Unit 3 – Science:
Key Topic 3: Getting to Know Interactions and Strategies that Support Science

Focus Statement

Students become familiar with the interactions and strategies in the four strands of the science domain by reviewing vignettes in the strands and discussing where and how the interactions and strategies were or could be used.

Curriculum Alignment Project (CAP) Student Learning Outcomes

The Curriculum Alignment Project's (CAP) lower division eight courses and student learning outcomes are mapped onto each instructional guide learning experience. See Appendix A for the specific student learning outcomes, objectives, and examples of course content and topics for the courses listed below.

- Introduction to Curriculum
- Principles and Practices of Teaching Young Children
- Practicum-Field Experience

Instructional Methodologies

- Class discussion
- Notetaking outline or guide
- Pairs or small groups
- Reflective discussion
- Short paper or report

California Early Childhood Educator Competency Areas to Consider

The Faculty Initiative Project will undertake a comprehensive process in the future to map the content of the instructional guides to the California Department of Education, Early Education and Support Division's *California Early Childhood Educator Competencies*. The "Competency Areas to Consider" below are listed in this instructional guide as a preliminary exploration of how particular competency areas might be addressed through these learning experiences.

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- Child Development and Learning
- Relationships, Interactions, and Guidance
- Learning Environments and Curriculum
- Professionalism

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Unit 3 – Science:
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Before You Start

This key topic focuses on the interactions and strategies that are recommended in the science domain as ways to support children's science learning in the early childhood setting. This is a segment of the curriculum framework that is available in every domain. Interactions and strategies are presented in connection with vignettes, teachable moments, and planned opportunities. Each vignette provides an opportunity to explore interactions and opportunities for a particular substrand. Each strand of the domain is then followed by a "Bringing It All Together" section, which integrates teaching from several of the substrands.

It is helpful if students review the organization of the science domain so that they can become familiar with the content of this domain and with how these recommendations are presented. One way to do this is presented in Unit 3, Key Topic 1 of this instructional guide.

The location of interactions and strategies in the *California Preschool Curriculum Framework, Volume 3* can vary from strand to strand in this domain, so it will support students in their work if they have a chance to review the domain before they begin this key topic.

This key topic is accompanied by Handout 1 that can be used in several ways. The handout lists all the interactions and strategies for each strand and substrand. It is designed so that students can review vignettes and look for those interactions and strategies in each substrand and consider which might be missing. There are several ways to work with these handouts.

1. Students can use Handout 1 for a complete strand and use the "Bringing It All Together" vignette at the end of the strand in the *California Preschool Curriculum Framework, Volume 3*. The active learning in this key topic is designed for this approach.

2. Students can use Handout 1 to work with a particular substrand and work with the vignettes in that substrand.

3. Students can use the interactions and strategies for the Scientific Inquiry strand and apply them to vignettes or "Bringing It All Together" vignette for each of the other strands.

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As you go through these interactions and strategies, remind students to keep in mind that children of different ages might respond differently to different interactions and strategies and that different family and community experiences with science will manifest in young children's responses. This is discussed in the introduction to the domain on page 139 as one of the guiding principles of the domain relating to what is developmentally appropriate for different children.

Faculty will need a copy of Handout 1 for this key topic for each student as well as access to the science domain chapter in the *California Preschool Curriculum Framework, Volume 3* in either a hard or electronic copy. A Portable Document Format (PDF) version of the curriculum framework can be downloaded from the California Department of Education Web site at http://www.cde.ca.gov/sp/cd/re/psframework.asp. An electronic version of the handout will be available when this instructional guide is online at http://facultyinitiative.wested.org/.

Information Delivery

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Students will need to be familiar with the content and organization of the science domain to do this work. It will be helpful if they review the domain before coming to class. This entire domain covers pages 135–246. Another way is for all students to read the introduction to the domain on pages135–152 and then read through whichever strand they are assigned. The introduction includes a summary of the domain and its strands on pages 151–152 that would be helpful for students as they work through Handout 1 included with this key topic.

In any case, students will need to be familiar with the organization and elements of the domain. This can be done by having students do the learning experience in Unit 3, Key Topic 1, Subtopic 2 of this instructional guide relating to the organization of the domain. Again, another way to provide familiarity is to have students do the subtopic in Key Topic 1 but only as it relates to the strand to which they are assigned. Students will become familiar with other strands as each of these strands is presented for discussion.

Active Learning

Getting it started

Let students know that they will be working with the "Interactions and Strategies" presented in the science domain. Organize students into pairs or groups of three or four. Assign a strand to each group. The number of interactions and strategies are not the same for each strand, but the differences are not likely to create challenges. The Scientific Inquiry strand, however, might work better if the two substrands are given separately to student groups. Additionally, the first substrand could be further subdivided. Provide students in the

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group with the appropriate section of Handout 1 for the strand or substrand with which they will work.

Ask students to review the interactions and strategies that they will be using. Ask them to find the strand they will be working with, and then ask them to look at the section for their strand called "Bringing It All Together." These are all listed in the table of contents of the *California Preschool Curriculum Framework, Volume 3*. For each strand in this section there is a vignette that demonstrates the use of some of the interactions and strategies recommended in that strand. Students are to use Handout 1 and respond to the following questions:

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- What interactions and strategies are represented in the vignette?
- If some interactions and strategies are not represented, how could they be? (For this second question, some of the questions for reflection at the end of each strand in the *California Preschool Curriculum Framework, Volume 3* might provide some prompts.)

Keeping it going

After students have had some time to explore the interactions and strategies in their vignette, reconvene the class as a whole group.

- Ask each group to share some examples of interactions and strategies that were represented in their vignette and to describe how they appeared in the vignette.
- Then ask students for some examples of interactions and strategies that were not represented in their vignette and how they thought the teacher could have included them.
- While they were working with these vignettes, did other activities come to mind where these interactions and strategies could be used?

Online Options

Students could summarize the interactions and strategies they found in their vignettes, interactions and strategies not seen in the vignettes that teachers might have used, and other activities where the interactions and strategies could be used. These summaries could be posted online, and students could review their classmates' work. Faculty could then facilitate an in-class discussion or an online discussion if that feature, such as a chat room, is available.

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Taking it further
After working with their strand, students can be asked to work with one or both of the substrands of the Scientific Inquiry strand. Any students who had worked with one or both of these substrands could join the groups that worked on the other three strands, distributing themselves as equally as possible among the other groups. Ask students to look for the interaction and strategies in the vignette for their substrand.

After they have had a chance to do this, ask them to discuss these questions:


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- What did you find?
- What does this tell you about the interactions and strategies for the Scientific Inquiry strand? What are some examples of where you could see these interactions and strategies at work?

Another approach
Faculty could also develop this learning experience using substrands as the focus rather than strands and use vignettes in the substrands for exploration by students.

Reflection

Direct students' attention to the "Questions for Reflection" at the end of each strand. These provide some opportunities to consider expanding and integrating science curriculum across all domains of early learning and development.

The following questions can be used for students to reflect on their experiences with this key topic:


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- What was new and surprising to you?
- Where did you struggle and how did you overcome that?
- What did you learn about interactions and strategies that can be used for science curriculum?
- What would you like to learn more about? How can you pursue that?

Deeper Understanding

There are descriptions of "Planning Learning Opportunities" and "Teachable Moments" in the introduction to the *California Preschool Curriculum Framework, Volume 3* on page 11 in the left column.

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Ask students to write a brief paragraph on each and a paragraph discussing the differences between them and why they are both important for teachers to use with young children.

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Strand: Scientific Inquiry			
Substrands and subcategories of substrands	**Interactions and Strategies**	**Included in "Bringing It All Together" vignette(s)?**	**If not, how could it be included?**
1.0 Observation and Investigation			
Observe and Describe	Facilitate children's observation skills.		
	Introduce children to the process of observing.		
	Introduce the term "observe" to children.		
	Encourage children to describe their observations.		
	Invite children to observe objects and phenomena related to the current focus of inquiry.		
	Invite children to record their observations.		
Use Scientific Tools	Promote the use of scientific tools to extend children's observations and investigation of objects.		
	Introduce children to scientific tools and their function.		

Strand: Scientific Inquiry – Continued			
Substrands and subcategories of substrands	**Interactions and Strategies**	**Included in "Bringing It All Together" vignette(s)?**	**If not, how could it be included?**
1.0 Observation and Investigation – Continued			
Use Scientific Tools – Continued	Suggest language to introduce magnifiers to children.		
	Support children in using the tools.		
Measure			
Sort, Classify, and Identify Patterns	Facilitate children's abilities to sort, classify, and identify patterns.		
Compare and Contrast	Ask questions and model comparative language to introduce the idea of comparing.		
	Invite children to compare and contrast objects and phenomena related to their current focus of inquiry.		
Predict and Check	Encourage children to make predictions.		
	Introduce children to the idea of predicting.		

Strand: Scientific Inquiry – Continued			
Substrands and subcategories of substrands	**Interactions and Strategies**	**Included in "Bringing It All Together" vignette(s)?**	**If not, how could it be included?**
1.0 Observation and Investigation – Continued			
Predict and Check – Continued	Encourage children to first *predict* and then *check.*		
	Elicit children's predictions by asking questions.		
	Remind children that predictions do not have to be right.		
	Record children 's predictions.		
Draw Inferences and Conclusions	Facilitate children's ability to make inferences and draw conclusions.		
	Use everyday observations to model inferring.		
	Encourage children to explain the reasoning behind their inferences.		

Strand: Scientific Inquiry – Continued			
Substrands and subcategories of substrands	**Interactions and Strategies**	**Included in "Bringing It All Together" vignette(s)?**	**If not, how could it be included?**
2.0 Documentation and Communication			
Record and Document	Encourage children to record observations and document investigations and findings.		
	Introduce children to the idea of recording.		
	Promote the use of different forms to record and document information.		
	Consider adaptations for children with special needs.		
	Encourage children to describe their representations while you write their words.		
	Encourage different means of communication.		
	Invite children to record collaboratively, using charts, graphs, or models.		

Strand: Scientific Inquiry – Continued				
Substrands and subcategories of substrands	**Interactions and Strategies**	**Included in "Bringing It All Together" vignette(s)?**	**If not, how could it be included?**	
2.0 Documentation and Communication – Continued				
Communicate	Ask open-ended questions: • *Questions to encourage children to share their observations* • *Questions to facilitate children's problem-solving and investigation* • *Questions to elicit children's predictions and explanations*			
	Engage children in collaborative discussions.			

Strand: Physical Sciences			
Substrands	**Interactions and Strategies**	**Included in "Bringing It All Together" vignette(s)?**	**If not, how could it be included?**
1.0 Properties and Characteristics of Nonliving Objects and Materials			
	Provide children with opportunities to explore a variety of objects and materials in the daily environment.		
	Prepare yourself and be purposeful about the scientific concepts children will investigate while engaged with objects and materials.		
	Engage children in projects that allow them to explore, experiment, and invent with objects and materials for an extended period of time.		
	Experiment with materials and objects before offering them to children.		
	Invite children to observe and describe the characteristics and physical properties of the objects and materials they investigate.		
	Plan opportunities for children to sort and classify objects and materials and reflect on similarities and differences.		

Strand: Physical Sciences – Continued			
Substrands	**Interactions and Strategies**	**Included in "Bringing It All Together" vignette(s)?**	**If not, how could it be included?**
1.0 Properties and Characteristics of Nonliving Objects and Materials – Continued			
	Provide children with opportunities to build and experiment with simple machines.		
	Provide children with opportunities to investigate the form and function of different tools and machines.		
2.0 Changes in Nonliving Objects and Materials			
Changes in Objects and Materials			
Movement of Objects	Avoid presenting children with activities of "magical" science.		
	Select activities or projects in which children can vary their actions on objects and observe the immediate reactions to their actions.		
	Use cooking activities as opportunities to reason about transformations in materials.		

Strand: Physical Sciences – Continued			
Substrands	**Interactions and Strategies**	**Included in "Bringing It All Together" vignette(s)?**	**If not, how could it be included?**
2.0 Changes in Nonliving Objects and Materials – Continued			
Movement of Objects – Continued	Invite children to set up an experiment and collect and analyze data.		
	Focus children's attention on the effect of one aspect (variable) at a time.		
	Lead children to make predictions about what they expect to happen.		
	Ask questions to raise children's awareness of how they produced an effect.		
	Encourage children to record and document investigations with objects and materials.		

Strand: Life Sciences				
Substrands	**Interactions and Strategies**	**Included in "Bringing It All Together" vignette(s)?**	**If not, how could it be included?**	
1.0 Properties and Characteristics of Living Things	Focus children's explorations on key concepts of living things.			
	Take children on outdoor explorations of plants and animals. • Model curiosity and interest in nature. • Remind children to be respectful of nature. • Engage children in conversations about what they notice and point their attention to important aspects of living things. • Document children's outdoor explorations.			
	Provide children with tools for explorations of living things.			
	Include plants and animals indoors.			

Strand: Life Sciences – Continued			
Substrands	**Interactions and Strategies**	**Included in "Bringing It All Together" vignette(s)?**	**If not, how could it be included?**
1.0 Properties and Characteristics of Living Things – Continued			
	Engage children in close observations of living things. • *Close observations of animals.* • *Close observations of plants.* • *Explorations of fruits and vegetables.*		
	Invite children to share in-home experiences with living things.		
	Use books to enrich and extend children's study of living things.		
2.0 Changes in Living Things			
	Provide children with opportunities to care for plants and animals.		

Strand: Life Sciences – Continued			
Substrands	**Interactions and Strategies**	**Included in "Bringing It All Together" vignette(s)?**	**If not, how could it be included?**
2.0 Changes in Living Things – Continued			
	Provide children with opportunities to observe and monitor plants' growth and development. • *Provide children with a variety of planting experiences.* • *Invite children to experiment and test what plants need in order to live.* • *Invite children to predict what plants will look like as they grow.* • *Encourage children to notice changes in their plants' growth.* • *Invite children to measure the growth of plants.* • *Invite children to record the growth of plants.* • *Engage children in reflective conversations in small or large groups.* • *Involve families in children's planting and gardening experiences.*		

Strand: Life Sciences – Continued			
Substrands	**Interactions and Strategies**	**Included in "Bringing It All Together" vignette(s)?**	**If not, how could it be included?**
2.0 Changes in Living Things – Continued			
	Provide children with opportunities to observe changes and transformations in animals passing through stages of the life cycle. • *Invite children to predict changes and closely observe animals passing through different stages of a life cycle.* • *Invite children to record and document their observations of changing animals.* • *Encourage children to compare life cycles of different animals.*		
	Discuss the death of living things.		
	Invite children to investigate their own growth.		

Strand: Earth Sciences			
Substrands	**Interactions and Strategies**	**Included in "Bringing It All Together" vignette(s)?**	**If not, how could it be included?**
1.0 Properties and Characteristics of Earth Materials and Objects			
	Take children on a search for earth materials in nature.		
	Invite children to observe, compare, and classify earth materials.		
	Invite children to explore and experiment with earth materials.		
	Use opportunities to explore earth materials in the context of studying living things or when exploring other solid and nonsolid materials.		
	Invite children to share in-home experiences with earth materials.		
2.0 Changes in the Earth			
	Engage children in observing and describing the sun and the moon and other natural objects in the sky.		

Strand: Earth Sciences – Continued			
Substrands	**Interactions and Strategies**	**Included in "Bringing It All Together" vignette(s)?**	**If not, how could it be included?**
2.0 Changes in the Earth – Continued			
	Provide children with opportunities to observe, record, and discuss the weather. • *Develop an awareness of the daily weather.* • *Invite children to record and discuss changes in the weather.* • *Invite children to observe and discuss the effects of weather and seasonal changes on their life and the environment around them.* • *Engage families in children's explorations of weather and seasonal changes.*		
Preserving the Environment	Model and discuss respect for the environment.		
	Engage children in caring for and protecting the environment through everyday routine in the preschool environment.		
	Collect and use recycled materials.		