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California Science Test Accessibility Supports for Operational Testing

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Contents

Introduction.....	1
A Three-tiered Approach to Accessibility	2
Specific Assessment and Accessibility Considerations for the California Next Generation Science Standards	3
Accessibility Supports and Their Recommended Use for the Operational CAST	3
Table 1: CAST Accessibility Supports—Universal Tools	4
Table 2: CAST Accessibility Supports—Designated Supports	5
Table 3: CAST Accessibility Supports—Accommodations	8
References	10
Bibliography.....	12
Biographical Summaries, ETS Assessment Design Team Members	13

Introduction

The goal of the California Department of Education (CDE) is to provide every student with a positive and productive testing experience that allows the student to demonstrate what he or she knows and can do. A valid assessment that provides an accurate measurement of a student's academic achievement is one of multiple sources of information that can be used to improve student learning. In order to ensure that all students, including English learners (ELs) and students with disabilities, have a fair opportunity to demonstrate what they know, it is necessary that assessments be designed to be inclusive for a diverse student population.

Educational Testing Service (ETS) and the CDE have collaborated in establishing guidelines for assessment development for the California Science Test (CAST) that follow an approach consistent with the Smarter Balanced Assessment Consortium's (Consortium's) *Accessibility and Accommodations Framework* (Smarter Balanced, 2014). The principles of universal design* have been applied in the development of the CAST items to make them accessible for a wide range of student accessibility needs. This document presents the lists of universal tools, designated supports, and accommodations for the operational CASTs that are aligned with the California Next Generation Science Standards (CA NGSS), pending adoption of the California Assessment of Student Performance and Progress (CAASPP) regulations by the Office of Administrative Law.

* **Universal design (UD) principles:** Guidelines that take into account best practices to make content accessible for test takers. UD assessment principles provide guidelines for test developers, ranging from acknowledging the target population, defining the construct, and providing recommendations for test directions and content presentation (see Thompson, Johnstone, and Thurlow, 2002, pp. 6–20, for more information).

A Three-tiered Approach to Accessibility

Recent educational reforms and technological advances have led to new approaches to accessibility. As a result, students who may not have received accommodations in the past may now benefit from needed accessibility supports both in instruction and on assessments. The Smarter Balanced three-tiered framework for accessibility was developed with extensive input from national experts as well as state-level representatives from the consortium. The framework is based on a thorough literature review, which included ratings of commonly available resources and incorporated findings from the cognitive labs, pilot, and field test (Smarter Balanced, 2014, p. 4).

A three-tiered approach, similar to that used by Smarter Balanced, will apply to the CAST in order to address a wider range of student needs than did the previous generation of paper-based assessments and to support a more personalized and inclusive testing experience. In addition to a review of the Smarter Balanced documentation, ETS consulted with science content experts and nationally recognized accessibility experts to develop the lists of the universal tools, designated supports, and accommodations for use on the operational CAST assessments.

The following three tiers include embedded supports, which are delivered digitally through the online testing interface, and non-embedded supports, which are provided locally:

- **Universal tools**—Features that are available to all students on the basis of student preference and selection
- **Designated supports**—Features that are available for use by any student for whom the need has been indicated by an educator or team of educators (with parent/guardian and student input as appropriate)
- **Accommodations**—Changes in procedures or materials that increase equitable access during testing for students who need them, based on documentation of the need for the accommodations via an individualized education program (IEP) or Section 504 plan, resulting in the generation of valid assessment results

Specific Assessment and Accessibility Considerations for the California Next Generation Science Standards

The CA NGSS present a fundamentally different approach to science education, with new expectations and implications for assessment. The performance expectations (PEs) are intended to include the application of science practices to science content knowledge. The complexity and multidimensionality of the CA NGSS demand the development of innovative item types to provide construct relevance and validity in measuring these standards. The new item types include greater interactivity and thus generate more student input, which in turn will provide more robust assessment data.

Ongoing research with national accessibility experts is being conducted to investigate ways to develop these item types and make them accessible to a wide range of students, including students with disabilities and ELs. ETS research staff are actively engaged in the accessibility standards work of both the World Wide Web Consortium (W3C) Web Content Accessibility Guidelines (WCAG) 2.0 level AA—which are essential for supporting assistive technologies used by students with disabilities—and Instructional Management Systems (IMS) Global Learning Consortium (GLC), with a particular focus on ensuring that standards and best practices are developed that support the needs of all students interacting with emerging technology items. Further, ETS accessibility researchers have conducted a range of studies that explore design approaches to address key challenges associated with innovative items (Hansen, et al., 2016, January; White & Hakkinen, 2016; and Hansen, et al., 2016, July).

Accessibility Supports and Their Recommended Use for the Operational CAST

The team of ETS science content and accessibility experts have reviewed the Smarter Balanced mathematics supports for their appropriateness to the science content and found that most of the supports are also appropriate for science, with a few minor differences. For example, due to construct relevance, thesaurus and spell check are not available for the CAST. In addition, while the non-embedded calculator, 100s number table, and multiplication table are accommodations for the Smarter Balanced mathematics assessment, for the CAST they are designated supports. Two new accessibility features for science are the embedded and non-embedded science charts and the embedded science tools (see Tables 1 and 2 for details).

Tables 1, 2, and 3 list the embedded and non-embedded universal tools, designated supports, and accommodations, respectively, with their recommended use for the operational CAST. ETS will continue to conduct research and collaborate with experts to inform further refinements for the available supports as needed.

Table 1: CAST Accessibility Supports—Universal Tools

Universal tools are accessibility features of the assessment that are available to all students based on student preference and selection (Smarter Balanced, 2016, p. 6).

Universal Tool ¹	Embedded	Non-embedded
Breaks	X	X
Calculator²: Four-function—grade 5 Scientific—grade 8, and high school	X	
Digital notepad	X	
English Glossary	X	
Expandable passages	X	
Expandable items³	X	
Highlighter	X	
Keyboard navigation	X	
Mark for review	X	
Mathematics tools (i.e., ruler, protractor)⁴	X	
Science charts (i.e., calendar, periodic table of the elements, conversion charts)	X	
Science tools (i.e., interactive laboratory equipment, stopwatch tools, static hardness key/tool)	X	
Scratch paper		X
Strikethrough	X	
Writing tools (i.e., bold, italic, bullets, undo/redo)	X	
Zoom (in/out)	X	

¹ These supports are intended for use in the operational administration pending regulatory approval by the Office of Administrative Law.

² These are the same as the calculators used during administration of the Smarter Balanced Mathematics Summative Assessment.

³ The expandable items universal tool is turned on by the test administrator in the Test Administrator Interface.

⁴ These are the same as the mathematics tools used during administration of the Smarter Balanced Mathematics Summative Assessment.

Table 2: CAST Accessibility Supports—Designated Supports

Designated supports are accessibility features that are available for use by any student for whom the need has been indicated by an educator or team of educators (with parent/guardian and student input as appropriate) (Smarter Balanced, 2016, p. 9).

Designated Support ⁵	Embedded	Non-embedded	Recommendations for Use
100s number table		X	The 100s number table is to be used for students with visual processing or spatial perception needs.
Calculator: Four-function—grade 5 Scientific—grade 8 and high school		X	Students with visual impairments who are unable to use the embedded calculator may need this support and may use the calculator that they typically use, such as a braille calculator or a talking calculator.
Color contrast	X	X	Students with attention difficulties may need this support for viewing test content. It also may be needed by some students with visual impairments or other print disabilities (including learning disabilities). Choice of colors should be informed by evidence that the color selections meet the student's needs.
Color overlay		X	Students with attention difficulties may need this support to view test content. This support may also be needed by some students with visual impairments or other print disabilities (including learning disabilities). Choice of color should be informed by evidence that the color meets the student's needs.
Magnification		X	The size of specific areas of the screen (e.g., text, formulas, tables, graphics, and navigation buttons) may be adjusted by the student with an assistive technology device. Magnification allows increasing the size to a level not provided for by the Zoom universal tool. The use of this support may result in the student needing additional overall time to complete the assessment.
Masking	X		Students with attention difficulties may need to mask content not of immediate need or that may be distracting during the assessment. This support also may be needed by students with print disabilities (including learning disabilities) or visual impairments.

⁵ These supports are intended for use in the operational administration pending regulatory approval by the Office of Administrative Law.

Designated Support ⁵	Embedded	Non-embedded	Recommendations for Use
Multiplication table		X	Students with a documented and persistent calculation disability (i.e., dyscalculia) may need this support.
Noise buffers		X	Student (not groups of students) wears equipment to reduce environmental noises. Students may have this testing variation if regularly used in the classroom. Students who use noise buffers will need headphones unless tested individually in a separate setting.
Read aloud for items and stimuli		X	Students who are struggling readers may need assistance accessing the assessment by having all or portions of the assessment read aloud. This support also may be needed by students with reading-related disabilities, or by students who are blind and do not yet have adequate braille skills. The use of this support may result in the student needing additional overall time to complete the assessment.
Read aloud in Spanish		X	Students receiving the translations (stacked) designated support and who are struggling readers may need assistance accessing the assessment by having all or portions of the assessment read aloud. This support also may be needed by students with reading-related disabilities. The use of this support may result in the student needing additional overall time to complete the assessment.
Science charts (i.e., calendar, periodic table of the elements, conversion charts)⁶		X	Students receive paper versions of science charts.
Scribe		X	Students who have documented significant motor or processing difficulties, or who have had a recent injury (such as a broken hand or arm), that make it difficult to produce responses may dictate their responses to a human who records verbatim what they dictate. The use of this support may result in the student needing additional overall time to complete the assessment.

⁶ PDFs of the science charts are available for download from the California Science Test Web page on the CAASPP Portal at <http://www.caaspp.org/administration/about/science/>.

Designated Support ⁵	Embedded	Non-embedded	Recommendations for Use
Separate setting (e.g., most beneficial time, special lighting or acoustics, adaptive furniture)		X	Students who are easily distracted (or may distract others) in the presence of other students, for example, may need an alternate location to be able to take the assessment.
Simplified test directions		X	The test administrator simplifies or paraphrases the test directions found in the Simplified Test Directions Guidelines.
Stacked translations (Spanish)	X		This support is for students whose primary language is not English and who use dual-language supports in the classroom; use of the stacked (dual language) translation may be appropriate. The use of this support may result in the student needing additional overall time to complete the assessment.
Text-to-speech (items and stimuli)	X		Students who are struggling readers may need assistance accessing the assessment by having all or portions of the assessment read aloud. This support also may be needed by students with reading-related disabilities or by students who are blind and do not yet have adequate braille skills. Note: Students who use text-to-speech will need headphones unless tested individually in a separate setting.
Translated test directions		X	Students who have limited English language skills (whether or not designated as ELs or ELs with disabilities) can use the translated test directions. A biliterate adult trained in the test administration manual can read the test directions to the student. The use of this support may result in the student needing additional overall time to complete the assessment.
Translations (glossary)	X		Students who have limited English language skills (whether or not designated as ELs or ELs with disabilities) can use the translation glossary for specific items. The translated glossaries are provided for selected construct-irrelevant terms. The use of this support may result in the student needing additional overall time to complete the assessment.
Turn off any universal tool(s)	X		Students who are easily distracted (whether or not designated as having attention difficulties or disabilities) may be overwhelmed by some of the universal tools. Knowing which specific tools may be distracting is important for determining which tools to turn off.

Table 3: CAST Accessibility Supports—Accommodations

Accommodations are available to students who have a documented need for the accommodations via an IEP or Section 504 plan (Smarter Balanced, 2016, p. 16).

Accommodation ⁷	Embedded	Non-embedded	Recommendations for Use
Abacus		X	Students with visual impairments who typically use an abacus may use an abacus in place of using scratch paper.
Alternate response options		X	Students who have some physical disabilities (including both fine motor and gross motor skills) may need to use the alternate response options accommodation. Some alternate response options are external devices that must be plugged in and be compatible with the assessment delivery platform.
American Sign Language (ASL) (videos)	X		Some students who are deaf or hard of hearing and who typically use ASL may need this accommodation when accessing text-based content in the assessment. The use of this accommodation may result in the student needing additional overall time to complete the assessment.
Braille (embosser and refreshable)	X		Students with visual impairments may read text via braille. Tactile overlays and graphics also may be used to assist the student in accessing content through touch. The use of this support may result in the student needing additional overall time to complete the assessment. If a student's language/presentation is set to Braille, there are no additional settings that need to be provided in order for embossing to be available.
Closed captioning	X		Students who are deaf or hard of hearing and who typically access information presented via audio by reading words that appear in synchrony with the audio presentation may need this support to access audio content.
Print on demand		X	Some students with disabilities may need paper copies of either passages/stimuli and/or items. The use of this accommodation may result in the student needing additional time to complete the assessment.

⁷ These supports are intended for use in the operational administration pending regulatory approval by the Office of Administrative Law.

Accommodation ⁷	Embedded	Non-embedded	Recommendations for Use
Speech-to-text		X	Students who have motor or processing disabilities (such as dyslexia) or who have had a recent injury (such as a broken hand or arm) that makes it difficult to produce text or commands using a keyboard may need alternative ways to work with testing devices.
Streamline	X		This accommodation provides the test in a single-column sequential, simplified format in which the items are displayed below the stimuli vertically. This accommodation includes zoom levels greater than 3X in the student interface. This accommodation may benefit students who have specific learning and/or reading disabilities.

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Biographical Summaries, ETS Assessment Design Team Members

Jennifer Aguilera, Test Creation Administrator—Lead, has more than nine years of experience in assessment support work. She joined ETS in 2008 as a consultant and has since moved forward in the company in positions of increasing responsibility in test creation. She has provided support for such large-stakes programs as the 2013 Virginia testing program and has also served as team lead for the California Modified Assessment and Texas and Tennessee programs. In this work, she utilizes her strong technical experience in online testing and leadership, and she often works directly with publishing managers and production staff in order to create material that meets program specifications and needs. Jennifer attended the University of Texas at San Antonio, where she studied psychology.

Dr. Markku (Mark) Hakkinen, Managing Senior Research Developer, is a research scientist in the Research and Development division at ETS, where he utilizes his expertise in addressing national and international accessibility standards for computer-based systems. At ETS, he works on a variety of accessibility and technology projects, including exploring accessibility challenges of tablet computers, gaming technologies, and ETS's current computer-based testing platforms. During his career, Dr. Hakkinen has placed significant focus on nonvisual interfaces to information, on the basis of experience gained initially as a research programmer supporting psychoacoustics research at the Central Institute for the Deaf and from his early graduate research in speech-based warning systems. He earned both his Ph.D. and Master of Science Degree in cognitive science from the University of Jyväskylä in Finland and his Bachelor of Science Degree in psychology from Washington University in St. Louis, Missouri.

Dr. Eric Hansen, Research Scientist, provides expertise in the area of evidence-centered design (ECD) for accessibility and leads training on extending ECD to accessibility to identify when accessibility elements may alter the construct of an item. Dr. Hansen joined ETS in 1988 and currently serves as a co-principal investigator on a National Science Foundation project that is seeking to make mathematics content accessible to middle school students with visual disabilities through the use of audio-tactile graphics and other methods. He has served as principal investigator on a variety of ETS and U.S. government-funded projects involving technology, learning, and assessment for individuals with disabilities. Dr. Hansen was coeditor of version 1.0 of the W3C's User Agent Accessibility Guidelines and has contributed to the accessibility activities of the IMS Global Learning Consortium. He also directed a project that developed an early testing system that used text-to-speech for test takers who are blind. He earned his Ph.D. in instructional psychology from Brigham Young University and his B.A. in biology from Harvard University in Cambridge, Massachusetts.

Dr. Cara Cahalan Laitusis, Research Director, is the principal investigator and project director at ETS for three grants from the U.S. Department of Education, all of which focus on improving state assessments for students with visual impairments, blindness, learning disabilities, or mild-to-moderate cognitive impairments. Dr. Cahalan Laitusis joined ETS in 1998; her applied specializations are in curriculum-based assessment and the diagnosis and treatment of students with learning disabilities. She has been involved in research on the validity and fairness of assessments for all test takers. These projects have included field

testing of new item types for students with disabilities on both the SAT® and Graduate Record Examination® (GRE®), examining the validity of testing accommodations for students with disabilities on a variety of tests, investigating gender differences in mathematical problem-solving, and examining the comparability of paper- and computer-based test formats between gender and ethnic groups. Dr. Cahalan Laitusis has authored numerous research articles and coedited the book *Large Scale Assessment and Accommodations: What Works?* which was published by the Council for Exceptional Children in 2007. She earned both her Ph.D. in urban school psychology and her Master of Science Degree in Educational Psychology from Fordham University, as well as her Bachelor of Science Degree in Psychology and African Studies from Trinity College in Hartford, Connecticut.

Michelle Palmer, Assessment Process Specialist I, serves as the process lead for the development of all alternate test forms (ATF) materials for CAASPP. For the past six years, Michelle has worked at ETS and served as the ATF lead on a variety of programs. She reviews and marks up test forms to post to vendors for visual impairment modifications; coordinates, plans, and communicates with vendors and clients on project tasks and scheduled deliverables; creates, populates, and inputs data into various tracking spreadsheets to track materials and confirm the meeting of deadlines; and researches and gathers data for documentation while accurately coding tasks for accounts payable. Prior to joining ETS, Michelle served as a staff sergeant in the United States Air Force Reserves. She earned her Bachelor of Arts Degree in English with a concentration in professional writing from the University of Texas at San Antonio and her Associate Degree in Liberal Arts from Del Mar College at Corpus Christi, Texas.

Justine Pascalides, ATF Manager, oversees the development of ATFs and facilitates nonvisual access to the computer-based tests. For the past five years, Justine has worked at ETS as an assessment process manager, where she manages the development of ATFs and test preparation materials for test takers with disabilities. Her duties include, but are not limited to: providing overall direction to staff members in the Princeton, New Jersey, and San Antonio, Texas, offices; managing the group's budget, the development of proposal text, and metrics reporting; interviewing and selecting staff; establishing policies and procedures to institute efficient and effective work toward the excellence of test materials; and risk management. Prior to her time with ETS, Justine worked for three years with Questar Assessment, Inc. as a project manager, and she managed the MI-Access project (i.e., Michigan's K–12 alternative assessment for students with cognitive disabilities). Justine holds a certificate in project management from Rutgers University in New Brunswick, New Jersey, and she is working to earn her certification in accessible information technology from the University of Southern Maine. She is knowledgeable of literary and Nemeth braille codes. Justine earned her Bachelor of Arts in Psychology and Archaeology from the State University of New York College at Potsdam.

Jennifer Schilke, Assessment Process Specialist, has more than 10 years of experience in process, product, and project management. Prior to joining ETS in 2013, Jennifer worked as a senior manager, product manager, and in technical support for security at Comcast. She also has experience working as a functional/business analyst and as a senior software support/consultant for Prophet 21™. In her work for ETS, Jennifer utilizes her strong background in education, research, assessment, testing, and management. She earned her Educational Specialist Degree in School Psychology from Rider University in Lawrenceville,

New Jersey, as well as her Bachelor of Science Degree in English Education from Mount Saint Mary's College in Emmitsburg, Maryland.

Barbara Wiener, Senior Assessment Director, joined ETS in 1997 and has served in roles of increasing responsibility since then. Currently, she primarily works as a test developer for the GRE, *Praxis*, and the Texas Examinations of Educator Standards (TExES) licensure tests; this is the role she will serve on CAASPP. Other programs she has worked on include PLUS AAA, the Comprehensive Testing Program (CTP 4), and the Graduate Management Admission Test® (GMAT®). In addition, Barbara has contributed her mathematical content expertise to research projects, including the development of new item types and item models. She also has contributed to process improvement projects and has a Six Sigma Black Belt. Before coming to ETS, Barbara worked as a teacher and engineer. She earned her Master of Science in Mechanical Engineering from Columbia University in New York, New York, and her Bachelor of Science in Civil Engineering from the University of Buffalo in New York. She is affiliated with the American Society of Civil Engineers and is licensed as a registered professional engineer in the State of New York.