2018 Science Adoption Program: Twig Science K6i

Evaluation Criteria Map Publisher: Twig Education

**Category 1: Science Content/Alignment with Standards**

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| Science Content/Alignment with Standards | Publisher Citations | Criterion Met? | Reviewer Comments, Citations, and Questions |
|  | Y | N |
| 1. Instructional Resources, as defined in *EC* Section 60010(h), must align to the CA NGSS, adopted by the SBE in September 2013 for kindergarten through grade five and resources from grades six through eight must be aligned either to the Integrated Learning Progression Courses for Middle Grades Six through Eight adopted in November 2013 found in chapter 5 of the *CA Science Framework* or, alternatively, the Discipline Specific Courses for Grades Six through Eight found in chapter 6 of the *CA Science Framework*. Alignment shall be determined by assessing a full year’s program, not unit by unit. When developing Discipline Specific courses, the publisher should consider which disciplinary core ideas, if any, from the other science domains would need to be introduced in specific grade-level courses in order to facilitate students’ full understanding of each performance expectation by the end of the year. For this reason, some units of the Discipline Specific Course model contain supplemental Disciplinary Core Ideas (DCIs) from other domains.
 | **Legend:**Teacher Edition (TE)Student Edition called the Twig Book (TB)Leveled Reader (LR)Module (M)Driving Question (DQ)Lesson (L)*Twig Science* © 2020 is a comprehensive K–6 NGSS program that ensures students master all of the CA NGSS standards as outlined in the CA Science Framework. Grade 6 aligns to the Integrated Learning Progression Courses for Middle Grades. The K–6 Twig Science correlation to the California NGSS can be found in the front of every TE and online<https://review.twigscience.com/asset/perma1961>The CDE Standards Maps have been provided in print form and are also downloadable from [www.twigscience.com](http://www.twigscience.com) The relevant NGSS standards appear on the overview page of all lessons.*Examples*: **Grade K Module 1****My Big Nature Adventure**DQ2, L3)**Grade 6 Module 1****BioTech Systems Worldwide**DQ4, L3  |  |  |  |
| 1. Instructional resources engage students in using text, discourse, and experiential learning to develop mastery of the three integrated dimensions of the CA NGSS: the Science and Engineering Practices (SEPs), Crosscutting Concepts (CCCs), and DCIs.
 | The instructional resources include a wide range of text resources in every module. These include informational texts embedded in the student edition (Twig Book), read-alouds (provided as digital resources) and the science leveled readers.Students are supported and encouraged to develop their discourse skills activities in the program through routines such asTurn and Talk, and Stronger and Clearer Each Time. *Example (Turn and Talk):***Grade 3 Module 2****Welcom­­e to the Biodome**DQ1, L3 *Example (Stronger and Clearer Each Time):***Grade 6 Module 1****BioTech Systems Worldwide**DQ3, L7 (Investigate, Report and Connect sections in Twig Lessons frequently include questions for the teacher to facilitate student–student/student–teacher discourse. Answers are included to help the teacher move the conversation on and check students’ understanding of the knowledge and skills.*Example (Investigate):***Grade 6 Module 3****The Red List**DQ1, L2 *Example (Report):***Grade 3 Module 2****Welcome to the Biodome**DQ4, L1 *Example (Connect)*:**Grade K Module 1****My Big Nature Adventure**DQ5, L2 Analysis of nonfiction text in ELA lessons regularly includes discussion about textual meaning based on pictures, headers, diagrams, graphs, and charts.*Example:***Grade 4 Module 5****Super Survivors**DQ3, L3 Leveled readers are designed for guided reading sessions: small groups of students at similar reading ability levels discussing what they have read and what it means.*Example:* **Grade 3 Module 3****How to Survive an Ice Age**Leveled Reader**: Surviving in Different Environments**All chapters (2–32)Twig Science demonstrates the full experiential learning cycle as the students make sense of the phenomena and engage in the performance tasks:*1. Doing/having an experience*This is the core of most Investigate lesson sections—genuine 3-D, hands-on activities designed to investigate specific phenomena and design problems. This includes using digital interactives designed to investigate simple models of complex phenomena. *Example (Hands-On Investigation):***Grade 4 Module 2****Sparks Energy, Inc.**DQ2, L6–L8 *Example (Digital Investigation):***Grade 4 Module 2****Sparks Energy, Inc.**DQ1, L5–L7 *2. Discussing and explaining the experience*The Report section of each lesson is designed to help students think about the evidence from investigations and research, as well as spotting patterns in the data and evaluating the strengths and weaknesses of the investigation, using the SEPs to help them.*Example:***Grade 3 Module 2****Welcome to the Biodome**DQ3, L6 *3. Concluding from the experience*The Connect and Reflect sections of each lesson help students to construct their own explanations and argue from the evidence, using SEPs and CCCs as the lens through which to view it.*Example:***Grade 3 Module 2****Welcome to the Biodome**DQ3, L7 *4. Try out what you have learned*Twig Science Benchmark Assessments are designed to ensure students can apply their learning to bespoke, truly 3-D problems, using new contexts they have not come across before to demonstrate their understanding.*Example:***Grade 3 Module 2****Welcome to the Biodome**DQ3, **Benchmark Assessment: Life Cycles and Traits** (Mastery is encouraged due to the regularity of formative assessment in each Reflect section and Pre-exploration assessment in each module.*Example:***Grade K Module 1****My Big Nature Adventure**DQ5, L3  |  |  |  |
| 1. Instructional resources reflect the full content of the *CA Science Framework* allowing teachers to engage students in using each of the SEPs in multiple contexts and to use and apply the CCCs to connect ideas across science topics.
 | The Twig Science modules directly align to the CA Science Framework segments that bundle the NGSS PEs from different disciplines.See the CA NGSS Alignment table in the front of every TE and online <https://review.twigscience.com/asset/perma1961/>This holistic approach to teaching science mirrors how scientists and engineers work in the real world and gives students the opportunity to apply the SEPs and CCCs to different areas of science and engineering in the same context, connecting ideas and concepts. For example, across **Grade 4,** students apply CCC-2, Cause and Effect, to collisions, solar cookers, erosion, earthquakes, and sensory inputs. Similarly, they use SEP-6 to design a solution to stop an egg cracking, convert kinetic energy to electricity, reduce soil erosion, create an earthquake-proof structure and send an SOS message.  |  |  |  |
| 1. Instructional resources progressively build students’ abilities to meet all grade-level Performance Expectations (PEs) through a three-dimensional instructional sequence.
 | The Twig Science curriculum spirals progressively within each grade and across the grades. Each grade comprises 4 or 5 modules, each aligned to a bundled set of PEs that progressively build student knowledge and skills. Each module is centered on a phenomenon that the students explore through a series of Driving Questions.The Driving Questions include 3-D performance tasks built around the PEs. These tasks require students to apply DCIs, SEPS, *and* CCCs in order to complete them successfully. *Examples:***Grade 4 Module 2****Sparks Energy, Inc.**DQ1, L1–L7 Key Resources**Humans and Earth**, Prior-Knowledge Read-Aloud text**Sparks Energy, Inc. Trailer** video**Wind and Water Power** video**How Can We Use the Sun’s Energy?** text (TB)**Melting Ice** investigation**Solar Cookers** interactive**Grade 4 Module 4****Earthquake Engineering**DQ1, L2–L3 Prior Knowledge Read-Alouds integrated into the first Driving Question of each Module recap and reinforce concepts that students should be familiar with before they start the module, setting them off on a pathway to success. *Example:***Grade 4 Module 1****Egg Racers**DQ1, L2 Guidance for teachers on how the PEs and instructional resources build is provided in the Grade Scope and Sequence in the front cover of each Teacher Edition, and the module Performance Expectation Progressions in the back cover. This information is also available online:<https://review.twigscience.com/asset/perma1961/>Students are supported to progress their skills in using and applying the SEPs through the Science Tools Poster. This dynamic classroom resource is created by the class, and charts the identification, use and application of each SEP throughout the year, empowering the students to “own” these important elements of the NGSS.*Examples:***Grade K Module 1****My Big Nature Adventure**DQ1, L9 **Grade 2 Module 4****A Garden for Life**DQ2, L1 **Grade 3 Module 3****How to Survive an Ice Age**DQ2, L2  |  |  |  |
| 1. Teacher resources support instructional opportunities and assessments that engage students in three-dimensional learning.
 | Teacher resources support multiple three-dimensional instructional opportunities and assessments through the exploration of the Module Phenomenon and the embedded performance tasks.For example, in **Grade 4 Module 4, Earthquake Engineering,** over a number of weeks students learn about natural hazards, patterns in earthquake and volcano occurrence (CCC-1), waves and their properties (PS4.A), natural hazards (ESS3.B), plate tectonics (ESS2.B) and the principles of engineering design (ETS1.A‒C). This leads to a full engineering design cycle in which students achieve the PE using the most relevant practices:* SEP-1: Students define the problem—how to stop houses falling down in earthquake zones.
* SEP-2: Students make their own models of earthquake-proof houses.
* SEP-3: Students test their models.
* SEP-4: Students analyze test data to work out which design is the most effective in resisting simulated earthquakes.
* SEP-5: Students calculate the cost of the materials in their models.
* SEP-6: Students define the solution that is the most effective within the constraints they have.

At key points during the module, students also undertake two three-dimensional assessment tasks: * They analyze maps and advise a building company where to build a theme park to reduce the risks of earthquakes. (DQ2,)
* Within set design constraints, they choose a solution for retrofitting an historic building with earthquake-proofing technologies. (DQ5,)
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| 1. Instructional resources shall use proper grammar and spelling (*EC* Section 60045).
 | All of the components of Twig Science, including the leveled readers and the informational texts in the Twig Books, use proper grammar and spelling. During development of the program, a comprehensive QC workflow included multiple checks of all text, with a centralized style guide to ensure consistent usage and formatting across the board.  |  |  |  |
| 1. Use of primary sources, such as scientific research, case studies, and photographs, are integrated into the three-dimensional learning, as grade-level appropriate.
 | Primary sources including scientific research, case studies, and photographs, are integrated into the videos, informational texts, interactives and leveled readers of every module of the program, as grade-level appropriate. *Examples:***Grade 1 Module 1****Museum of Leafology**DQ6, L3 The **Biomimicry: Lotus Leaf** video tells the story of engineers who were inspired by the lotus leaf to create space suits that repelled dust. This is a great example of defining a specific problem (SEP-1) and designing an engineering solution (SEP-6).<https://review.twigscience.com/asset/rys965>**Grade 4 Module 4****Earthquake Engineering**DQ5, L4 The **Edison** video uses archive photographs to tell the story of Edison’s repeated failures before his ultimate success at creating the electric light bulb. Students understand how he constructed his own explanation based on the large amount of evidence collected (SEP-6).<https://review.twigscience.com/asset/pva873/> **Grade 6 Module 1****BioTech Systems Worldwide**DQ2, L1 The **Ghost Heart** video explores the latest scientific research using stem cells to repair damaged hearts. <https://review.twigscience.com/asset/dox398/>DQ3, L1 and L3 This module also features the **Virtual Microscope** interactive, through which students can experience CCC-3 (Scale, Proportion, and Quantity) deepening their understanding of scale and proportion *and* the difference between a tissue and and an organ (PE).<https://review.twigscience.com/asset/ruy668/> **Grade 6 Module 3****The Red List**DQ4, L3 (The **Kakapo** video and **Saving Sea Turtles** video allow students to witness footage of recent conservation case studies, which they connect to SEP-6 (Constructing Explanations and Designing Solutions), in this case creating conservation plans for endangered species.<https://review.twigscience.com/asset/trv992><https://review.twigscience.com/asset/gxw747>Regular updates on the latest scientific advancements are featured on[www.twigsciencereporter.com](http://www.twigsciencereporter.com)  |  |  |  |
| 1. Instructional resources introduce real-world phenomena and systems that students can investigate, model, and explain using the targeted DCIs and CCCs.
 | Every module in the program focuses on a phenomenon or investigative problem that students explore, investigate, model, and explain in order to build understanding, using the relevant DCIs, SEPs and CCCs.*Examples:***Grade 1 Module 3****Shadow Town**Students investigate the Norwegian town of Rjukan, which sits in the shadow of a mountain, resulting in many months without any direct sunlight during winter. Students investigate the concepts of shadows and reflection, and apply the concepts of patterns (CCC-1) and cause and effect (CCC-2) to work out a solution (SEP-6)—positioning a mirror on the mountainside to reflect the sunlight down to the town square. **Grade 6 Module 1****BioTech Systems Worldwide**As the culmination of their study of human body systems, students are tasked with building a prototype prosthetic hand. Throughout this module, they use CCC-4 (Systems and System Models) and CCC-6 (Structure and Function), to understand the function and interrelation of body systems. They apply ETS1.A (Defining Engineering Problems) and ETS1.B (Developing Possible Solutions) as they and design and build the prosthetic hand.**Key Resources**DQ1, L13 **Climbing Systems** videoDQ4, L1  **Bioengineering Project** videoDQ4, L2 **Advanced Prosthetic Arm: Design Requirements** video |  |  |  |
| 1. Instructional resources focus on the application of science to be learned (e.g., medicine, engineering, environmental science) using authentic and meaningful real-world applications and scenarios that are specific to California when appropriate.
 | Twig Science modules apply science to real-world scenarios that are specific to California when appropriate. *Examples*:**Grade 1 Module 1****Museum of Leafology**Leveled Reader: **Our Leafy Friends** Associated lessons The Leveled Reader features a Californian company that has engineered indoor farms in shipping containers.<https://review.twigscience.com/asset/perma1065>**Grade 4 Module 4****Earthquake Engineering**DQ5, L2 The **LAX Engineers** video features engineers that retrofitted the Theme Building at Los Angeles International Airport to be earthquake-proof.<https://review.twigscience.com/asset/tvs776>Leveled Reader: **Shake, Rattle and Roll**The leveled reader for this module explores an earthquake-proof home that Stanford University is testing.**Grade 5 Module 3****H2O Response Team**DQ3 Driving Question 3 in this module is “Why are some places in California drier than others?” Students investigate and build an answer to this question throughout the lesson sequence.  |  |  |  |
| 1. The science curriculum is enriched with opportunities for students to access informational texts, literature, simulations and other media related to science and engineering and it presents diverse examples of notable scientists and engineers.
 | Twig Science modules are enriched with a plethora of rich media assets and texts that showcase diverse examples of notable scientists and engineers. Every Twig Book includes multiple examples of science-related informational texts .*Example:***Grade 4 Module 4 Earthquake Engineering** The Twig Book contains informational texts at the pages above.Every module comes with a Leveled Reader. Chapter 2 of each reader features an interview with a scientist or engineer:*Examples:***Grade 2 Module 1**Leveled Reader: **What Is a Map?** **Grade 4 Module 4**Leveled Reader: **Shake, Rattle, and Roll****Grade 5 Module 2**Leveled Reader: **The Galápagos Islands**Videos and simulations are integrated into every module.*Examples:***Grade 1 Module 1****Museum of Leafology**DQ6, L2 **Biomimicry: Hook and Loop Fasteners** video<https://review.twigscience.com/asset/kio234>**Grade 3 Module 1****The Ultimate Playground**DQ1, L4 **What Is a Force?** video<https://review.twigscience.com/asset/onh573>**Grade 5 Module 2****Yellowstone: Uncovered**DQ4, L3 **Food Chain** video and **Food Chains** interactive<https://review.twigscience.com/asset/yvw664><https://review.twigscience.com/asset/juy363>Poetry is also integrated into selected modules at lower grade levels.*Example:***Grade K Module 1****My Big Nature Adventure**DQ2, L4  |  |  |  |
| 1. Resources include examples of people and groups who used their context, learning, and intelligence to make important contributions to society through science and technology from different demographic groups: Native Americans; African Americans; Mexican Americans and other Latino groups; Asian Americans; Pacific Islanders; European Americans; lesbian, gay, bisexual, and transgender Americans; persons with disabilities; women; and members of other ethnic and cultural groups. Resources emphasize the importance of science education to all members of our society in a way that is culturally and socially authentic [*EC* Sections 51051, 60040(b), and 60044(a)].
 | Examples of the different demographic groups detailed here are embedded throughout the program: in the videos, the leveled readers, the Teacher Edition, the read-alouds and the Twig Book. As an example, Grade 5 includes mention of:1. Evan Forde (M3, DQ4, L2)
2. Rafael Luis Bras (M3, DQ3, L4)
3. Ven Te Chow (M3, DQ4 L5)
4. Jorge Moreno (M4 DQ5, L4).
5. Miguel Ordenana (M2, DQ6, L1)
6. Phung Le (M2, DQ5, L3)
7. Patricia Bath (M1, DQ6, L5).

Each Leveled Reader features in an interview with a scientist or engineer, the subjects of which are drawn from different demographic groups. Teacher Editions are annotated with Cultural Connections at point of use to support teachers to raise the profile of different demographic groups and emphasize the importance of science education to all society.A curated collection of videos and interviews with scientists and engineers featured in the programme can be found in the STEM Careers section of [www.twigscience.com](http://www.twigscience.com). <https://review.twigscience.com/asset/perma1957> —see pages 8, 14, 20, 22, 24 42, 48, 54, and 64. **Twig Science Reporter**[www.twigsciencereporter](http://www.twigsciencereporter) regularly features scientists and engineers from diverse backgrounds.*Examples:*<https://www.twigsciencereporter.com/news-update/dinosaur-footprints-robotic-fish-macaques-in-hot-water/><https://www.twigsciencereporter.com/feature/animal-mummies/> |  |  |  |
| 1. Student assignments make linkages and are consistent with the grade-level appropriate expectations in the California Common Core State Standards for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects (CA CCSS for ELA/Literacy), the California English Language Development Standards: Kindergarten through Grade 12 (CA ELD Standards), and California Common Core State Standards: Mathematics (CA CCSSM) and are consistent with the guidance in the *CA Science Framework*.
 | The assignments in Twig Science have been designed to align with grade-level appropriate CA CCSS ELA, Math and CA ELD standards. These standards are highlighted at Module level in the Grade Scope and Sequence (inside the front cover), at Driving Question level in the Time Savers overview, and at Lesson level in the standards section of the Lesson Overview.*Examples:***Grade 2 Module 1****My Journey West**TE inside cover**Grade 5 Module 3****H2O Response Team**TE inside cover,  |  |  |  |
| 1. The materials provide support for students to develop grade-level appropriate academic language and discipline-specific vocabulary through their use in context in classroom discourse around science phenomena (science talk), and through well-written and grade-level appropriate text resources.
 | Embedded in Twig Science modules are language routines developed in partnership with the team at Understanding Language—Stanford Center for Assessment, Language and Equity.These routines—such as Collect and Display, Meta-Think-Aloud and Stronger and Clearer Each Time— support sensemaking around phenomena, by using tasks that amplify language, optimize output, strengthen opportunities to cultivate conversations, and encourage students to maximize linguistic and cognitive meta-awareness.*Examples:***Grade 4, Module 4** **Earthquake Engineering**DQ1, L2 L3.L4 ,L5 (Teacher support for the language routines in Twig Science is provided online:<https://review.twigscience.com/asset/perma1963> Text resources in the Twig Books, the Leveled Readers, and the Prior-Knowledge Read-Alouds support growing mastery of the discipline-specific vocabulary. Twig Science videos also support mastery of this vocabulary by bringing it to life, further supported with on-screen text. *Examples*:**Grade** **4, Module 4****Earthquake Engineering*** Text resource in TB
* Leveled Reader: **Shake, Rattle and Roll**

<https://review.twigscience.com/asset/perma1059>* DQ1 L1 **Earthquakes, Tsunamis and Volcanoes**  Prior-Knowledge Read-Aloud text

<https://review.twigscience.com/asset/uko344>* DQ3 L1 **Building Loads** video

<https://review.twigscience.com/asset/pts735/> A library of Science Glossary videos is available online to support Grade 6 Program Modules<https://review.twigscience.com/grade-list/> Twig Science includes a range of other vocabulary strategies:The Academic World Wall—new terminology is clearly defined as it arises and added to a visual list.*Example:***Grade 2 Module 1****My Journey West**DQ1, L5 Regular opportunities to argue from the evidence in the TE.*Example*:**Grade 5 Module 4****Galactic Guidebook**DQ4, L1‒3 Regular ELA lessons (in each Driving Question) that concentrate on reading for understanding and use grade-level technical language.*Example*:**Grade 4 Module 2****Sparks Energy, Inc.**DQ1, L3  |  |  |  |
| 1. Teacher resources provide guidance to support all students, including language learners and non-standard English speakers, to develop their science-related language and reading abilities, and to coordinate the multiple elements (text, diagrams, graphs and charts, etc.) that occur in science textual materials.
 | The Twig Science language routines embedded throughout the program have been designed to support all learners—including language learners and non-standard English speakers—to develop their science language proficiency. The CA ELD standards have been integrated throughout the program, and specific differentiation for ELs of varying proficiencies (emerging, expanding, and bridging levels) and SELs is noted in the TE at the point of use. Here are some examples based on the CA ELD framework:Twig Science is **collaborative**: * Students engage in dialogue with others
* Students offer opinions, negotiate or persuade others

*Example*:**Grade 2 Module 4****A Garden for Life**DQ2, L1‒5 **Key Resource:****The Plant Problem** text (TB)Twig Science is **interpretive:*** Listening actively and asking or answering questions about what was heard.
* Close reading and explaining interpretations and ideas from reading.

*Example*:**Grade 6 Module 3****The Red List**DQ1, L2‒L10 **Key Resources****Courtship Rituals: Alligator** video**Giant Otter** video**Claim-Evidence-Reasoning** ChartTwig Science is **productive:** * Expressing information and ideas in oral presentations
* Supporting opinions or justifying arguments and evaluating others’ opinions or arguments

*Example***:** **Grade 2 Module 3****Save The Island**DQ1, L10‒L11 Twig Science provides opportunities to **structure cohesive texts:*** Understanding text structure and organization based on purpose, text type, and discipline.

*Example***:****Grade 3 Module 2****Welcome to the Biodome**DQ2, L6 Twig Science provides opportunities to **expand and enrich ideas:*** Modifying to add details to provide more information and create precision.

*Examples***:****Grade 4 Module 5****Super Survivors**DQ1, L7 Twig Science provides opportunities to **connect and condense ideas.*** Students are given the opportunity to improve their written work using a variety techniques.

See example:**Grade 3 Module 4****Weather Warning HQ**DQ2, L4 Leveled Readers are provided at four levels: On-Level, Below-Level, Above-Level, and English Learners, with accompanying lesson instruction aligned to each level that develops language and reading ability. The EL Readers include additional support to help students decode text, diagrams, graphs and charts. *Example*: **Grade 4 Module 4****Earthquake Engineering**English Learners Leveled Reader: **Shake, Rattle and Roll**<https://review.twigscience.com/asset/perma1154> |  |  |  |
| 1. Instructional resources, where appropriate, examine humanity’s place in ecological systems and the necessity for the protection of the environment (*EC* Section 60041). Resources include instructional content based upon the Environmental Principles and Concepts developed by the California Environmental Protection Agency and adopted by the SBE *(Public Resources Code* Section 71301) in context and aligned to the CA NGSS*,* as exemplified in Appendix 2.
 | Twig Science instructional resources have been created to align with the CA Environmental Principles and Concepts. This correlation is highlighted at Module level in the Grade Scope and Sequence (inside the front cover), and at lesson level in the standards section of the Lesson Overview.*Examples*:**Grade 5 Module 3****H2O Response Team** TE inside cover, and pages 6, 16, etc. |  |  |  |
| 1. Instructional resources include explanations about human organ and tissue donation, as age and grade-level appropriate, aligned to the relevant standards and related science research (*EC* Section 33542).
 | Twig Science includes grade-level appropriate explanations about human organ and tissue donation. *Example*:**Grade 6 Module 1****BioTech Systems Worldwide** DQ2, L3‒5 ( |  |  |  |
| 1. Instructional resources, as age and grade-level appropriate, discuss trends and research in science, including medical research, neuroscience and neurological diseases (such as Amyotrophic Lateral Sclerosis, or Lou Gehrig’s disease) and inform students about career pathways in science.
 | Twig Science includes age- and grade-appropriate materials about trends and research in science and STEM careers in every module. This content is integrated into the Twig Book, the videos, [www.twigsciencereporter.com](http://www.twigsciencereporter.com) and the Leveled Readers. Chapter 2 in every Reader centers on a interview with a scientist or engineer talking about their career, while Chapter 3 focuses on real-world applications of the module’s concepts. *Examples*: **Grade 5 Module 4****Galactic Guidebook**Leveled Reader: **Looking to the Stars and Beyond****Twig Science Reporter**A video showcasing the work of Professor Barton who is investigating superbugs:[www.twigsciencereporter.com/feature/superbugs/](http://www.twigsciencereporter.com/feature/superbugs/)A curated collection of STEM career examples is provided online, including an interview with the scientist Dr. David Owen, who is researching the neurological disease, multiple sclerosis <https://review.twigscience.com/asset/perma1957> —see page 66 |  |  |  |
| 1. Instructional resources support students to address the applications of science in the development of technologies and in fields such as agriculture, medicine, engineering, and environmental protection. Resources support students to reflect on the interconnections between science, engineering and technology, and to discuss ethical and regulatory issues that can arise when new science and technology allow new capabilities.
 | Embedded in Twig Science are resources that support students to address the applications of science, reflect on interconnections, and discuss ethical issues.*Examples*:**Grade 5 Module 3****H2O Response Team**DQ4, L5‒6 **Grade 6 Module 1****BioTech Systems Worldwide**DQ2, L3 and L6 **Nanobots** video <https://review.twigscience.com/asset/axv382/>**Grade 6 Module 3****The Red List**DQ3, L1 **Grade 6 Module 4****Cities of the Future**DQ4, L2‒L8  **Twig Science Reporter**Fracking<https://www.twigsciencereporter.com/feature/fracking/>Pesticides:<https://www.twigsciencereporter.com/feature/tracking-honey-bees/> Connections to Engineering, Technology, and Applications of Science (CETAS) relevant to each lesson are listed in the standards section of the Lesson Overview.*Examples*:**Grade 4 Module 4****Earthquake Engineering**DQ5, L2 **Grade 4 Module 2****Sparks Energy, Inc.**DQ1, L7 **Grade 4 Module 5****Super Survivors**DQ6, L5  |  |  |  |
| 1. Instructional resources engage students in the SEPs. Teacher resources will include discussion of expendable and permanent equipment and materials necessary to conduct activities, guidance on obtaining those materials inexpensively, recycling or disposing of materials, and explicit instructions for organizing and safely conducting instruction, labs and activities. (Aligned to the *Science Safety Handbook for California Public Schools*, California Department of Education [CDE] 2014).
 | Students using Twig Science are supported to engage in the SEPs to investigate the Module Phenomenon, through discourse, informational texts and experiential learning. Students are taught to use the SEPs explicitly. As the grade progresses, the class keeps tracks of its growing use of SEPs through the Science Tools Poster. The Teacher Edition contains prompts to add to and refer to the poster at relevant points in each module.*Examples***Grade 4 Module 1****Egg Racers**DQ2, L3‒L4 The Teacher Edition details the materials required to conduct the activities. This is highlighted at Module level (in the kit list on page vii, and online), at Driving Question level (in the Overview) and at Lesson level (in the Resources section of the Lesson Overview).Many of the materials required (including all specialist items and equipment) can be obtained inexpensively through the Twig Science Lab Kits.*Example:***Grade 5**Grade-level Science Essentials kit list<https://review.twigscience.com/asset/perma1448>**Grade 5 Module 2****Yellowstone: Uncovered**Module kit list<https://review.twigscience.com/asset/perma1451>Guidance is also given on how the teacher can obtain the resources themselves or with the help of class parents/guardians using the Family Connection letter in each module.*Example:***Grade 4 Module 4****Earthquake Engineering**<https://review.twigscience.com/asset/docx-095>Guidance is provided on how to recycle and safely dispose of materials.*Example:***Grade 3 Module 3****How to Survive an Ice Age**DQ1, L1 Safety instructions are embedded in the Teacher Edition at the point of use. *Examples:* **Grade K Module 1****My Big Nature Adventure** DQ4, L2 **Grade 3 Module 3****How To Survive an Ice Age**DQ1**,** L6 Age-appropriate student safety handouts have been created to align to the *Science Safety Handbook for California Public Schools*. These are available online in within the Teaching and Research Aids document (see pages 6-12)<https://review.twigscience.com/asset/perma1965> |  |  |  |
| 1. Instructional resources include opportunities for reflection on the nature and history of science and on their science learning as indicated in the *CA Science Framework*.
 | Embedded in the resources are opportunities to connect to the nature and history of science. These connections are highlighted at Lesson level in the standards section of each Lesson Overview page.*Examples*:**Grade 4 Module 4****Earthquake Engineering**DQ1, L3 **Grade 4 Module 2****Sparks Energy, Inc.**DQ2, L8)**Grade 4 Module 3****Time-Traveling Tour Guides**DQ2, L1 L2 L4  |  |  |  |

**Category 2: Program Organization**

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| Program Organization | Publisher Citations | Criterion Met? | Reviewer Comments, Citations, and Questions |
|  | Y | N |
| 1. Sequential organization of the material provides structure concerning what students should learn each year and allows teachers to convey the science content incorporating the three-dimensional learning expressed in the CA NGSS.
 | The CA NGSS Framework Alignment table in the front cover of each Teacher Edition maps out the sequential organization of the K‒6 program and how it correlates to the CA NGSS. More detail on the three-dimensional learning the students engage with each year is detailed in the Grade Scope and Sequence tables, also found in the Teacher Edition front cover. A focus on the logic of how the PEs in a specific module have been developed in prior grades and will progress at future grades is explained in the Performance Expectation Progression table, found in the back cover of every Teacher Edition. This information is also available online:<https://review.twigscience.com/asset/perma1961/> |  |  |  |
| 1. Instructional resources support teacher questioning strategies as a tool to assess students' knowledge and skills, promote student-to-student discourse, and guide student learning.
 | Embedded within every lesson are questioning strategies to assess, promote and guide student discourse and learning. Suggested questions that scaffold in complexity, along with possible student responses, are provided to support formative assessment. Focus questions for discussion are also provided.*Example*: **Grade 6 Module 3****The Red List**DQ1, L2 Professional Learning on language routines includes tips for effective questioning and classroom discussion.<https://review.twigscience.com/asset/perma1963/>Twig Science language routines and classroom discussions are integrated throughout the lessons in each module, and help to facilitate student discourse. *Example*:**Grade 4 Module 5****Super Survivors**DQ1, L7 Instructional resources include argumentation sessions to encourage appropriate scientific discussion between students.*Example*:**Grade 3 Module 2****Welcome to the Biodome**DQ4, L1 and L4 ( |  |  |  |
| 1. Instructional resources explicitly state which knowledge and skills learned in prior grades or units are applied and extended to accommodate new knowledge and skills.
 | A progression table provided for every module (within the back cover of the Teacher Edition) details the prior knowledge and skills that are applied and extended in the module, as well as the skills and knowledge to come in later modules throughout the program. This information is also available online: <https://review.twigscience.com/asset/perma1961/> |  |  |  |
| 1. Teacher resources provide support to engage students in three-dimensional learning and suggest research-based strategies to elicit student thinking and support student discourse.
 | At the heart of all Twig Science modules are student-centered, three-dimensional performance tasks that have been designed to support teachers and students to demonstrate growing mastery of the NGSS PEs. *Examples:* **Grade 4 Module 4 Earthquake Engineering** DQ6 (**Grade 1 Module 1****Museum of Leafology**DQ3 The research-based language routines, designed in partnership with the team at Understanding Language‒Stanford Center for Equity, Learning and Assessment, are embedded in the instructional materials. These routines support teachers to elicit student thinking and support discourse. *Example*:**Grade 4 Module 4 Earthquake Engineering** DQ1, L4 DQ5, L1 Professional Learning on language routines is provided online:<https://review.twigscience.com/asset/perma1963/>Formative assessment in the Twig Science program is influenced and informed by the research of Dylan Wiliam and Paul Black. Sources: * <https://www.rdc.udel.edu/wp-content/uploads/2015/04/InsideBlackBox.pdf>
* <https://www.learningsciences.com/embedded-formative-assessment>

An overview of the Twig Science approach to assessment is provided online:<https://review.twigscience.com/asset/perma1967> |  |  |  |
| 1. The instructional resources are grade-level specific and provide instructional content for 180 days of instruction for at least one daily class period, including an estimate of the necessary instructional time.
 | The Twig Science program consists of grade-level specific modules that align to the CA NGSS framework segments. Instructional resources consist of* Lessons that relate to each module (organized by Driving Question)
* Lessons that relate to each Leveled Reader
* Additional topical instructional resources at [www.twigsciencereporter.com](http://www.twigsciencereporter.com)
* Additional resources for review, differentiation and extension at [www.twigsciencetools.com](http://www.twigsciencetools.com)

A Comprehensive Planner outlinging 180 days of instruction for each grade is provided online:<https://review.twigscience.com/asset/perma1962> |  |  |  |
| 1. The content is well organized and presented in a manner consistent with providing all students an opportunity to achieve the essential knowledge and skills described in the CA NGSS and the *CA Science Framework*.
 | Twig Science comprises 29 grade-level specific Modules that correlate directly to the PEs in the CA Science Framework segments. Each Module focuses on a phenomenon that integrates interdisciplinary CA NGSS standards and engineering practices.  Each Module comprises a series of Driving Questions that scaffold student three-dimensional learning in manageable chunks, and build towards a growing mastery of the PEs and the Module Phenomenon. Each Driving Question comprises a sequence of lessons that cycle through the 5 Es (Engage, Explore, Explain, Elaborate, Evaluate) and build toward understanding that will allow students to answer the question.Each Lesson follows an instructional design that supports three-dimensional, student-centered learning. Each Lesson consists of the following 5 sections: 1. **Spark**: Students engage and prepare for the investigations ahead.
2. **Investigate:** Students think and act like scientists and engineers, collaborating in teams for hands-on and digital investigations.
3. **Report**: Students share what they have learned so far. They cite their evidence and reasoning for their claims.
4. **Connect**: Students connect the day’s learning to the NGSS standards, the Driving Question, the Module Phenomenon.
5. **Reflect:** Students reflect on, and demonstrate, their understanding of the module standards and phenomenon.

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| 1. Resources include explanations to teachers regarding how the SEPs, DCIs, and CCCs work together to support students in making sense of phenomena and/or to design solutions to problems and build toward the PEs of the CA NGSS. Teacher resources support understanding of how PEs are developed within units and across units throughout a year.
 | The Program Overview (found in the Teacher Edition front matter) explains how the SEPs, DCIs and CCCs work together in the NGSS to develop three-dimensional problem solvers, and how the program components support teachers and students to make sense of the Twig Science Module Phenomena and Investigative Problems.  This information is also available online: <https://review.twigscience.com/asset/perma1959>The Grade Scope and Sequence in the inside cover of each Teacher Edition maps out how the PEs develop across the grade. The Module Contents page on page iii of each Teacher Edition details each Driving Question, the main PEs that are the focus of that Driving Question, and key activities that build toward the PEs. The Driving Question Overview gives an at-a-glance view of each lesson in the Driving Question, while the Lesson Overview details the NGSS standards relevant to that specific lesson and how the lesson helps meet those standards. *Example:***Grade 2 Module 2****Master of Materials**The Connect section of each lesson supports the teacher to help students link the day’s learning to the module phenomenon, the module PEs and associated SEPs, CCCs and DCIs.  |  |  |  |
| 1. Topics selected for in-depth study are developed through their role in explaining selected phenomena, chosen to support students in building the knowledge and abilities needed to achieve proficiency in a bundle of PEs.
 | The topics chosen for in-depth study have been carefully selected to support sensemaking of the module phenomena, which in turn have been selected to offer the richness required to study and demonstrate proficiency in the bundled PEs. *Example:***Grade 2 Module 3****Save the Island** bundles a number of Earth and Space Science PEs with several that relate to engineering design. To address the PEs, students investigate the fast and slow ways that landforms change, and discover some of the engineering solutions used to slow down or prevent erosion. They apply what they’ve learned to the island of Tangier in Virginia, which is at risk of disappearing into the sea as a result of coastal erosion. Students define design criteria to address this problem, then create a model and test their solution.  |  |  |   |
| 1. Resources encourage the meaningful use of technologies such as video clips or computer simulations to investigate phenomena that cannot be directly experienced in the classroom; effective measuring tools (computer linked thermometer or range-finder, digital scales, etc.); and spreadsheets and other software to record, display, and analyze data, etc. In these contexts, the materials support teachers as they introduce students to computational thinking and provide guidance to teachers on how science instruction may be improved by the effective use of library media centers and information literacy skills.
 | Videos and computer simulations are embedded through the program, allowing students to investigate phenomenon that cannot be experienced directly. Measuring tools and software to interrogate data are also integrated into the learning journeys in a meaningful way. In each case, teachers are supported to help students develop their information literacy skills by locating and evaluating the relevant information, and using it effectively.*Examples, (Simulations)***:****Grade 4 Module 4****Earthquake Engineering**DQ2 L1‒L3 **Earth Explorer** interactive<https://review.twigscience.com/asset/tba659/>**Grade 5 Module 4****Galactic Guidebook**DQ1, L3 **Sunrise Sunset Calculator** interactive:<https://review.twigscience.com/asset/hen585/>**Grade 5 Module 2** **Yellowstone: Uncovered**DQ6, L1 **Making Changes to an Ecosystem** interactive<https://review.twigscience.com/asset/uiu257/>*Examples (Videos)***:****Grade 1 Module 2****Animal Reporters**DQ4, L1 (**Prairie Dogs** video**Grade 3 Module 3****How To Survive an Ice Age**DQ1**,** L3) **Traits—Odd One Out** videoDQ1, L4 **Why Are Flamingos Pink?** Video, **Young Caimans** video**Grade 4 Module 2****Sparks Energy, Inc.**DQ3, L3 **Fuels** videoDQ3, L5, **Energy Debate** video*Examples (Tools):***Grade 4 Module 4 Earthquake Engineering** DQ1, L5 Students observe a demonstration of an app that functions as a seismometer.**Grade 5 Module 1****Matter Mysteries Hotline**DQ1, L1 (Students use scales and rulers to measure the size and weight of a range of mystery objects. Many other lessons in this module require students to weigh and measure materials, using tools such as scales, measuring spoons, and graduated cylinders. **Grade 5 Module 3****H2O Response Team**DQ3, L4 Students use moisture meters to measure the water content of soil.*Examples (Data):***Grade 1 Module 4****Patterns in the Sky**DQ2, L2‒L4 Students combine and analyze class data (collected over several months) about the amount of daylight at different times of day, and draw conclusions from it. **Grade 6 Module 2****Destination Everywhere!**DQ3, L1‒L8) Students build model ‘passive houses’ and conduct a series of tests to determine the best materials with which to insulate the walls and floor. They collect, analyze, and synthesize a range of data.  |  |  |   |
| 1. Resources suggest appropriate engineering design tasks in varied contexts as a path to understanding and applying the science ideas being learned. Where appropriate, resources suggest computational tools and software to support the design process and allow students to model or simulate their designed products.
 | Engineering tasks that support understanding and demonstration of the Module Phenomenon and PEs are woven into the modules that feature engineering standards. The engineering tasks are highlighted in the Module Introduction and in the summary of each Driving Question in the Module Contents on page iii of the TE, as well as in the lessons themselves. Computational tools and software are included/suggested where relevant.*Examples:***Grade 4 Module 2****Sparks Energy, Inc.**DQ1, L5-L6 (**Solar Cookers** interactive<https://review.twigscience.com/asset/ufh934/>**Grade 5 Module 3****H2O Response Team**DQ5, L1 **Water saver** interactive<https://review.twigscience.com/asset/uqd543/> |  |  |  |
| 1. Teacher resources include references to where related supplemental open educational resources may be found.
 | References to helpful open educational resources are clearly indicated at the point of use throughout each TE. **Grade 4 Module 4 Earthquake Engineering**DQ2, L3 ) and subsequent lessons [www.emsc-csem.org](http://www.emsc-csem.org) DQ2, L3 <https://www.timeanddate.com/worldclock/>**Grade 6 Module 3****The Red List**DQ1, L1) The IUCN Red List of Threatened Species™**Grade 6 Module 4****Cities of the Future**DQ2, L6 (NASA and NOAA websites  |  |  |  |
| 1. Ancillary and support resources are an integral part of the instructional program and are clearly aligned with the CA NGSS.
 | Suggestions for additional and ancillary resources that support sensemaking of the Module Phenomenon and PEs are clearly indicated at the point of use throughout each TE.These include websites, trade books and digital tools.*Example:***Grade 4 Module 4 Earthquake Engineering**DQ5, L2 *Civil Engineering and the Science of Stuctures* trade bookIn addition, [www.twigsciencetools.com](http://www.twigsciencetools.com) provides grade-level NGSS-aligned review and extension resources, while [www.twigsciencereporter.com](http://www.twigsciencereporter.com) provides topical science and engineering content.  |  |  |  |
| 1. Course descriptions are aligned to a specific progression of courses across each grade band so that students completing the course sequence can meet all grade band CA NGSS PEs. The progression builds ideas in a planned sequence, so that each unit builds progressively on prior learning. The logic of the progression is described and explained in teacher resources.
 | The CA NGSS Framework Alignment table in the TE front cover maps out how the program correlates to the CA NGSS, and how the modules of Twig Science and their associated PEs progress both within a grade and across K‒6. More detail on how the PEs sequence across a grade is provided in the Grade Scope and Sequence tables (also in the TE front cover).A focus on the logic of how the PEs in a specific module have been developed in prior grades and will progress at future grades is explained in the Performance Expectation Progression table in every TE back cover. This information is also available online:<https://review.twigscience.com/asset/perma1961> |  |  |  |
| 1. Suggested student tasks, including end-of-chapter or culminating problems and exercises, are three-dimensional in nature and build in complexity throughout the year and across years.
 | The PEs in the Twig Science modules correlate to the PEs in the CA Science Framework segments.As the Framework segments progress in complexity within a grade and across the grade, so do the Twig Science modules.The three-dimensional performance tasks in Twig Science have been built around specific PEs. The purpose of the performance tasks is to give students the opportunity to apply their knowledge, skills and reasoning and demonstrate their ability to meet the PE. Just as the PEs in CA NGSS spiral in complexity throughout the year and across the grades, so too do the correlate performance tasks in Twig Science.*Examples:***Kindergarten Module 1****My Big Nature Adventure**To meet the PE K-LS1-1, students conduct an investigation to discover what plants need to survive. They observe plants and make predictions about what will happen to plants under different conditions. They conclude the performance task by drawing in their Twig Books to demonstrate an understanding that a plant cannot live or grow without water and light.**Grade 5 Module 2****Yellowstone: Uncovered**To meet the PE 5-LS1-1, students analyze the relationship between water, air, sunlight, nutrients, and the matter of plants, and then write a scientific argument in response to the question: Where do plants get the matter they need to grow?DQ3, L4  |  |  |  |

**Category 3: Assessment**

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| --- | --- | --- | --- |
| Assessment | Publisher Citations | Criterion Met? | Reviewer Comments, Citations, and Questions |
|  | Y | N |
| 1. Assessments in the instructional resources reflect the three-dimensional nature of the CA NGSS and the *CA Science Framework.* Assessment tools measure what students know and are able to do, as defined by the PEs in the CA NGSS. Assessments stress performance tasks rather than rote memorization.
 | Twig Science has developed a system of assessments embedded in the modules that measure all three dimensions of the PEs and will provide data on student performance. The assessments are multimodal in approach and include pre-assessments (known as pre-explorations), daily formative assessments, performance tasks, multiple-choice assessments, and benchmark assessments that were developed in partnership with the Stanford Center for Assessment, Learning and Equity.An overview of Twig’s approach to assessment can be found online:<https://review.twigscience.com/asset/perma1967/>The Module Assessment Overviews available online indicate the location of the significant assessments in each module, and what each one assesses. *Examples*:**Grade 4 Module 4****Earthquake Engineering**Module Assessment Overview: <https://review.twigscience.com/asset/perma1960> Benchmark Assessment: Analyzing MapsTeacher instructions: DQ2 Student assessment: <https://review.twigscience.com/asset/perma1178/>Rubrics: <https://review.twigscience.com/asset/perma1642/>Multiple-Choice Assessment (available online) Teacher file: <https://review.twigscience.com/asset/perma1860>Student files: <https://review.twigscience.com/asset/perma1833/> <https://review.twigscience.com/asset/perma1834> **Grade 5 Module 2****Yellowstone: Uncovered**Benchmark Assessment: From Matter to Organisms Teacher instructions: DQ5 Student assessment: <https://review.twigscience.com/asset/perma1185>Rubrics: <https://review.twigscience.com/asset/perma1650>Multiple-Choice Assessment (available online) Teacher file: <https://review.twigscience.com/asset/perma1863>Student files: <https://review.twigscience.com/asset/perma1839/> <https://review.twigscience.com/asset/perma1840>  |  |  |  |
| 1. Entry-level assessments for each unit are provided to help teachers elicit students’ prior knowledge and preconceptions and gauge their facility for using the SEPs and CCCs. Information is provided to teachers to help them use the results of those assessments to guide instruction and to determine modifications for specific students or groups of students.
 | The Twig Science entry-level assessments are called Pre-Explorations. Guidance is provided for teachers on how use the results of the Pre-Explorations to tailor their instruction and track student progression. Near the start of each module, and at appropriate points throughout the Module (usually at the start of a Driving Question), students complete a Pre-Exploration in their Twig Book. The Pre-Exploration elicits misconceptions, preconceptions and prior knowledge of the module standards.Teachers are provided with a Pre-Exploration Tracker to record the results. The tracker is also used to assess students’ growing mastery of the module standards and concepts. Teachers are informed where the pre- and misconceptions are addressed in subsequent lessons, and during those lessons are prompted and supported on how to address those pre- and misconceptions if they continue to exist. *Examples*:**Grade 4 Module 4 Earthquake Engineering*** Earthquake Patterns Pre-Exploration is completed in DQ1, L5
* It is referred to and student progress is tracked in DQ2 L1 DQ2 L2 DQ2 L3, DQ2 L4

**Grade 1 Module 3****Shadow Town*** Shadows Pre-Exploration is completed in DQ1 L1
* It is referred to and student progress is tracked in DQ1 L2, DQ1 L3 (DQ1 L4 DQ1 L5 (DQ1 L6 (DQ1 L7, DQ1 L8 DQ1 L9
 |  |  |  |
| 1. Teacher materials provide support to engage students in tasks that afford both learning and formative assessment opportunities at the same time and provide guidance to teachers on how to embed formative assessment activities in the broader learning activity.
 | Twig Science offers frequent and varied opportunities for teachers to engage students in formative assessment activities. We define formative assessment as: “*any evidence about student achievement is used by teachers and learners to decide on next steps in instruction that would be better than the decision made without this information.”*Whether students are engaged in a hands-on lab, recording and analyzing data or interrogating an informational text, they note their observations, their reasoning, and their results in their Twig Book and share their thoughts with the class and their teacher during the Report part of each lesson. Both the Twig Book and the Report allow students to demonstrate evidence of achievement in many forms, for example:1. Graphic organizers
2. Verbal replies to Turn and Talk routines
3. Diagrams
4. Draw/writes
5. Multiple-choice quizzes
6. Cause and effect tables
7. KLEW charts
8. Read-responses
9. Final statements from Stronger and Clearer routines
10. Posters that summarize a process (e.g., an engineering design)
11. Outcome of reflect task scores
12. Rubrics for students to assess their own progress
13. Benchmark Assessments

Teachers may use the evidence of student learning to amend their approach for individuals or the whole class as appropriate. There is specific guidance for misconceptions that teachers may encounter. **Grade 4 Module 2** **Sparks Energy, Inc.**Benchmark Assessment: Nuclear EnergyDQ3 and online)**Grade 2 Module 3****Save The Island**DQ3, L2, Formative Assessment  |  |  |  |
| 1. Brief formative assessment tools and practices at key stages in the unit of instruction are designed to elicit current understandings and preconceptions and to provide evidence of students’ progress toward mastering the three-dimensional learning called for in the CA NGSS and the *CA Science Framework*. In addition to providing formative assessment tools, instructional materials must also provide teachers with strategies of how to address preconceptions during instruction. These strategies are to be differentiated for different age levels.
 | Regular and brief formative assessments are built into the structure of every module. Throughout the lessons, suggested questions, as well as typical student responses, are provided to help teachers continuously assess students’ understanding. The Reflectsection at the end of each lesson gives teachers and students the opportunity to assess their growing understanding of the standards, the Driving Questions and the Module Phenomenon.  The Pre-Explorations embedded at key stages of the module are a formative assessment tool that provides evidence of student progress on the CA NGSS. Strategies are also provided on how to address the pre- and misconceptions. These strategies are differentiated for different age levels.*Example:***Grade 4 Module 5****Super Survivors**DQ1, L1  |  |  |  |
| 1. Assessments should yield information teachers can use in planning and modifying instruction to help all students meet or exceed the standards.
 | All of the assessment strategies in Twig Science yield data that teachers can use to modify instruction to improve student performance.The rubrics provided for Performance Tasks and Benchmark Assessments suggest evidence that teachers should ‘look for’ in student work to help them assess whether the student is at an emerging, developing, proficient, or advanced stage of meeting the relevant standards. *Examples*:**Grade 4 Module 4 Earthquake Engineering**Benchmark Assessment: Analyzing Maps Rubrics: DQ2 (**Grade K Module 4** **I Can**DQ5, L4 (TE 232-235) Reduce, Reuse, or Recycle Rubric: <https://review.twigscience.com/asset/perma1567>**Grade 6 Module 3****The Red List**DQ4, L3-5 World Conservation Symposium Rubric:<https://review.twigscience.com/asset/perma1595>The following activity types are embedded in lessons of all grades and are designed to yield assessment information:1. Graphic organizers
2. Verbal replies to Turn and Talk routines
3. Diagrams
4. Draw/writes
5. Multiple-choice quizzes
6. Cause and effect tables
7. KLEW charts
8. Read-responses
9. Final statements from Stronger and Clearer routines
10. Posters that summarize a process (e.g., an engineering design)
11. Outcome of reflect task scores
12. Checklists/Rubrics for students to assess their own progress
 |  |  |  |
| 1. Teacher resources supply a differentiated path for diverse students to build toward the PEs of the CA NGSS. In particular, formative assessment tasks are designed to support teachers in collecting and analyzing data about student conceptual understanding.
 | Teachers are supported to supply a differentiated path for diverse students to build towards the PEs. Extra scaffolding is provided at the point of use in the TE for students that need extra support, with a particular focus on ELs and Students with Disabilities (Special Needs). GATE students can be stretched by the Challenges. The NGSS-aligned Leveled Readers that accompany each Module provide another path for scaffolding, reinforcement and extension. Another set of resources that offer review and differentiation opportunities is available at [www.twigsciencetools.com](http://www.twigsciencetools.com), which is searchable by NGSS standard.Both the Pre-Explorations and the Performance Tasks in each module support teachers in collecting and analyzing data about student conceptual understanding. |  |  |  |
| 1. Summative assessments designed to provide valid, reliable and fair measures of students' progress and attainment of three-dimensional learning after a period of instruction (for example at the end of a chapter, unit, or course) should involve multi-component tasks including, but not limited to: hands-on or simulation-based performance tasks, open-ended constructed response problems, and scoring of portfolios of student work collected over the course of instruction. Selected-response items, if used, should require analysis and reasoning to answer them, rather than simply memorized responses.
 | The three-dimensional Performance Tasks in every module have been designed to allow students to demonstrate their attainment of knowledge and skills after a period of instruction. They are multimodal in approach and include hands-on and simulation-based tasks, oral and written presentations, and portfolios of student work. *Examples:***Grade 1 Module 4** **Patterns in the Sky**DQ3 L8 **Grade 4 Module 2****Sparks Energy, Inc.**DQ1 L5-L7 The Benchmark Assessments provide another means to summatively assess students’ ability to apply their understanding of the module PEs to a new context.*Examples:***Grade 5 Module 2 Yellowstone: Uncovered**DQ5 (and online) Benchmark Assessment: From Matter to Organisms**Grade 5 Module 3****H2O Response Team** DQ5 (and online) Benchmark Assessment: Water PollutionThe module Multiple-Choice Assessments also summatively assess a broad range of the Module PEs.  |  |  |  |
| 1. Students’ progress toward meeting the three-dimensions of the CA NGSSis assessedthrough both writing and performance tasks. Student written responses are consistent with the grade-level writing and mathematics requirements in the *CA CCSS for ELA/Literacy and the CA CCSSM*.
 | Assessment of student performance is multimodal and includes both writing and performance tasks. The written tasks have been correlated to the grade-level appropriate CA CCSS for ELA and Math. The relevant ELA and Math standards are highlighted on the Lesson Overview page at the start of each lesson.Typical writing tasks include:1. Paraphrase text
2. KLEW charts
3. Claim, evidence reasoning charts
4. Posters
5. Write an argument based on conflicting evidence
6. Construct an explanation for an investigation
7. Communicate an idea through a blog, letter, or article
8. Write scientific questions in response to a stimulus

Typical performance tasks include:1. Role play
2. Designing engineering solutions
3. Benchmark Assessments

*Examples*: **Grade 4 Module 1****Egg Racers**DQ2, L4 ( **Grade 5 Module 4****Galactic Guidebook**DQ2, L4 DQ3, L6 (DQ4, L3  |  |  |  |
| 1. Resources include student work expectations and analytical rubrics for scoring performance tasks and, where possible, examples of student work at each scoring level. Resources include an explanation of the use of rubrics by teachers and students to evaluate the progress of students’ models, projects, writing, and progression toward understanding.
 | Analytical rubrics with student work expectations are provided for both the Performance Tasks and Benchmark Assessments.An explanation of the use of rubrics for both students and teachers is provided at the point of use in the TEs. The rubrics provide clear guidance on how to assess students’ work and gauge their level of understanding. The rubrics are grade-level appropriate and are shared with students from Grade 2.The Benchmark Assessments include ‘Look Fors’ that guide the teacher in finding evidence of attainment of the standards at four different levels: Emerging, Developing, Proficient, Advanced. **Grade 4 Module 3 Time-Traveling Tour Guides**DQ4 Benchmark Assessment:Sculpting Landscapes**Grade 4 Module 2****Sparks Energy, Inc.**DQ3 (Benchmark Assessment: Nuclear Energy |  |  |  |
| 1. Assessment tools include multiple measures of student performance as addressed in the assessment chapter in the *CA Science Framework*, including, but not limited to, engineering design and lab practical tasks; performance-based tasks; open-ended, short answer and essay responses; lab reports; research projects; computational simulations; and oral presentations.
 | Assessment tools include multiple measures of student performance.*Example (Engineering/lab task):***Grade 1 Module 1****Museum of Leafology**DQ3, L4-6 *Examples (Multiple-choice questions with computational simulations)*:**Grade 4 Module 4 Earthquake Engineering**Multiple-Choice Assessment, Section C, Q1.1<https://review.twigscience.com/asset/perma1834>**Grade 5 Module 4****Galactic Guidebook**Multiple-Choice Assessment, Section C, Q1.1<https://review.twigscience.com/asset/perma1844>**Grade 6 Module 4****Cities of the Future**Multiple-Choice Assessment, Section C, Q1.1 and Q1.4<https://review.twigscience.com/asset/perma1852>*Example (Performance Task):***Grade 4 Module 2****Sparks Energy, Inc.**DQ2, L6-9 (*Example (Research Project):***Grade 6 Module 3****The Red List**DQ4, L3-L5 (*Example (Oral Presentation)*:**Grade 4 Module 3 Time-Traveling Tour Guides**DQ3, L4  |  |  |  |
| 1. Assessment tools include guidance on measuring students’ ability to apply information literacy skills when obtaining and evaluating information about science topics.
 | Guidance is given to teachers to assess students’ ability to apply information literacy skills to when obtaining and evaluating information about science topics.*Example:* **Grade 6 Module 1****BioTech Systems Worldwide**DQ1, L13  |  |  |  |

**Category 4: Access and Equity**

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| --- | --- | --- | --- |
| Universal Access | Publisher Citations | Criterion Met? | Reviewer Comments, Citations, and Questions |
|  | Y | N |
| 1. The instructional resources should reflect the goals of access and equity outlined in chapter 10 of the *CA Science Framework.*
 | Access for all is at the heart of Twig Science. The resources and instructional design provide for the specific learning needs of California’s diverse student population at the point of use in each lesson.Selected highlights of the differentiated instruction are also provided at the start of every Driving Question *Example*:**Grade 4 Module 1****Egg Racers:**DQ1 Differentiated Instruction highlights )Differentiated instruction includes Cultural Connections that support teachers to be culturally and linguistically responsive by highlighting possible prior experiences and frames of references for ethnically diverse students. Chapter 10 of the CA Science Framework notes that socially and economically disadvantaged students that actively engage in arts are more likely to succeed in school. A key facet of Twig Science is its multiple connections to History, Social Science and Art. These connections are highlighted in the Time Savers section at the start of every Driving Question.*Examples:***Grade 1 Module 2****Animal Reporters**DQ1 **Grade 3 Module 2****Welcome to the Biodome**DQ1 **Grade 5 Module 1****Matter Mysteries Hotline** DQ1 (Throughout the program students are given opportunities to Create, Respond, Perform, Present and Connect. Positive role models of women, people of color, people with disabilities and people of different sexualities are integrated in the program’s videos, visuals, informational texts, and Leveled Readers. *Examples:* Young students with disabilities feature in the title sequence of the song videos in K & Grade 1, e.g., **Animal Moves Song** video:<https://review.twigscience.com/asset/joq763/>  Disabled scientist Dr. Richard Mankin in Grade 5, Module 2 Leveled Reader: **The Galápagos Islands** (LR 14-18): <https://review.twigscience.com/asset/perma1076> Female engineer in**Snowboard Engineering** video:<https://review.twigscience.com/asset/frb244>Female scientist Dr Young-hye Na in Grade 2, Module 2 Leveled Reader: **What Is It Made Of?** (LR 16-20)<https://review.twigscience.com/asset/perma1071> A selection of resources that focus on positive role models in science and engineering is available online: <https://review.twigscience.com/grade-list/> (see STEM Careers section)<https://review.twigscience.com/asset/perma1957>  |  |  |  |
| 1. At every grade level, suggested lessons and teacher resources will include research-based strategies to address the needs of English learners consistent with the CA ELD Standards.
 | Embedded in the program are research-based language routines developed in partnership with Understanding Language – Stanford Center for Assessment, Learning and Equity (UL–SCALE). For example, the Stronger and Clearer Each Time routine provides a structured and interactive opportunity for students to revise and refine both their ideas and their verbal and written output. We have responded to the suggestions about planned scaffolding (based on Hammond and Gibbons’ research) in the CA ELD Standards, such as: 1. Using a range of information systems, such as diagrams, photographs, and videos, to enhance access to content.*Example:***Grade 4 Module 2****Sparks Energy, Inc.**DQ2, L1 **Solar Power** videoDQ2, L5 **Wind Turbines** video; **Interview with Dr. Anoushka Sivaraman** text (TB)L10 **Hydroelectric Power Station** video 2. Frequently checking for understanding during instruction. *Example:***Grade K Module 1****My Big Nature Adventure** DQ2, L3 L4 L5  *and for vocabulary:*  3. Teaching individual academic words (both general academic and domain-specific)*Example:***Grade K Module 1****My Big Nature Adventure**DQ2, L4  4. Rich and varied language experiences (e.g., wide reading, teacher read-alouds)*Example:***Grade 2 Module 3****Save The Island**DQ1, L3 (**Expanding Islands** Read-Aloud text; **Kilauea** video |  |  |               |
| 1. Instructional resources incorporate instructional strategies to address the needs of students with disabilities in lessons, assessments, and teacher resources, as appropriate, at every grade level.
 | Grade-appropriate instructional strategies for students with disabilities (Special Needs) are provided at the point of use in every lesson, including the assessed performance tasks, in the Teacher Edition.  A highlight of strategies used across each Driving Question is provided in the Differentiated Instruction section in the Teacher Edition.*Example*:**Grade 1 Module 2****Animal Reporters**DQ1  |  |  |  |
| 1. Teacher resources supply a differentiated path for all students. In particular, instructional resources should provide guidance to support students with special needs, including standard English learners, English learners, long term English learners, students living in poverty, foster youth, girls and young women, advanced learners, students with disabilities and students below grade level in science skills, three-dimensional learning, literacy skills, or mathematics skills.
 | Twig Science resources provide a differentiated path for all students, regardless of their background or disabilities. The CA ELD standards have been integrated throughout the program, and specific differentiation for ELs of varying proficiencies (emerging, expanding, bridging,) is noted in the Teacher Edition at the point of use, as well as for SELs.Leveled Readers are provided at four levels: On-Level, Below-Level, Above-Level and English Learners, with accompanying lesson instruction aligned to each level. The instructional design of the videos is especially helpful for students with special needs and below-grade literacy skills. Created by documentary makers, their narratives and high production values captivate disengaged learners, while their images and graphics allow students to visualize abstract concepts. The narration is paired with imagery and on-screen text, reinforcing the key academic vocabulary: students hear the word, read the word, and see a related image, all at the same time.Advanced learners are stretched to reach their full potential through the Challenges found throughout the program, while the 3-D Performance Tasks and Benchmark Assessments allow them to demonstrate their advanced mastery of the PEs. Additional resources aligned to the CA NGSS, to reinforce, scaffold and extend learning are available at [www.twigsciencetools.com](http://www.twigsciencetools.com) |  |  |  |

**Category 5: Instructional Planning and Support**

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| --- | --- | --- | --- |
| Instructional Planning and Support | Publisher Citations | Criterion Met? | Reviewer Comments, Citations, and Questions |
|  | Y | N |
| 1. Program resources include a curriculum guide for the academic instructional year for teachers to follow when planning for 180 days of instruction.
 | A 180-day year planner is provided for each grade:<https://review.twigscience.com/asset/perma1962> |  |  |  |
| 1. The teacher resources provide an estimated instructional time for each activity, lesson, chapter, and unit which allows for student engagement in the SEPs and engineering design projects.
 | The Module Contents on page iii of each TE provides a breakdown of the Lessons and Driving Questions in the Module, while the planning guide on page ix gives an overview of timings at each grade level.The Overview at the start of each Driving Question provides an estimated instructional time for each lesson in the DQ. *Example*:**Grade 4 Module 4 Earthquake Engineering**Every Lesson includes an estimated instructional time for each activity.*Example:***Grade 4 Module 4 Earthquake Engineering**DQ1, Lesson 1  |  |  |  |
| 1. The teacher resources provide guidance in daily lessons and units of instruction with appropriate opportunities for checking for understanding and adjusting lessons, if necessary, to ensure three-dimensional learning.
 | Twig Science Modules are made up of daily Lessons.Each Lesson is made up of five sections: Spark, Investigate, Report, Connect, Reflect.During the Report section, students share their learning, giving teachers the opportunity to check for understanding. During the Connect section, teachers can correct misunderstandings and tailor their teaching to ensure student learning is aligned to the module DCIs, SEPs, and CCCs.During the Reflect section,students reflect on and demonstrate, their understanding of the lesson and Driving Question objectives, allowing teachers to assess student progression and attainment.  |  |  |  |
| 1. Program resources address the articulation of three-dimensional learning by identifying the knowledge and skills learned in prior grades and prior grade-level units, and address how to connect and build on these learnings to help students develop increasingly sophisticated ideas.
 | The CA NGSS Framework Alignment table in the front cover of each TE is a top-level overview of how the PEs progress across the K–6 program and within each grade.A more detailed look at how the DCIs, SEPs and CCCs spiral within a grade is provided in the Grade Scope and Sequence (also in the TE front cover). Inside the back cover of each TE, the Performance Expectations Progressions focuses on the module PEs, clearly identifying the knowledge and skills learned in prior grades, and addressing how these are built on in the current module to help students develop understanding of increasingly complex concepts and ideas. This information is also available online:<https://review.twigscience.com/asset/perma1961/> |  |  |  |
| 1. Teacher resources provide background knowledge about the SEPS, DCIs, and CCCs and discuss the desired level of SEPs in which students will engage, including how the three dimensions are integrated into units and lessons.
 | Subject background knowledge is provided online for every Driving Question in the program.*Examples:***Grade 1 Module 1****Museum of Leafology** <https://review.twigscience.com/asset/perma1794/>**Grade 4 Module 4 Earthquake Engineering**<https://review.twigscience.com/asset/perma1809> **Grade 6 Module 1****BioTech Systems Worldwide**<https://review.twigscience.com/asset/perma1815/>Background knowledge is provided for each SEP and CCC with support to help teachers understand what the desired level of student attainment is for each grade span:<https://review.twigscience.com/asset/perma1958> Throughout the program, teachers are supported at point of use in the TE to understand how the SEPs, CCCs and DCIs are integrated into each module, DQ and lesson.The Science Tools Poster that the class creates and adds to over the year empowers students to “own” the SEPs. They progress from being able to each identify each SEP, to applying it, and finally to choosing which SEP is the most appropriate for a task. *Examples:***Grade 4 Module 1****Egg Racers**Science Tools poster references **Grade 4 Module 5****Super Survivors** Science Tools poster references  |  |  |  |
| 1. All suggested student tasks, including classroom activities, end-of chapter tasks, suggested out-of-school activities, and assessment tasks are supported with guidance for the teacher on how to implement and, where appropriate, grade the task. Assessment keys and rubrics are provided.
 | Guidance for how to implement and, where appropriate, grade student tasks is included at point of use in the TE. Rubrics are provided for Performance Tasks and Benchmark Assessments. |  |  |  |
| 1. Teacher and student resources have correlating page numbers in print resources or corresponding references in electronic resources.
 | The Teacher Editions contain images of the relevant pages of the student edition (Twig Book), with correlating page numbers.  |  |  |  |
| 1. Teacher resources include a planning guide describing the relationships between the components of the program and how to use all the components to meet all of the CA NGSS.
 | The Program Overview (online and in the front matter of every TE) details how the different components of Twig Science combine to meet all of the CA NGSS.Program Overview: <https://review.twigscience.com/asset/perma1959/> |  |  |  |
| 1. Instructional objectives for three-dimensional learning are explicitly stated and clearly identifiable in the teacher resources. Teacher resources include guidance on explaining these objectives to parents.
 | The NGSS standards relevant to each lesson, together with the three-dimensional objectives for the lesson, are clearly stated at the start of the lesson. *Example:***Grade 2 Module 2****Master of Materials**DQ3, L1 L2 ), L3 Family Outreach letters outlining the 3-D learning are provided at the start of each Driving Question throughout the module. They are available for teachers to download, modify (if desired), and send home to families.*Example:***Grade 2 Module 2****Master of Materials**<https://review.twigscience.com/asset/docx-047/><https://review.twigscience.com/asset/docx-048/><https://review.twigscience.com/asset/docx-049/><https://review.twigscience.com/asset/docx-050/><https://review.twigscience.com/asset/docx-051/> |  |  |  |
| 1. While learning goals may be explicitly stated in the teacher materials, student resources will provide experiences that clearly build to the development of those learning goals without explicitly stating those goals prior to the instruction. In most cases, prior to instruction, introduce a phenomenon or guiding question or the end result of the lesson series.
 | Each Twig Science module is aligned to a Module Phenomenon that the students make sense of as their skills and knowledge build throughout the period of instruction. Driving Questions within each Module scaffold the learning journey. Both the Module Phenomenon and the Driving Questions are shared with the students at the start of each period of instruction and are connected back to appropriate opportunities. The learning objectives for each lesson are stated explicitly in the TE, but are not shared with the students in the Twig Book.  |  |  |  |
| 1. Lessons include instructional strategies aligned to the CA NGSS, the *CA Science Framework* and based on current and confirmed research (e.g., teacher facilitated student-led conversations, as well as hands-on activities and laboratories). Resources are clearly connected to and support the goals of the CA CCSSM and CCSS for ELA/Literacy.
 | Twig Science modules are designed to help students experience science by supporting them to make sense of phenomena, and use evidence to support their reasoning as it develops—within modules, within grades, and across grade levels. There is a direct correlation between the program modules and the CA Science Framework segments that bundle the CA NGSS Performance Expectations. Reflecting the full content of the CA NGSS, the program supports daily opportunities based on current and confirmed research for students to implement the SEPs, CCCs and DCIs and engage in three-dimensional learning. Activities include teacher-guided discourse, multisensory hands-on and digital investigations and the interrogation of informational texts.There are daily opportunities to connect to and support the goals of the CA CCSSM and CCSS for ELA/Literacy. The relevant ELA and Math standards for each lesson are clearly identified in the standards section on the lesson overview page. Connections to ELA and Math are also highlighted at Driving Question level in the Time Savers section.*Examples:***Grade 4 Module 4 Earthquake Engineering**DQ1 Time Savers section (Lesson Overview pages Twig Science meets the CA instructional strategies in the following ways:*1. Depth of Knowledge framework*Questions in the TE are designed with the Depth of Knowledge framework in mind (with higher level questioning towards the end of a module). All Multiple-Choice and Benchmark Assessments are marked with DoK levels. *Example:* **Grade 3 Module 2Welcome to the Biodome**Benchmark Assessment: Life Cycles and TraitsMultiple-Choice Assessment:<https://review.twigscience.com/asset/perma1853/>*2. 5 Es model*Twig Science makes use of the 5 Es model first developed by Roger Bybee. Each Driving Question cycles through the 5 Es. This is visible in the Driving Question Overview in the TE. Individual lessons are also marked with the E they relate to.*Example:***Grade 4 Module 4 Earthquake Engineering**DQ1 Overview *3. Problem-based learning* In problem-based learning, students work either individually or in cooperative groups to solve challenging problems with real-world applications. The “Engineering Design Challenges” in modules across all grades provide students with opportunities to do this.*Examples:* **Grade 6 Module 1****BioTech Systems Worldwide**DQ4, L1-L5 (Key resources: **Bioengineering Project** video and **Advanced Prosthetic Arm: Design Requirements** video*5. Teacher Questioning Strategies: Promoting Science Talk*Twig Science uses the research-based UL‒SCALE Language Routines to encourage science talk. All lessons include prompts to encourage questioning and possible answers to help the teacher encourage productive and meaningful scientific discussion in their class.Teacher guidance on the language routines is available online:<https://review.twigscience.com/asset/perma1963> *6. Science notebooks*The Twig Book is the scaffolded science notebook for Twig Science and includes graphic organizers, nonfiction text to analyze, and plenty of room for students to record their ideas, either on their own or collaboratively.*7. Engineering Design Cycle*The Engineering Design Challenges in various modules at all grade levels provide students with opportunities to work through the Engineering Design Cycle. Teachers are supported to build students’ meta-awareness of this process in grade-appropriate ways.*Examples:***Grade 2 Module 2****Master of Materials**DQ5, L5-L9 **Grade 6 Module 2****Destination Everywhere!**DQ3, L1-L9 Key resource: **Design Cycle** visual <https://review.twigscience.com/asset/visual-373/> |  |  |  |
| 1. Instructional resources should include a list of consumable and non-consumable equipment and materials required for each lesson and address safety issues included in the *Science Safety Handbook for California Public Schools* (CDE 2014).
 | The list of consumable and non-consumable equipment and materials required for each lesson is clearly identified in the Resources section at the start of each lesson. Safety issues noted in the *Science Safety Handbook for California Public Schools* (CDE 2014) are addressed at the point of use in the lesson instructions *Examples*:**Grade 4 Module 1 Egg Racers** Examples of Safety notes: In addition, grade-appropriate **Classroom Safety handouts** that align to the *Science Safety Handbook for California Public Schools* (CDE 2014) are provided online and referenced at the appropriate time during instruction.See the Teaching and Research Aids document online:<https://review.twigscience.com/asset/perma1965>Students engage with Classroom Safety handouts in depth during the Teamwork-Mini Modules at the start of grades 2 to 6, and age-appropriate safety instruction is built into the early lessons of grades K and 1.*Examples*:**Grade 4 Module 1** **Teamwork Mini-Module: Catapult Challenge** L2 (**Grade K Module 1****My Big Nature Adventure**DQ1, L4 ( |  |  |  |
| 1. Terms from the CA NGSS and *CA Science Framework* are used appropriately and accurately in the instructions.
 | The program authors have taken great care to use terms from the CA NGSS and *CA Science Framework* appropriately and accurately. |  |  |  |
| 1. Electronic learning resources, including technology-based assessments, support instruction that is connected explicitly to the CA NGSS, have a well-designed user interface, provide technical support, and include suggestions for appropriate and differentiated use.
 | The electronic learning resources within Twig Science are connected explicitly to the CA NGSS and have a well-designed user interface. Resources are clearly organized by Grade, Module, Driving Question and Lesson.Instructions in the TE support teachers in the appropriate and differentiated use of digital resources. *Examples:***Grade 2 Module 4****A Garden for Life**DQ1 **Habitat Explorer Field Guide** interactive:<https://review.twigscience.com/asset/ski989/>**Grade 4 Module 4 Earthquake Engineers**DQ1 **Making Waves** interactive<https://review.twigscience.com/asset/vyx447/>**Grade 5 Module 3****H2O Response Team**DQ5 **Water Savers** interactive<https://review.twigscience.com/asset/uqd543/>Technical support is available online and at the Toll-free number:+1 888 881 4977 |  |  |  |
| 1. The teacher resources provide background information about important events, diverse people, places, ideas, and scientific principles appearing in, but not limited to the CA NGSSand *CA Science Framework*.
 | The Teacher Edition provides background information about important events, diverse people, places, ideas, and scientific principles appearing in, but not limited to the CA NGSSand CAScience Framework. This information can be found at point of use in the Cultural Connection sections, in the Read-Aloud texts, and in the Leveled Readers. The subject background knowledge provided online to support teachers’ professional learning also contains pointers to such information. Further information can be found online in the digital STEM Careers section at <https://review.twigscience.com/grade-list/>, at [www.twigsciencetools.com](http://www.twigsciencetools.com), and at [www.twigsciencereporter.com](http://www.twigsciencereporter.com) *Examples:***Grade 4 Module 4 Earthquake Engineering**Factboards with ‘Earthquake facts of the day’ **Earthquakes, Tsunamis, and Volcanoes** Prior-Knowledge Read-Aloud text:<https://review.twigscience.com/asset/uko344/>Background subject knowledge:<https://review.twigscience.com/asset/perma1809/>**Twig Science Tools**What Killed the Dinosaurs? <https://www.twigsciencetools.com/video/what-killed-the-dinosaurs-VVNFTlBSTTAwNjE3>Human Ancestors<https://www.twigsciencetools.com/video/where-did-humans-come-from-VVNFTlRUSjAwMDk4>**Twig Science Reporter**Angkor Wat <https://www.twigsciencereporter.com/feature/angkor-wat-engineers-of-the-past/>Stephen Hawking<https://www.twigsciencereporter.com/article/stephen-hawking/>  |  |  |  |
| 1. Teacher resources discuss and identify preconceptions typical at a grade span (such as inaccurate explanations based on everyday experiences or vernacular conflicts between the everyday use of a term and the meaning of the term in a scientific context) and provide guidance to help students build more accurate understandings of the scientific concept or process.
 | The Prior-Knowledge Read Aloud text provided for each Module and the Pre-Explorations embedded throughout all content-based Driving Questions support teachers to discuss and identify typical grade-level preconceptions.During the Report section of Lessons throughout the program, there are opportunities for teachers to identify preconceptions.Support to identify and address vernacular conflicts between the everyday use of a term and the meaning of the term in a scientific context is provided at point of use in the lesson instructions. The Collect and Display language routine and the use of the academic word wall are the tools that help teachers to do this.*Example:*The word ‘table’ in**Grade K Module 3****Be Prepared** DQ3, L5  |  |  |  |
| 1. Suggested homework, if included, extends and reinforces classroom instruction. Homework should also provide opportunities to support student learning through shared experiences with family. Opportunities may include projects, journaling, reflection, or interviews with parents around a concept or activity such as family history used in genetics, decomposition in gardening, or chemistry in cooking.
 | Opportunities to extend learning at home are included at appropriate points in the program. Family Outreach letters that support a shared learning experience are available to send home to families/carers. *Examples:* **Grade 4 Module 4 Earthquake Engineering**Family Outreach for DQ2:<https://review.twigscience.com/asset/docx-097/> Family Outreach for DQ3:<https://review.twigscience.com/asset/docx-098/> Family Outreach for DQ6:<https://review.twigscience.com/asset/docx-101>and<https://review.twigscience.com/asset/perma1292> |  |  |  |
| 1. The program should include resources that teachers can use to inform families about the CA NGSS and student progress.
 | Family Outreach letters provided at the start of each module and throughout the module support teachers to inform families about what their children are investigating in each module, along with opportunities to monitor student progress.*Examples:***Grade 4 Module 1****Egg Racers**<https://review.twigscience.com/asset/docx-096/>**Grade 5 Module 1****Matter Mysteries Hotline**<https://review.twigscience.com/asset/docx-108/>Students are encouraged to share their Twig Books with their families. The “I can…” statements in the Twig Book help students and families stay informed about student progression.*Examples:***Grade 4 Module 4 Earthquake Engineering****Grade K Module 1** **My Big Nature Adventure** |  |  |  |
| 1. Resources provide teachers with instructions on how outside resources (e.g., guest speakers; museum visits; electronic field trips, informal science education providers including state parks, nature parks, science centers, local organizations, school gardens or schoolyard open spaces, local parks, etc.) can be incorporated into a three-dimensional learning, standards-based science program.
 | Twig Science provides teachers with instructions on how relevant outside resources can be incorporated into the program. These are included at the point of use in the lesson instructions.*Example:***Grade 1 Module 1****Museum of Leafology**DQ1, L3  |  |  |  |
| 1. Using guidance from the Model School Library Standards for California Public Schools, resources provide information for teachers on the effective use of library and media resources that best complement the standards.
 | Information for teachers on the effective use of library and media resources that best complement the standards is provided at the point of use within the instructional materials. *Example:***Grade 6 Module 3****The Red List**DQ1, L1 (In addition, a summary document on the effective use of library and media resources that best complement the standards and Twig Science is provided online. This guidance is aligned to the Model School Library Standards for California Public Schools. See Guide to Classroom and Language Routines (16-22)<https://review.twigscience.com/asset/perma1963>  |  |  |  |
| 1. The teacher resources provide guidance and support for engaging students in collaborative conversations using grade level appropriate academic vocabulary for scientific discourse.
 | Guidance and support for collaborative discussion is embedded at the point of use throughout the program.In addition, the Twig Science Language Routines have been designed specifically to cultivate conversation**.** They highlight opportunities for and support constructive conversations (in pairs, groups, and the whole class), that build up ideas about science and engineering using grade-level vocabulary. For example, the Collect and Display routine captures students’ oral language into a collective reference point. Throughout the module, teachers reference the displayed language as a model, update the display as student language changes, and bridge between student language and new academic language.The Meta-Think-Aloud routine helps students make sense of complex language, allowing them to engage more deeply in discussions.The Stronger and Clearer Each Time routine provides a structured and interactive opportunity for students to revise and refine both their ideas and their verbal and written output.Background information on all the language routines is provided online—see Guide to Classroom and Language Routines (7-15)<https://review.twigscience.com/asset/perma1963> *Examples:***Grade 4 Module 4 Earthquake Engineering**Language routines embedded in DQ1 ( |  |  |  |

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