

## **Proposal for Use of Supplemental Subject Matter Tests in the UC Admissions Process**

In January 2002, the Board of Admissions and Relations with Schools (BOARS) issued a discussion paper<sup>1</sup> proposing a set of principles to serve as the foundation for the University of California's admissions testing policy and suggesting future directions for specific tests the University should adopt. The latter recommendation had two elements:

- 1) "a new "core" examination covering the essential competencies needed for successful college work—reading, writing, and mathematics;"
- 2) "two one-hour long examinations in specific content areas within the subjects covered by the University's "a-g" requirements<sup>2</sup>, allowing for some level of student choice in the selection of specific tests."

In the months following release of the BOARS paper, faculty discussions regarding the admissions test proposal have focused primarily on the core examination. These discussions have taken place simultaneously with BOARS' continued work with the major admissions testing agencies and with internal discussions at those agencies regarding possible changes to the national tests. These discussions have been very fruitful and BOARS expects in the 2002-03 academic year to make recommendations regarding specifications of the new core tests being developed by the testing agencies.

With many of the immediate issues concerning the proposed core test nearing resolution, BOARS has turned its attention once again to the subject-based tests that would complement the core examination.

### **Summary of Recommendations**

With regard to the use of supplemental subject matter examinations in the determination of UC eligibility, **BOARS recommends that:**

- 1) Students be required to submit scores on two supplemental subject examinations to be chosen from two of the six curricular areas specified by the University's "a-g" course requirements; and**
- 2) On a provisional basis, scores from these tests be weighted equally to the scores from the three components of the new core examination, such that the core examination accounts for sixty percent of the test score component of the University's Eligibility Index and the two supplemental subject matter**

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<sup>1</sup> University of California Academic Senate Board of Admissions and Relations with Schools, "The Use of Admissions Tests by the University of California." University of California, January 2002. This paper is available at the following website: <http://www.ucop.edu/news/sat/boars.html>.

<sup>2</sup> (a) History/Social Science, (b) English, (c) Mathematics, (d) Laboratory Science, (e) Language Other Than English, (f) Visual and Performing Arts, and (g) other College Preparatory Electives.

**examination scores account for forty percent. The relative weight in the Index of test scores versus grades would not change—i.e., high school grades would remain the dominant factor in the Eligibility Index.**

The remainder of this paper describes the rationale that led BOARS to adopt these recommendations.

### **History of the Use of Supplemental Subject Examinations**

A battery of three subject-specific achievement tests has been a part of the University of California's admissions testing policy since the adoption of the testing requirement in 1967. Over the years, however, the particular combination of tests required has changed a number of times:

- For the first ten years of the requirement, applicants were required to submit scores for the SAT II examinations in (1) writing, (2) either mathematics or science, and (3) either social science or foreign language.
- In October 1977, upon recommendation of the Academic Senate, The Regents approved the adoption of an early form of the Eligibility Index (to be defined by the Senate) and narrowed the choice of test options to include (1) writing, (2) mathematics (but not science), and (3) either social science or foreign language.
- In 1982 (effective for fall 1983), BOARS voted to continue to require the writing and mathematics examinations and to broaden the options for the third test to include science and English Literature as well as social science and foreign language—the pattern that exists today.

Although the subject examinations have always been a part of the University's testing requirement for eligibility purposes, and have also been used in the assessment of academic qualifications for purposes of admission selection on the campuses that cannot admit all UC-eligible applicants, scores on the subject examinations were not a formal part of the University's Eligibility Index prior to 1999. In 1998, following issuance of a validity study indicating the predictive power of the supplemental tests (and, in particular, the SAT II Writing examination), BOARS recommended that scores on the subject tests be incorporated into the test score component of the Eligibility Index and weighted twice as heavily as the SAT I/ACT.

### **Principles to Guide the Design of the Supplementary Subject Matter Portion of the New Admissions Testing Requirement**

As noted above, UC's current testing policy requires both the verbal and quantitative portions of the SAT I/ACT examinations and additional subject matter tests in writing, mathematics, and a third area of the student's choice. One of the primary findings of BOARS' study of the testing requirement is that, as the requirement has historically been structured, the two sets of tests are considerably redundant and do not cover the subject

areas required in the a-g college curriculum as broadly as they might. **BOARS recommends that the University’s new testing policy view the two portions of the testing requirement as more complementary than duplicative:** the core examination tests all applicants’ achievement in the three key areas required for success in college—reading, writing, and mathematics—, while the subject tests introduce more breadth and an element of choice for individual students.

Thus, BOARS has identified the following primary purposes the subject examinations can and should serve:

- 1) to validate student preparation in a broader range of the required a-g college preparatory curriculum than is possible in the core test;
- 2) to allow students to “shine” by submitting scores in areas where they have particular strengths and interests;
- 3) to aid in the selection process for selective campuses or majors by allowing students to signal achievement and preparation in specific areas related to their intended field or major; and
- 4) to provide students an element of choice in the scores they submit.

During the discussions that led to its recommendations for a new core test, BOARS also identified as a central principle that the new testing requirement should not add significantly to the burden the tests pose to students in terms of time or cost. Because the writing examination, which has previously been a required subject test, is essentially being “moved” to become part of the core examination (which will then become longer and, in all likelihood, more expensive), **BOARS recommends reducing the number of additional subject tests required from three to two.** This would keep the number of tests and the testing time relatively stable.

### **Issues to Consider in the Design of the Supplementary Subject Matter Portion of the New Admissions Testing Requirement**

In considering various options for the supplementary subject matter tests, BOARS identified several key issues that need to be addressed with regard to this portion of the proposed new admissions test policy.

#### **Measures of Test Validity**

In its January 2002 discussion paper, BOARS identified predictive validity as an important quality of tests to be used for college admissions. It is expected that the new tests that compose the core examination will have statistical properties that allow them to predict first-year success with at least the same degree of reliability as current tests.

The concept of validity is more complex, however, with regard to tests of specific supplementary subject areas in which students have some level of choice in the subjects to be tested. First, although the subject matter tests currently in use by the University generally have predictive validity when considered on their own, BOARS' research indicates that they contribute less incremental predictive ability to a regression analysis that already includes scores from tests of basic writing, reading, and mathematics tests. Second, assessing predictive validity is difficult when test-takers are given choices because of sample bias—students choose tests of fields they know the best, and the degree to which their performance in these subjects is related to their performance overall will vary from student to student (i.e., for students whose knowledge or preparation in the field tested is relatively higher than their knowledge or preparation overall, the specific test score may be less predictive of overall success in college).

Finally, the degree to which performance on individual subject tests is related to overall success in college depends significantly on later course-taking patterns and on choice of major—behaviors that cannot be known at the time students apply. Test scores in mathematics and physics can reasonably be expected to correlate strongly with performance for students who become engineering majors. But not all students pursue study in the same field in which they wish to present test scores. A student who has excelled in foreign language in high school and wishes to demonstrate her proficiency by taking the French examination may choose to study environmental science in college. There is no reason to expect that her ability in French would be highly predictive of her grades in her first-year science courses.

Nonetheless, subject examinations remain useful measures of preparation in the specific areas tested and are educationally important in the determination of UC eligibility and admission because they demonstrate achievement in a broader range of a-g subject areas—the primary purpose BOARS believes the supplemental subject matter tests should serve. They also support the desirable policy goal of allowing applicants to demonstrate an area of particular strength in high school. Thus, BOARS concluded that while *content validity*—the degree to which scores on specific tests are demonstrably related to preparation and mastery of that particular field of study—and predictive validity are both important properties of admissions tests, content validity should play a somewhat more prominent role for the supplementary subject matter tests to be used by the University than predictive validity, while the latter remains a more important statistical measure for the core test. BOARS also notes the importance of continuing to evaluate regularly any tests used in the UC admissions process for both content and predictive validity.

### The Need to Test a Range of Mathematics Preparation

As a corollary to the expressed purpose of introducing breadth into the areas covered by the test battery, BOARS members identified as a general principle that the subject areas covered in the additional examination should not duplicate those assessed in the core test—thus writing and mathematics would no longer be required in the supplemental subject test battery because they are already tested in the core. Carrying this principle a

step further, a policy designed to ensure maximum breadth of subject areas tested would not allow students to present a mathematics score to fulfill the supplementary subject test requirement. However, BOARS members concluded that mathematics represents a special case.

The University's basic requirement for eligibility is three years of high school mathematics, beginning with Algebra I and proceeding through the equivalents of Geometry and Algebra II. Many students present this level of preparation in Mathematics and go on to success in college-level work. However, college-level study in many disciplines in the sciences, engineering, and business/economics requires greater levels of mathematics preparation. Thus the University recommends that students complete a fourth year of math. And, an increasing number of students begin Algebra in the eighth grade (as specified by the California State Content Standards) and are thus able to complete a fifth mathematics course (usually Calculus or Statistics) in high school.

This level of preparation is commendable, but it is not required for all students and testing all applicants on topics covered in courses beyond Algebra II is neither necessary nor desirable. A positive aspect of the University's current testing policy is that the availability of two different levels of subject matter examinations (currently the SAT II Mathematics Level 1C or Level 2C) allows students to choose whether they wish to take an advanced math test as part of their subject matter test requirement. Many disciplines (e.g., physical sciences and engineering) strongly recommend that applicants interested in their fields take these higher-level exams and the scores are weighted heavily in the selection process for some math-based majors that cannot admit all UC-eligible applicants.

BOARS has recommended that the new core test required of all students cover high school mathematics through three years (roughly the same as the former SAT II Level 1C examination). But BOARS recognizes that some students wish to demonstrate a higher level of mathematics preparation and that this information is very important in making selection decisions for math-based disciplines. Therefore, BOARS members agreed that the ability for students to choose to submit scores on a higher-level math exam (e.g., the SAT II Mathematics Level 2C examination or another test that might be developed in the future) should be built into the options for the subject tests.

### Issues Associated with the Language Examinations

As noted earlier in this paper in the discussion of the history of the use of supplemental examinations, subject examinations in languages other than English have been incorporated in the University's test requirement since its inception. This is consistent with the inclusion of the study of languages other than English as item "e" in the a-g requirements and, more broadly, with the classical view of language knowledge as a key element in the training of an educated person.

More recently, however, the specific role and weight of scores on examinations in languages other than English have come into question. This development stems from a

number of sources. As the proportion of students in California who learn another language prior to or simultaneously with English has grown, and increasing numbers of these individuals have sought higher education, larger proportions of students are presumed to be taking supplemental subject examinations in their native languages. The likelihood of this being the case has increased as new tests in modern non-European languages (e.g., Chinese, Japanese, Korean, and Modern Hebrew) have been developed in the past fifteen years. These issues may have become more prominent when scores on the supplemental examinations were made a formal part of the Eligibility Index.

In this context, some questions have emerged regarding the fairness of the University's consideration of language examination scores in determining eligibility. The first is whether allowing students whose first language is not English to take a test in their native language constitutes an unfair advantage: some observers presume that these students have not had to study as hard—if at all—to do well on the examination as have non-native speakers and, therefore, that their scores are less related both to academic achievement in high school and to likely success in college. Others note that second-language ability is not evenly distributed across various communities. Supporters of the continued use of language tests have responded that the subject tests currently in use go beyond conversational knowledge of a language to test grammar and the ability to think critically in the language and that students who have spoken a language “on the street” are not likely to do well on the tests absent a foundation in the classroom. They also observe that the vast majority of students—native speakers included—who choose to take examinations in languages other than English have indeed studied the language in high school.

BOARS members concur that, overall, individuals from some groups are more likely to have access to a language other than English outside of the classroom. Whether this constitutes an “unfair” advantage, however, and what can or should be done to address this question are more complex issues.

In considering these questions, BOARS members observed that knowledge of a language other than English is fundamentally valued in the academic community, regardless of how this knowledge is gained. As noted above, language study has been a part of the a-g requirements since their inception in the 1930's; this reflects a long-standing tradition that includes mastery of more than one language as one of the basic components of a liberal education. Fluency in other languages enriches one's understanding of English and of the grammatical and linguistic rules on which all languages are built. And because language study also involves study of the countries in which a particular language is spoken, it broadens perspective on cultures, nations, and societies other than one's own. BOARS members observed that this perspective has never been more important than it is today, given our increasingly global economy and society and, in particular, California's status as a multi-cultural state on the edge of the continent.

Given these factors, BOARS members could not identify any compelling educational rationale for excluding languages other than English from the supplemental subject test battery. Nor could they identify any means by which a distinction could or should be

drawn between tests taken by native speakers and those taken by non-native speakers. Defining what constitutes a native speaker is far from simple—should a Chinese-American student whose parents speak only English but insisted that their child study Chinese in a Saturday language academy for four years be proscribed from taking the Chinese examination? What about the Caucasian student whose parents were posted by the armed forces in Germany? Or a Latino student who learned Spanish at home but also studied the language for five years in middle and high school and earned a 5 on the AP Spanish examination? Nor could BOARS members endorse the idea that only subjects studied in school should be tested. All students gather knowledge both inside and outside the classroom; what matters is how much they learn, not how or where they learned it.

Thus, BOARS members concluded that, while students from certain backgrounds may indeed be more likely to enjoy the advantage of early exposure to a language other than English, and while all questions about the fairness of particular tests must be given serious consideration, these issues do not alter the fundamental appropriateness of allowing all students the same options for submitting test scores that reflect accomplishment in the full range of a-g subjects, including languages other than English.

### **Recommendations for the Supplementary Subject Matter Test Requirement**

#### **Test Availability**

At present, the only subject matter admissions tests available to high school students are the SAT II examinations, which are currently offered in a number of fields that can be roughly aligned with the University's a-g requirements as follows:

- a) **History/Social Science:** American History, European History and World Cultures (?), World History
- b) **English:** Literature<sup>3</sup>
- c) **Mathematics:** Mathematics Level II<sup>4</sup>
- d) **Laboratory Science:** Biology, Ecological Biology, Chemistry, Physics
- e) **Language Other than English:** Chinese, French, Hebrew, German, Italian, Japanese, Korean, Latin, Modern Hebrew, Spanish
- f) **Visual and Performing Arts:** no tests currently available
- g) **College Preparatory Electives:** contained in a-f categories

While the discussion below is framed in terms of the currently available tests, **BOARS anticipates—and encourages—the development of additional tests which might serve as alternatives to the SAT II in the above fields or offer opportunities to demonstrate achievement in other areas** encompassed in the a-f curricular areas but not currently represented in the SAT II battery. Such tests could be developed by the College Board to augment its current battery, by other testing agencies like ACT, Inc., or could be

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<sup>3</sup> Note that the currently available Writing examination is excluded because it is presumed to be incorporated into the core examination.

<sup>4</sup> Similarly, the currently available Math Level 1C examination is excluded because it is presumed to be duplicative of the math content incorporated into the new core examination.

adapted from current tests such as the Golden State Examination. Tests developed for this purpose would need to be evaluated to determine that they do indeed cover the topics at the appropriate college-preparatory level specified in the a-g requirements.

### Combination of Tests Required

Given the goals and constraints described in this paper, BOARS members identified the following options for specification of the testing requirement.

1. Allow students entirely free choice in the selection of any two tests to submit to satisfy the requirement—that is, students could submit any combination, including two tests from the same broad subject area (e.g., Biology and Chemistry, French and Spanish, American History and World History). The advantage of this option is that it provides the greatest amount of choice for students. Its disadvantage is that it does not guarantee breadth in terms of the fields covered in the subject examinations.
2. Allow students to choose examinations from any two of the subject areas specified in the a-g curriculum for which subject tests exist—i.e., History/Social Science, English (Literature), Mathematics, Laboratory Science, Language Other than English (no tests currently exist in the sixth required area, Visual and Performing Arts). The advantage of this option is that it would still allow for a substantial degree of student choice while also ensuring breadth.
3. Require students to submit one score from a test in either mathematics (Level 2) or science and the second from another field of the student’s choice (not science or mathematics). The advantage of this option is that it sends a clear message that scientific knowledge, while perhaps not critical to success across all fields (and thus distinct from the fields covered in the core examination) is nonetheless so important to our society that UC-bound students must demonstrate proficiency in it. Requiring the second test to be from a field outside of math and science would preserve breadth.

A variant of this option would be to allow students to submit a score from any test for the second score. This option would allow students headed for technical fields to demonstrate achievement in two fields related to their major—e.g., math and physics for future engineers or biology and chemistry for pre-med students—but would violate the breadth principle which is fundamental to BOARS’ conception of the purpose of the subject examinations.

4. Rather than dividing them up according to the a-g subjects, categorize the various tests according to standard notions of disciplines within the University—i.e., history/social science; math and science; Literature, languages, and the arts—and allow students to choose one from each category. The advantage of this option is that it introduces applicants to traditional academic divisions and may be more natural for faculty members. Its disadvantages are that it might confuse students and that, by placing the tests in a smaller number of categories, it somewhat restricts choice.



After fully considering each of these options, **BOARS recommends that the University allow students to submit test scores from any two of the six subject areas specified in the a-g requirements** (Option #2 above). This option allows ample choice without sacrificing the desire to demonstrate additional breadth, which is a key purpose of the supplemental subject matter examinations. In addition, it strikes an appropriate balance by permitting students interested in pursuing careers in engineering and science to submit scores from a higher-level math test as well as a science test, while not requiring supplemental tests in science or math from those interested in humanities and social science (as Option #3 would have). In contrast, BOARS felt Option #1 sacrificed breadth for choice and Option #3 did not offer students sufficient choice. Option #4 did not seem to offer substantial advantages that would mitigate the reduced choice and increased confusion it might present.

#### Weighting of the Supplementary Subject Matter Tests in the University's Eligibility Formula

As noted earlier in this paper, at present, scores from the three required subject matter tests and SAT I/ACT are combined in a linear formula (the Eligibility Index) with high school GPA to determine eligibility for UC. In this formula, high school grades are given by far the greatest weight, consistent with their substantially greater statistical relationship to overall college performance. Based on validity studies conducted in the mid-1990's, the three subject matter tests currently are weighted twice as heavily as the scores from the verbal and math portions of the SAT I (or the ACT equivalent). Thus, each subject matter test accounts for 25% of the weight of the test score component of the Index and the SAT I/ACT combined score accounted for the remaining 25%.

As part of the adoption of a new admissions testing requirement, the University will need to develop a new formula for incorporating test scores in the computation of eligibility. In the long run, this formula will presumably be constructed based on relative predictive validity of its various components. However, because the core examinations are new, we will not have predictive validity information until several years after the new test requirement is put in place. Moreover, the Index may also have to be adjusted in the coming years based on results of eligibility studies to be conducted by the California Postsecondary Education Commission (CPEC) both before and after the new testing policy goes into effect. Thus BOARS recognizes that, while it is necessary to create a weighting scheme to go into effect with the next tests, any decisions made now about the eligibility formula are provisional in nature. Nonetheless, it seems highly unlikely that the statistical grounds that led the University to weight the subject tests more heavily than the SAT I/ACT in 1999 will still pertain after the creation and adoption of new core examinations that are more closely aligned with college preparatory curricula and that include a writing test.

Thus, as an interim measure (until new tests have been in use long enough for UC to study their relative value in predicting college success), **BOARS recommends that tests maintain roughly the same weight relative weight versus grades that they currently have and that the five tests that comprise the new testing requirement—that is, the**

**three components of the core exam and the two supplemental subject matter tests—be weighted equally in the eligibility formula.** Thus, scores on the core examination would contribute 60% of the weight and each supplemental examination would contribute 20% of the weight in the test score component of the Index. **BOARS further recommends that, after the new tests have been in place long enough to develop the necessary longitudinal performance data, the University conduct validity studies of the new core test and subject matter tests and revise the Eligibility Index as needed.**