether a better educational environment would have made a considerable difference for the student from poverty. The rate of achievement, albeit equal for both students, should be seen as having greater value for the poorer student when considering the imbalance in resources.

Table 1. ACT to SAT (Indiana University, 2003)

ACT Composite Score	SAT I Score (V +M)
36	1600
35	1580
34	1520
33	1470
32	1420
31	1380
30	1340
29	1300
28	1260
27	1220
26	1180
25	1140
24	1110
23	1070
22	1030
21	990
20	950
19	910
18	870
17	830
16	780
15	740
14	680
13	620
12	560
11	500

Implementation

In order to implement this admission strategy a formula is employed using information common to all admission departments, where C=SAT/SES. "C" is an abbreviation for "composite score" and correlates to the final score by which to judge candidates for admission. "SAT" represents the score from the standardized test. If ACT scores were used in the application they will be converted to SAT scores using the figures in Table 1.

"SES" stands for socioeconomic status and represents a number that directly relates to data from the Free Application for Federal Student Aid (FAFSA) form, commonly used in the process of applying for financial aid.

SES is deduced from the Expected Family Contribution

Table 2. 2007-08 Estimated Expected Family Contribution (EFC)
Number in College = 1

Annual Income	Number in Family	Total Parent Assets				
		$25,000	$50,000	$75,000	$100,000	$125,000
$20,000	3	$0	$200	$850	$1,500	$2,150
	4	$0	$200	$850	$1,500	$2,150
	5	$0	$200	$850	$1,500	$2,150
$40,000	3	$2,400	$2,550	$3,250	$4,050	$4,950
	4	$1,550	$1,700	$2,350	$3,050	$3,800
	5	$700	$900	$1,550	$2,200	$2,850
$60,000	3	$6,600	$6,950	$8,300	$9,700	$11,100
	4	$5,200	$5,500	$6,600	$7,850	$9,300
	5	$4,100	$4,300	$5,250	$6,350	$7,550
$80,000	3	$13,300	$13,700	$15,100	$16,500	$17,900
	4	$11,450	$11,850	$13,250	$14,650	$16,100
	5	$9,750	$10,150	$11,550	$12,950	$14,350
$100,000	3	$19,400	$19,800	$21,200	$22,600	$24,000
	4	$17,700	$18,100	$19,500	$20,950	$22,350
	5	$16,150	$16,550	$17,950	$19,350	$20,800

(EFC) portion of FAFSA, which determines the family's level of financial obligation. More specifically, the figure derives from information regarding income, family size, assets, expenditures, net worth, debt, and other related data, giving a valid figure for determining socioeconomic status. Financial support can range from $0 to $99,999. For the purpose of using our formula, $1 will be the smallest value instead of $0. Table 2 gives an estimate of how income and family assets affect an average size family with one person in college (www.finaid.org, 2006).

According to these figures, a family of three that earns $100,000 a year with total assets of $125,000 would need to contribute $24,000 towards college tuition. Extrapolating the trend, a family income of $500,000 and assets of $600,000 would require a family to pay the maximum amount of $99,999 towards tuition expenses. This is important for understanding the real differences in socioeconomic opportunity between students on the low and high end of the EFC scale.

A student whose family is required to pay $1 towards tuition represents the lowest degree of socioeconomic status. The educational opportunities available related to resources that support learning, are at the lowest range of the scale. A student from this background likely has few books in the home, attended a high school of poorer quality, and enjoyed little in the way of extracurricular activities that would contribute towards educational outcomes.

A student whose family is required to pay $99,999 towards tuition represents the highest degree of socioeconomic status. This family would have ample resources to provide a rich array of educational opportunities and support learning with a wide variety of reading material in the home. The neighborhood this student grew up in would likely be middle to upper class and the schools attended would probably be high quality, offering a rich variety of resources. Table 3 illustrates how to use this data for implementation in the formula.

Table 3. SES Values

SES Value	EFC Data
10	1-9,999
10.05	10,000-19,999
10.10	20,000-29,999
10.15	30,000-39,999
10.20	40,000-49,999
10.25	50,000-59,999
10.30	60,000-69,999
10.35	70,000-70,999
10.40	80,000-80,999
10.45	90,000-99,999

The SES value corresponds to a range of EFC, and serves as the denominator in the formula by which to adjust the SAT score. This adjustment in SAT scores takes into account the wide variety of environmental and educational opportunities that relate to socioeconomic status. Comparing students after making this adjustment gives a clearer picture of what achievements have been made in relation to the opportunities available, allowing admission officers the capacity to judge students more fairly.

Derivation of SES values

Understanding the derivation of SES values requires an analysis of how SAT scores relate to minorities and students from low socioeconomic status. The average combined SAT scores for white students is 1063, compared with an average SAT score for black students of 863 (a substantial 18 percent difference), with a standard deviation of approximately 100 for each group (College Board, 2006). With the clear understanding of no inherent genetic or otherwise immutable trait that is intrinsic to different ethnic groups (Singham, 2003), the combination of environmental and socioeconomic factors loom as significant variables explaining the large discrepancy.

Any student who scores in the highest SAT range is performing well above the norm for their ethnicity. However, a black person who has achieved this score is eight standard deviations higher than the mean compared with six for a white student.

The first step in deriving the SES value was to choose a number range for values that was easily represented. By using the number 10, the composite values range between 48 and 160, a reasonable range for making comparisons. The next step involved a determination of how scores should differentiate between students in the extremes of socioeconomic status who scored in the highest SAT bracket. It was determined that a 67-point differential was reasonable. To put it in perspective, a student from the lowest socioeconomic range would need to score a 1500 on the SAT to achieve a composite score of 150, while a student from the highest socioeconomic range would have to achieve a 1567 to achieve a similar composite score.

The formula leaves a three point differential for students who scored in the lowest percentile of SAT scores. This means that a student with an SAT score of 500, whose parents earn no more than $20,000, and assets of no more than $25,000, has achieved an intelligence level (C) that is three points higher than a student with the same SAT score whose family earns more than $500,000 and assets exceeding $100,000. In this case both students have scored well below the norm for test scores, but the student from a higher socioeconomic status is rated lower, due to a failure to take advantage of greater opportunities. Statistics show that less than 1 percent of students score this low on the SAT (College Board, 2006).

Score Analysis

Table 4 gives a synopsis of how scores are affected over the range of extremes.

Table 4. Scores Over Range of Extremes

Variables/ Students	1	2	3	4
SAT	1600	1600	500	500
SES	10	10.45	10	10.45
C	160	153.11	50	47.85

Student 1 has achieved the highest score possible on the standardized test and comes from the lowest socioeconomic background. The score of 160 reflects the highest possible composite score, indicating an individual who has achieved an extremely high knowledge base with minimal opportunity.

Student 2 has also achieved the highest score possible on the standardized test and comes from the highest level of socioeconomic background. The score of 153.11 is lower than 160, due to greater educational opportunities available.

Student 3 has achieved the lowest score possible on the standardized test and comes from the lowest socioeconomic background. The composite score of 50 represents his adjusted score based on a lack of opportunity.

Student 4 has also achieved the lowest score possible on the standardized test, but comes from an affluent background with multiple opportunities for support. His score of 47.85 takes the socioeconomic factors into account, giving him a lower composite score relative to student 3. Table 5 shows how scores compare over a closer range.

Table 5. Scores Over Closer Range

Variables/ Students	SAT	SES	C
1	1600	10	160
2	1600	10.05	159.20
3	1600	10.10	158.42
4	1600	10.15	157.64

Student 1 comes from the lowest socioeconomic bracket and received a composite score of 160 after scoring perfectly on the

SAT. Student 4's family must contribute $40,000-$49,999 in financial contributions towards college tuition, indicating higher socioeconomic status. His composite score of 157.64 is slightly lower than the student who has achieved a similar degree of knowledge with fewer resources

Logic Review

It was first determined that intelligence relates to the exercise of an ability to adapt and conform to one's environment. Additionally, admission to college was identified as an important opportunity that contributes to empowerment for the individual as well as society at large. The inability of standardized testing to adequately assess intelligence has been discussed, but is still seen as the best alternative to date for determining a comparative measure of accumulated knowledge. Lastly, data from FAFSA (EFC) offers a national database from which to compare socioeconomic status.

Determination of values for SES was based on a judgment by this author to adjust composite scores through a comparison of economic differences between students. Further research is needed to determine the degree to which socioeconomic environment affects standardized test scores and to help educators understand the factors that enable some students to succeed while others fail.

The need to rely on standardized testing for admission data is understandable considering the increasing numbers of applicants to colleges. Between 1994 and 2004, enrollment increased by 21 percent, from 14.3 million to 17.3 million (National Center for Education Statistics). With this increased demand on admission officers, a need exists to automate information regarding student portfolios, especially considering the increased diversity of applicants. Using data from FAFSA and correlating it with SAT scores, is an attempt to streamline the process, while maintaining an equitable policy for dealing with an increasingly diverse student body.

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