

Digital SAT[®] Research Summary

September 2023

Over the past several years, content experts, psychometricians, and researchers have been hard at work developing, refining, and studying the digital SAT. Our work is grounded in foundational best practices and advances in measurement and assessment design, with fairness for students informing all of the work that we do. This paper shares learnings from key research studies that have informed the design and development of the digital SAT and our current understanding of how well the assessment is working for its intended uses.

Introduction

This document summarizes the key research studies undertaken by College Board that have informed the development and design of the digital SAT

- Curriculum survey
- Alignment studies
- Reading and Writing section pilot study
- Timing study
- Student surveys and focus groups
- Cognitive labs
- Concordance studies
- Validity studies (predictive and convergent)

Curriculum Survey

Ensuring the digital SAT covers the right content

College Board content and measurement staff made extensive use of curriculum survey data to inform decisions about which skills and knowledge should be tested on the digital SAT Suite. College Board's most recent curriculum survey data (College Board, 2019) were collected from (1) a nationally representative sample (n=1,645) of postsecondary faculty at two- and four-year institutions that teach courses in English, math, social science, and science and (2) a nationally representative sample (n=2,686) of middle school/junior high school math teachers and high school English language arts and math teachers.

College Board analyzed the collected data to determine whether the literacy and math skills and knowledge assessed on the SAT Suite are:

1. important prerequisites for students to have to be college and career ready.
2. emphasized in secondary-level teaching.

For the purpose of our assessment, the answer to question 1 is more significant because it relates directly to the core purpose of the SAT Suite: measuring students' attainment of essential college and career readiness prerequisites. The answer to question 2 is still important, however, as the SAT Suite is designed to closely mirror instructional priorities in secondary-level literacy and math teaching.

Although this curriculum survey study was framed with the paper-based SAT Suite and its specifications in mind, the survey's data nonetheless support the conclusion that the digital SAT Suite, which, by design, measures a highly similar range of skills and knowledge, also addresses critical college and career prerequisites in English language arts/literacy and in math. The curriculum survey findings both served to guide and validate the selection of skills and knowledge tested on the digital SAT Suite.

In terms of question 1, above, for English language arts/literacy, all surveyed skill/knowledge elements incorporated into the digital SAT Suite design (including the twenty-five elements in the Standard English Conventions content domain considered together) were rated at or above 2.50, the midpoint of the rating scale and the threshold at which an element was considered important in the analysis. For math, most skill/knowledge elements incorporated into the digital SAT Suite have a mean importance rating of 2.50 or higher, with the relatively small number that do not meet or exceed this threshold being included in the design for the sake of coherence and comprehensiveness of math domain testing.

In terms of question 2, all but two surveyed English language arts/literacy items incorporated into the digital SAT—elements dealing with understanding data displays—were reported to be emphasized in the instruction of high school English language arts teachers (i.e., were given a mean emphasis rating of 2.50 or greater). In math, the majority of skill/knowledge elements incorporated into the digital SAT were emphasized by high school math teachers in their instruction.

In 2024, College Board will again undertake a national curriculum survey, this time attuned to the specifications of the digital SAT Suite, to assess the continued importance of the skills and knowledge tested in the suite to college and career readiness as well as secondary-level teaching emphases.

Alignment Studies

[Examining alignment between skills and knowledge tested on the digital SAT Suite and state standards](#)

The digital SAT Suite has been designed to be broadly aligned to secondary-level academic standards in English language arts/literacy and math, even though the suite hasn't been designed to measure any one particular set of such standards. This makes sense, as the digital SAT Suite and these standards documents are derived from the same sorts of evidence about essential prerequisites for college and career readiness. To document and confirm this relationship, College Board is undertaking state-by-state alignment studies.

College Board will issue alignment reports to educators in each state and will update these documents as states themselves revise their expectations. These reports, focused on clarity and usability, will summarize the degree of alignment in reading, writing, language, and math as well as provide detailed tables showing the match between specific standards and skill/knowledge elements tested on the digital SAT Suite.

To supplement and validate these internally produced alignment studies, College Board is commissioning a set of studies from a third-party firm with an established track record in alignment work to independently assess the degree of alignment between the digital SAT Suite tests' specifications and state college and career readiness standards in general terms. These studies are expected to confirm College Board's internally developed claims about the degree of alignment and to contribute materially to justifying the use of the digital SAT Suite as a part of state accountability systems. These reports are expected to be available in late 2023.

Reading and Writing Section Pilot Study

Confirming design changes to the Reading and Writing section

The purpose of this study was to compare performance on existing SAT passages and item sets to the digital SAT's shorter passage and single item. Students were randomly assigned to take a shorter modified version of the existing SAT or a similar length of revised items for digital. The results of the study showed that performance on items was similar in terms of item difficulty and discrimination. Scores from the two forms were also of similar reliability and there was no evidence of differences in subgroup performance.

Timing Study

Arriving at the most appropriate length and timing for the digital SAT Suite

A timing study conducted in the fall of 2021 was designed to ascertain whether the time initially budgeted for students to complete the digital SAT Suite Reading and Writing and Math sections was sufficient to allow the vast majority of them to finish the test sections without rushing. "Speededness" is an undesirable test characteristic in assessments such as those in the digital SAT Suite because the constructs being tested pertain to English language arts/literacy and math achievement, not test-taking speed.

To assess timing conditions, comparable samples of student volunteers, including relevant subgroups, were given otherwise identical digital SAT Suite test sections under different timing conditions, and both performance and self-reported experience data were collected. Although the data suggested that the overwhelming majority of students in all subgroups had enough time to complete both sections without feeling rushed and therefore the digital SAT Suite tests were not speeded, College Board psychometricians determined that adding a few minutes to the Reading and Writing section would help an additional segment of the test-taking population finish the section without rushing. Based on a thorough analysis of the findings, College Board leadership decided to slightly increase the amount of time students had in Reading and Writing (from the initially proposed sixty minutes to sixty-four minutes) and slightly decrease the number of questions asked (from fifty-six to fifty-four). The Math section saw an identical decrease in the total number of questions administered in the section (from forty-six to forty-four) but no change in the amount of time allotted, as the study data indicated that there was no solid basis for increasing the time to complete that section.

Student Surveys and Focus Groups

Incorporating student voices and feedback throughout the digital SAT design process

Beginning with the digital Reading and Writing section piloting discussed above and extending to the Math section in late 2021, College Board has systematically collected feedback from student test takers on various aspects of the digital SAT Suite experience. This has included students' perceptions of the comprehensibility and ease/difficulty of the test questions, the opportunity to accurately demonstrate their skills and knowledge, their academic preparedness for and comfort with answering the test questions, the tests' timing conditions, and students' experiences with the digital testing application.

College Board has also inaugurated a series of ad hoc student focus groups to obtain more systematic feedback on the digital SAT Suite tests. To date, these focus groups have included broad cross-sections of the SAT Suite test-taking population as well as groups composed of members of specific test-taking subpopulations, including English learners and international students. Input from these surveys and focus groups has been correlated with student performance data to help evaluate the test design and to identify potential refinements to the tests. College Board will

continue to conduct surveys and meet with focus groups in order to collect feedback directly from the tests' most important users: students themselves.

Cognitive Labs

[Ensuring digital SAT Suite questions elicit the higher-order, cognitively complex thinking needed for college and career readiness](#)

To confirm that the digital SAT Suite tests are capable of eliciting cognitively complex thinking from students, College Board is conducting a cognitive lab study in 2023 with student volunteers. The centerpiece of this small-scale study is a series of one-on-one interviews with participants, who are asked to think aloud as they work through a set of digital suite test questions in either Reading and Writing or Math. Transcripts of the interviews are then coded by College Board content experts to measure the extent to which the responses exhibit cognitively complex behaviors. Such a study is important because it helps ensure that the tests of the digital SAT Suite are measuring skills and knowledge at levels of sophistication required for college and career readiness. In addition, such a study is a key source of evidence supplied by College Board as part of federal peer review of state systems using one or more tests of the digital suite for accountability purposes. The present study, the final report for which is expected in late 2023, is a follow-up to College Board's similar examination of the paper-based SAT (College Board and HumRRO, 2020), which found that that test elicited the requisite degree of cognitively complex thinking from students.

College Board will also be conducting cognitive labs with members of select test-taking population subgroups, such as English learners, to examine these students' thought processes as they take portions of the tests. The two main goals here are, first, to learn more about how students in these population subgroups engage with test materials and, second, to learn whether changes in test design introduced by the digital SAT Suite contribute to a more accurate assessment of these students' knowledge and skills. Findings from these studies will feed into future test design and development. These studies will be conducted in 2023 and 2024 and results published as available in 2024.

Concordance Studies

[Arriving at the direct one-to-one relationship between paper-based and digital SAT scores](#)

Two concordance studies, conducted in the spring and fall of 2022, provided data to establish the direct relationship between paper-based and digital SAT scores (College Board, 2023). All participating students took both versions of the SAT, taking the digital version either one month prior or after their paper version. Utilizing an equipercentile linking method, the same method used in equating the existing SAT forms, on average overall and across subgroups the performance on the two versions is the same. Additionally, the results show that the distributions, as reflected by percentiles, are the same across the two versions such that the same percent of students are at or below the score on each version. With the launch of the digital SAT with international test-takers, we have monitored the scores and see that student performance is within the expected ranges we have historically seen. As we continue to roll out the digital version, we will continue to monitor this performance to validate that the scores have a similar meaning and continue to be used in the same manner.

Direct relationship in this sense means that scores on the two versions of the SAT are comparable for the students and test forms included in the studies—that is, scores of (for example) 540 on either test would be comparable, and scores from both tests could be fairly evaluated side by side without a concordance table. These studies' results support the direct one-to-one relationship between the two versions of the assessment. Students participating in these studies received college-reportable SAT scores, which, among other benefits, ensured maximal motivation on the part of test takers. Note that this study process only concorded the two versions of the SAT; concordance

between the two versions of the PSAT-related assessments will occur subsequently and may require conversion tables. The timeline for determining the need for these tables is the end of October before PSAT-related digital scores are released.

Validity Studies (Predictive and Convergent)

Examining digital SAT score relationships with college outcomes

College Board's pilot predictive validity study examined relationships between digital SAT scores and key college and career readiness outcomes, while the convergent validity study is intended to ascertain whether digital SAT scores relate to (i.e., "agree" with) other established educational measures, such as high school GPA (HSGPA) and AP Exam scores, to the same degree that paper-based SAT scores do.

Findings from the pilot predictive validity study, which focused on first-semester college performance, showed that digital SAT scores are as predictive of students' college performance as are paper-and-pencil SAT scores (Marini, Westrick, Young, Ng, & Shaw, 2023). Moreover, the study found that the accuracy of predictions of students' college performance notably improved when digital SAT scores were considered in combination with HSGPA relative to when HSGPA was used alone—a 25 percent improvement for the overall student sample and a 37 percent improvement for those students majoring in STEM (science, technology, engineering, and math) fields. Digital SAT Reading and Writing section scores were also able to differentiate among levels of postsecondary English course performance—a particularly valuable finding given that 95 percent of college students earn As and Bs in first-semester college English.

Strong positive digital SAT score relationships with first-semester college GPA (FSGPA) were also observed for population subgroups such as underrepresented minority students, first-generation college students, and students who identified their best language(s) as being a language other than English or as English and another language.

Analyses in a second SAT pilot predictive validity study examined full first-year GPA (FYGPA) as the college outcome of interest (versus first-semester grades) as well as first-year credit hours earned, a signal of student progress toward degree completion (Westrick, Marini, Young, Ng, & Shaw, in press). The same strong predictive SAT relationships were found. Findings showed that the SAT remains a powerful tool for understanding students' readiness for college, for course placement and academic major field decisions, for scholarship and honors program decisions, and in identifying students who may need academic support. After the digital SAT launches in the U.S. in 2024, College Board will study the first entering college cohort with digital SAT scores to longitudinally examine digital SAT score relationships with college outcomes across a large national sample of institutions.

College Board's convergent validity study was conducted prior to having college outcome data (such as FYGPA or first-semester GPA) available to analyze. This study examined relationships between digital SAT scores and other relevant educational achievement measures, such as HSGPA, PSAT/NMSQT total score, and average AP Exam score, and compared those relationships to their paper-and-pencil SAT equivalents (Marini, Westrick, Young, & Shaw, 2022). Results indicated that students' digital SAT scores were strongly positively related to their scores on the paper-based SAT. Moreover, the strength of the relationships of the digital SAT with other measures of academic achievement—HSGPA, PSAT/NMSQT total score, and average AP Exam score—paralleled the strength of the relationships found between the paper-based SAT and these same measures. Given this, relationships between digital SAT scores and other student outcomes such as first-year GPA are expected to parallel those found with the paper-based SAT, which should give paper-based SAT score users confidence in the value of digital SAT scores for use in various enrollment-related decisions and processes on campus.

Next Steps

This document summarizes some of the key studies and areas of research that have informed the design of the digital SAT Suite and that continue to inform the development and use of the tests. This research, along with many other studies, will continue, not only to satisfy the best-practices requirements of the *Standards for Educational and Psychological Testing* (AERA, APA, & NCME, 2014) but also to recognize the needs and questions of the stakeholders, including students, educators, and other College Board members, who play an important role in the digital SAT Suite and have an investment in its corresponding longer-term research agenda.

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