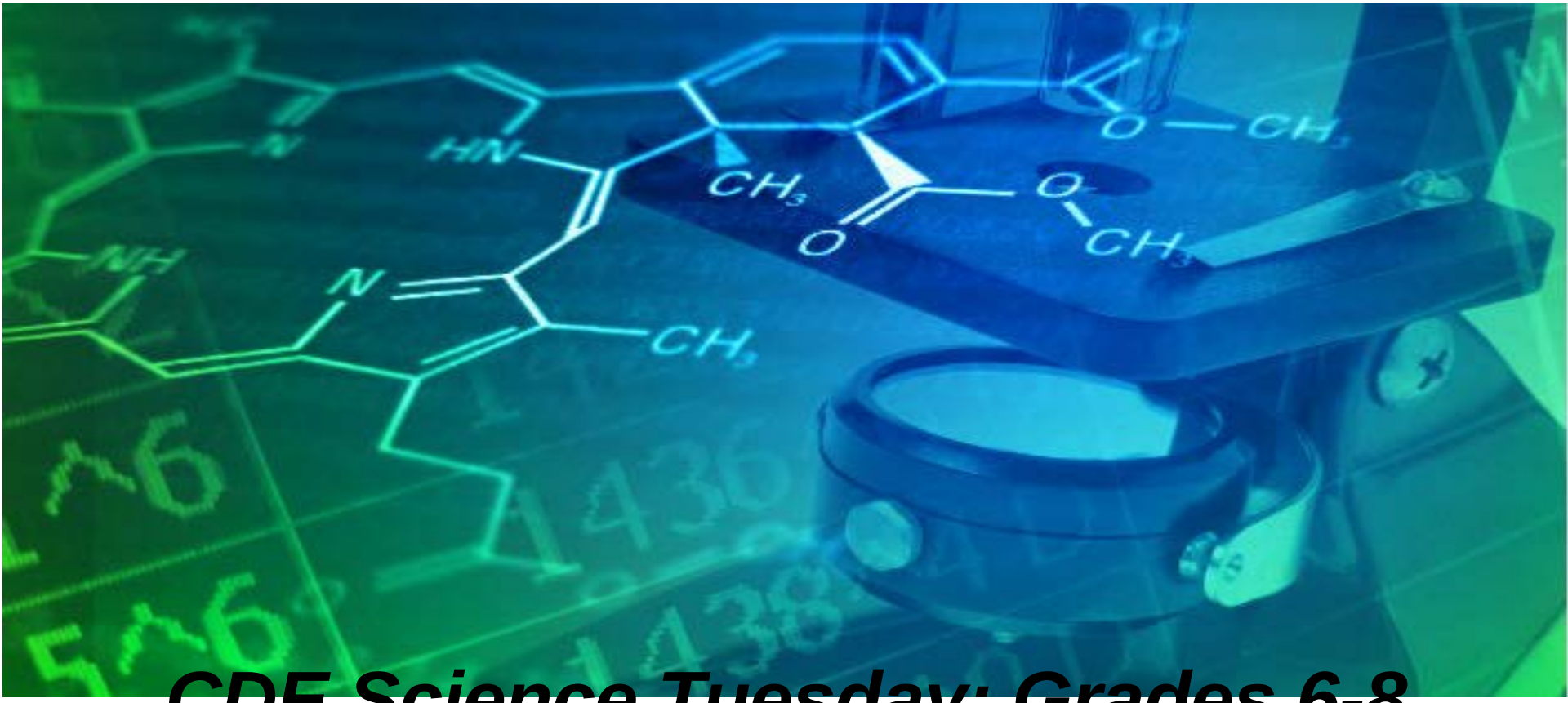

CDE Science Tuesday: Grades 6-8

Publisher Briefing Webinar
August 15, 2017

TOM TORLAKSON
State Superintendent
Of Public Instruction

Welcome

Please note that within this Web-posted presentation we have replaced a number of slides from the original live presentation with simple text in order to meet accessibility requirements.

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Welcome

California Department of Education (CDE) staff presenters:

Bryan D. Boyd , Education Programs Consultant

David Almquist, CDE Publisher Liaison, Instructional Resources Unit

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California's 2018 Science Instructional Materials Adoption

- Kindergarten through Grade Eight Instructional
- Programs All the info: http://www.cde.ca.gov/ci/sc/im/
- Including:
- Schedule of Events
- Notices
- Frequently Asked Questions
- Prior Webinars
- Evaluation Criteria
- CA Science Framework

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The Bedrock of the California Next Generation Science Standards

- Phenomena
- Three Dimensions
- Performance Expectations and Instructional Segments

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What is Phenomena?

- Anchoring phenomena
- Investigative phenomena
- Everyday phenomena
- Everyday problem (engineering)

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Three Dimensional Learning

- **Science and Engineering Practices (SEPs)**
- **Disciplinary Core Ideas (DCIs)**
- **Crosscutting Concepts (CCCs)**

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Middle School Vs. Middle Grades

Brian: “As a Middle School science teacher for 14 years, I had a hard time transitioning to the term “Middle grades” instead of using the term “Middle School”. However, the performance expectations are labeled MS for middle school because in California we have schools that are Kindergarten through grade six, 6-8, K-6, 7-8, and other combinations. Therefore during the development of the middle grades progressions, the educators and stakeholders came to refer to grades 6, 7, and 8 as the “Middle Grades.”

Throughout this presentation I will say middle grades and that is referencing grades 6, 7, and 8.”

Two Pathways for the Middle Grades

Category 1: Alignment with the CA NGSS Three-Dimensional Learning

All programs must include the following features:

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……"

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Grades 6–8 Standards

Preferred Integrated Course Model

http://www.cde.ca.gov/pd/ca/sc/documents/msintcourseovrw15.doc

Discipline Specific Course Model

http://www.cde.ca.gov/pd/ca/sc/documents/msaltdcicrsovrw15.doc

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Let's Begin with the....

Preferred Integrated Course Model

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Building Your Program

"I am planning on submitting both course models. May I take content from my Discipline Specific Course Program and use it for my Integrated Course Model?"

In most case you will not be able to due to:

1. Reading level

2. Math Concepts that need to be taught

3. The different course models state which PE must be taught at certain grade levels.

4. Phenomena is the driving factor and that content may not match your overall phenomenon your students are exploring.

Most importantly keep the background knowledge and scope and sequence at the forefront when you are building your programs.

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Preferred Integrated Course Model

Chapter 5 of the California Science Framework covers the Preferred Integrated Course Model.

http://www.cde.ca.gov/ci/sc/cf/scifwprepubversion.asp

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This example year is not integrated!

6th Grade Integrated Year

If you bundle all of your ESS in one unit, and LS in one Unit, and ETS in one Unit, and then PS in one unit—you have not created an integrated program.

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Here an in example of integration!

Try to develop lessons that have at least two of the domains present. The year plan should have all domains taught through out the year.

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Arrangement for Articulation

Grade	Cross cutting concepts	Life	Earth and Space	Physical	Engineering
Eighth	Stability and change; scale, proportion and quantity	Natural Selection	History of the Earth Space systems	Waves and Electro-magnetic radiation Energy Forces and Interactions	ETS
Seventh	Energy and Matter: flows, cycles, and conservation; cause and effect	Ecosystems	Natural resources	Structure and property of matter	ETS
Sixth	Patterns; structure and function; systems and system models	Cells and Organisms	Weather and climate	Energy	ETS
Fifth	Energy and Matter: flows, cycles and conservation; Scale, proportion and quantity	Matter cycles through living and non living things	Earth in space, interactions of earth systems	Properties and structure of matter	ETS

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Instructional Segments

The performance expectations are bundled into instructional segments with the crosscutting concepts as the main thread that runs from one instructional segment to the next.

In grade 3-5, there are Instructional Segment tables that provide an overview of relevant performance expectations and topics that will be covered and then developed more under each instructional segment. This is only one way to organize the grade level Performance Expectations.

The intention of the instructional segments is to provide instructional support, suggestions, and possible models for the grade-level teachers; they can also help teachers make connections to the grade below or above.

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Grade 6 Preferred Integrated Course Model

Instructional Segments

1: Systems and Subsystems in Earth and Life Sciences

2: Earth System Interactions Cause Weather

3: Causes and Effects of Regional Climates

4: Effects of Global Warming on Living Systems

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Grade 7 Preferred Integrated Course Model

Instructional Segments

1: Organisms and Nonliving Things are Made of Atoms

2: Matter Cycles and Flows through Organisms and Rocks

3: Natural Processes and Human Activities Shape Earth's Resources and Ecosystems

4: Sustaining Biodiversity and Ecosystem Services in a hanging World

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Grade 8 Preferred Integrated Course Model

Instructional Segments

1: Objects Move and Collide

2: Noncontact Forces Influence Phenomena

3: Evolution Explains Life's Unity and Diversity

4: Sustaining Local and Global Biodiversity

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Evaluation Criteria Category 1, Criterion 12

Student assignments make linkages and are consistent with the grade-level appropriate expectations in the CA CCSS for ELA and Literacy in History/Social Studies, Science, and Technical Subjects (CA CCSS for ELA/Literacy), the CA ELD Standards, and CA CCSS Mathematics (CA CCSSM) and are consistent with the guidance in the CA Science Framework.

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Grade 6 - Phenomena

Weather phenomena naturally integrate all disciplines of science and engineering. Different parts of California experience dramatically different weather. This is a great way to connect students with everyday life.

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Grade 7 - Phenomena

"What are things in the world made out of?"

"Why things are located where they are, including organisms within an ecosystem and resources and hazards on the planet?"

"What natural processes and human activities threaten biodiversity and ecosystem services?"

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Grade 8 - Phenomena

Integrated Grade Eight begins with a year-long mystery on planet Earth about what causes the mass extinctions and species diversification events that happen repeatedly in Earth's history. At first, this phenomenon does not appear to match the title of the instructional segment, but understanding this phenomenon requires that students understand many different aspects of science, including the physics of impacts and collisions.

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Preferred Integrated Course Model- Crosscutting Concepts

Crosscutting Concepts		
Grade 6	**Grade 7**	**Grade 8**
CCC-1 Patterns	**CCC-2 Cause and Effect**	**CCC-3 Scale, Proportion and Quantity**
CCC-4 Systems and System Models	**CCC-5 Energy and Matter**	
CCC-6 Structure and Function		**CCC-7 Stability and Change**

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Connections to the Environmental Principles and Concepts

The Environmental Principles and Concepts and human impact can be addressed across disciplines and across grade levels. Embedded in the Earth and Space Science PEs is a relation to human impact. In sixth grade, a PE asks students to apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. This links nicely with the concepts of weather and climate. In seventh grade, a PE highlights natural hazards. This provides the opportunity to investigate earthquakes in connection with plate tectonics. In eighth grade, a PE challenges students to think deeply about the consequences of human population growth and resource consumption. The PEs related to human impact allow students to understand how humans can impact natural systems and change patterns.

Engineering Connection
Grade 6 - Integrated Course Model

Engineering Connection: Systems Models of Organ and Tissue Donation

Teaching about organ and tissue donation provides opportunities to connect learning about body **systems [CCC-4]** with a socially beneficial topic that also has strong connections with engineering and technology. Donate Life California has an informative website that includes educator resources, notably an Interactive Body Tour

(see Donate Life California at http://www.donatelifecalifornia.org/education/how-donation-works).

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Engineering Connection
Grade 7 - Integrated Course Model

Engineering Challenge: Engineer a Bird Beak

In elementary school, students constructed arguments about internal and external structures of organisms that help them survive (4-LS1-1). In this activity, they engineer structures and use their own designs to make inferences about how the internal and external structures of an animal connect and interact. Different animals eat different types of food, and their bodies must have the correct structures [CCC-6] to enable them to eat that food effectively. Birds in particular have large variation in their beak shapes based upon their food source. Students can design a “beak” from a fixed set of materials that will allow them to “eat” as much “food” as possible (for an example, see Curiosity Machine, Engineer a bird beak at https://www.curiositymachine.org/challenges/4/).

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Engineering Connection
Grade 8 - Integrated Course Model

Engineering Connection: Collisions

MS-PS2-1 provides a capstone goal for IS1. Students design a solution [SEP-6] to a problem involving the motion of two colliding objects. The clarification statement for the PE offers examples of collisions between two cars, between a car and a stationary object, or between a meteor and a space vehicle. In order for this challenge to extend deeper into the design process, the suggestion here is to restrict the projects to situations that students can physically model and obtain data that can be used in iterative testing and refinement of their design solution.

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Grade 6 – Math Connections

Global average temperature rises as humans emit more greenhouse gases. This rate of emission depends on two key variables: population growth, and energy consumed per person. Students must construct an argument from evidence [SEP-7] that connects these population and energy use ideas to a significant impact on Earth's systems (MS-ESS3-4).

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Grade 6 – ELA/ELD Connections

To help data come alive and help students compile it for particular audience, have them obtain information [SEP-8] about the effect [CCC-2] temperature changes [CCC-7] have on sea level, glaciers, or storm intensity.

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Grade 7 – ELA/ELD Connections

As a concluding activity, students create a set of true/false text cards with statements that summarize participle interactions that happen under different conditions and the resulting macroscopic properties of solids, liquids and gases. Working in groups, students exchange the cards with other students so they can use what they have learned about states of water (see Table 5.7 Comparing Solids, Liquids, and Gases) to discuss the statements on the cards about whether the behavior of different substances (such as helium, nitrogen, copper) are true or false using evidence about the atomic/molecular composition of matter.

CA CCSS ELA/Literacy Standards: RST.6–8.2; SL.6–8.1

CA ELD Standards: ELD.PI.6–8.3

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Grade 8 – ELA/ELD Connections

Have students create a visual and explain, using evidence and scientific principles, how an object influences the motion of another object without touching it. Ask students to list the scientific terms they will be using. As students present, coach and encourage them to use all the listed terms correctly.
CA CCSS ELA/Literacy Standards: WHST.6–8.7; SL.6–8.4, 5; L.6–8.6
CA ELD Standards: ELD.PI.6–8.9

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Integrated Grade 8 Vignette Student Capstone Projects

I also wanted to highlight the capstone project for grade eight. By the end of grade eight, students can approach new phenomena, recognize how different parts of the Earth system are interacting in the situation, draw on DCIs from all disciplines of science and engineering to explain the mechanisms driving these interactions, and design solutions to problems that they identify and constrain. This capstone project puts them to work at using all their understanding from grades K–8.

It would be nice if your materials provided capstone projects.

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Revisiting Performance Expectations

It is sometimes appropriate to revisit a PE later in the course sequence. In other words some of the PEs will be partially addressed at one point and then come back to be fully addressed at another point.

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Let’s move on to the…

Discipline Specific Course

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Building Your Program

Grade 6: Earth and Space Science

Grade 7: Life Science

Grade 8: Physical Science

Grades 6–8: Engineering, Technology and Application of Science

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Discipline Specific Course Model

Chapter 6 of the California Science Framework covers the Preferred Integrated Course Model.

https://www.cde.ca.gov/ci/sc/cf/cascienceframework2016.asp

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Instructional Segments

Instructional Segments: The next three slides are examples of how you could possible organize your performance expectations at each grade level.

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Grade 6 - Discipline Specific Course Model

Instructional Segments

1: Earth's Place in the Solar System
2: Atmosphere: Flows of Energy
3: Atmosphere/Hydrosphere: Cycles of Matter
4: Geosphere: Surface Processes
5: Geosphere: Internal Processes

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Grade 7 - Discipline Specific Course Model

Instructional Segments

1: Interdependent Ecosystems

2: Photosynthesis & Respiration

3: Cells and Body Systems

4: Evidence of Evolution

5: Inheritance and Genetics

6: Natural Selection

7: Ecosystem Interactions, Revisited

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Grade 8 - Discipline Specific Course Model

Instructional Segments

1: Energy of Motion

2: Gravity, Energy Related to Position

3: Electric and Magnetic Interactions and Energy

4: Waves Transmitting Energy and Information

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Grade 6 - Phenomena

Discipline Specific Grade Six Vignette 6.1: Using Models of Space Systems to Describe and Explain Patterns of Moon's Phases

Anchoring Phenomenon: Students look up at the Moon and wonder, 'How big is the Moon?'
Investigative Phenomenon: The Moon rises and sets each day and changes phase throughout the month.
Investigative Phenomenon: The Moon rises and sets at a different time each day.

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Grade 7 - Phenomena

Anchoring phenomenon: Maple syrup made from tree sap is sweet and sugary.

Anchoring phenomenon: A pine tree struck by lightning on one branch survives and thrives on other branches.

Investigative phenomenon: Humans have two kidneys but can survive with just one. However, they cannot survive when both kidneys fail.

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Disciplinary Core Ideas

I know that you may not be able to see this, but this is where all of the DCIs are covered in the Discipline Specific model… in this PowerPoint I have divided the chart into tow charts. In the CA Science Framework there is a chart that combines both models and it is a great visual to help you see the integration versus a domain specific model.

Discipline Specific Course Model Crosscutting Concepts

Crosscutting Concepts		
Grade 6	**Grade 7**	**Grade 8**
CCC-1 Patterns **CCC-3 Scale, Proportion and Quantity**	**CCC-3 Scale, Proportion and Quantity** **CCC-4 Systems and System Models**	**CCC-3 Scale, Proportion and Quantity** **CCC-5 Energy and Matter**

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Engineering Connection
Grade 6 - Discipline Specific Course Model

Solar Array Design

This concept has important engineering applications for solar energy. California hosts several of the world's largest arrays of solar panels in the world. When people place solar panels on their roofs, the angle of the panels is usually fixed by the angle of the roof. To maximize efficiency at large solar power arrays, the motors constantly turn the panels so that they face the Sun at an angle as close to 90° as possible to get the maximum energy output. Students can experience this effect in a classroom with a small solar panel hooked up to an electric motor. As they rotate the solar panel to change the angle of sunlight, the energy output changes [CCC-7] so that the motor turns at a different speed (New York State Energy Research and Development Authority 2015). Students could engage in an engineering challenge to design a rotating base for solar panels that has the necessary range of movement (both tilting and swiveling) and uses low cost materials (MS-ETS1-1, MS-ETS1-2).

Engineering Connection
Grade 7 - Discipline Specific Course Model

Using Technology to Enhance an Ecosystem
Some human activities have negative impacts on ecosystems, but some technologies enhance ecosystem productivity by providing valuable ecosystem services such as the purification of water, reducing soil erosion, or nutrient recycling. Students **investigate [SEP-3]** competing technologies or various design alternatives of a given technology to see which benefits the ecosystem the most (MS-LS2-5).

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Engineering Connection
Grade 8 - Discipline Specific Course Model

Designing a Hand Warmer Powered by Chemical Reactions

Students now imagine that they will travel to a very cold place to explore and play and that they will want a way to keep their hands warm for as long as possible. Their goal is to **analyze data [SEP-4]** from the previous experiment to help design a hand warming pad powered by chemical reactions (MS-PS1-6). Students will need to **define the criteria [SEP-1]** for judging hand warmer performance (MS-ETS1-1). Is it best to have the hand warmer reach its peak temperature quickly and cool back down quickly, or to warm slowly to a lower peak temperature?

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Grade 6 – Math Connections

Students plot climatograms showing the average temperature for each month (CA CCSSM 6.SP.4). They calculate the average temperature of each city over the entire year, as well as the difference in temperature between the hottest month of the year and the coldest. (CA CCSSM 6.SP.2, CA CCSSM .6.SP.3).

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Grade 7 – Math Connections

Many physical traits can be expressed by a measurable **quantity [CCC-3]** such as height, arm length, and hand span. Students have the most prior knowledge with height as a visualizable quantity, but it also can be a sensitive topic for some students. It is important for students to recognize individual differences in appearance and development, and this data collection activity can engage students in an important discussion that goes beyond scientific facts (Health Standards 7-8.1.8G, 7-8.2.2.G). Teachers should pick a measurable quantity that will be meaningful and socially comfortable for their classroom.

Grade 8 – Math Connections

Global average temperature rises as humans emit more greenhouse gases. This rate of emission depends on two key variables: population growth, and energy consumed per person. Students must construct an argument from evidence [SEP-7] that connects these population and energy use ideas to a significant impact on Earth's systems (MS-ESS3-4).

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Grade 6 – ELA/ELD Connections

During the instructional segment, students investigate and develop their understanding of Earth's systems (geosphere, hydrosphere, atmosphere, biosphere, and anthrosphere) and how each of these systems has components that intersect with each other. Each system's understanding could be developed through students using concept maps, word webs, or graphic organizer (e.g., Frayer Model) to identify corresponding types, examples and non-examples, definitions, illustrations of concept, essential (or non-essential) characteristics, and meanings of word parts (prefix/suffix) as they engage in academic discourse through their investigations.

Grade 7 – ELA/ELD Connections

As a concluding activity, students create a set of true/false text cards with statements that summarize participle interactions that happen under different conditions and the resulting macroscopic properties of solids, liquids and gases. Working in groups, students exchange the cards with other students so they can use what they have learned about states of water (see Table 5.7 Comparing Solids, Liquids, and Gases) to discuss the statements on the cards about whether the behavior of different substances (such as helium, nitrogen, copper) are true or false using evidence about the atomic/molecular composition of matter.

CA CCSS ELA/Literacy Standards: RST.6–8.2; SL.6–8.1

CA ELD Standards: ELD.PI.6–8.3

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Grade 8 – ELA/ELD Connections

Students create “mini-lessons” on Newton’s Laws of Motion to present to the class. Each team or group of students research, using at least two different sources, a Law of Motion for presentation to the class. Encourage students to include multimedia components and visual displays to clarify important findings, reasoning, and evidence and to emphasize salient points. The presentation should include a general description/definition of the law plus an example demonstrating the application of the principle.
CA CCSS ELA/Literacy Standards: RST. 6–8.2, 7; WHST.6–8.6, 7, 8; SL.6–8.5
CA ELD Standards: ELD.PI.6–8.9

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Grade 6–8 Progressions

Appendix 1: Progression of the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts in Kindergarten Through Grade Twelve

https://www.cde.ca.gov/ci/sc/cf/cascienceframework2016.asp

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Vignettes/Snapshots

Chapter 1- Overview Table 1.2 Instructional Shifts Required by the CA NGSS

Chapter 11- Instructional Strategies Snapshot 11.3. Scientific Methods and the Nature of Science

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DATA

Just like in 3-5, data is another area where teachers need support.

Student need to have opportunities to collect and work with data.

What does a baby computer call his father?
Data!

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More Info

Integrating the CA ELD Standards into K–12 Mathematics and Science Teaching and Learning

http://www.cde.ca.gov/sp/el/er/documents/fnl1516agmnteldstndab899.doc

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Questions

At this point, we'll answer the questions we can.

We may need to wait to answer other questions, so continue to monitor the FAQ Web page for updates.

Next Steps

- ✓ “CDE Science Tuesday: Grades K-2” August 1, 2017, 1-2 p.m.
- ✓ “CDE Science Tuesday: Grades 3-5” August 8, 2017, 1-2 p.m.
- ✓ “CDE Science Tuesday: Grades 6-8” August 15, 2017, 1-3 p.m.
- “CDE Science Tuesday: Cal Recycle Environmental Principles and Concepts Presentation” August 29, 2017, 1–3 p.m.

  (The final meeting may also be attended in person, in Sacramento, at 1500 Capitol Mall - conference rooms A, B, C)

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Information

All relevant information about the 2018 Science Instructional Materials adoption is posted online at the following CDE Web site:

http://www.cde.ca.gov/ci/sc/im/

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Thank you!

California Department of Education
September 2017

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