



Science: Piecing Together the Science Domain Content Puzzle

Science Domain:
Piecing Together the Science Domain Content Puzzle

Focus Statement

Students become familiar with the content and structure of the science foundations by assembling puzzle pieces of the strands, substrands, and foundations of the domain.

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.

- Child, Growth, and Development
- Introduction to Curriculum
- Principle and Practices of Teaching Young Children
- Practicum-Field Experience

Instructional Methodologies

- Class discussion
- Pairs or small groups
- Problem solving
- Reflective discussion

California Early Childhood Educator Competency Areas to Consider

The Faculty Initiative Project 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.

- Child Development and Learning



- Special Needs and Inclusion
- Learning Environments and Curriculum
- Professionalism



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Before You Start

This learning experience provides students with an opportunity to explore the content and organizational structure of the science domain of the *California Preschool Learning Foundations, Volume 3*. If this is the first time some students are working with the foundations, assembling the puzzle will serve as an introduction to all the foundations because their organizational structures are nearly identical.

Students will be assembling puzzles of the domain elements, and a handout of the pieces (Handout 1) is included if instructors want to reproduce and use it in this learning experience. An electronic version of these puzzle pieces (Handout 1) will be available when this instructional guide is available online at www.wested.org/facultyinitiative. The pieces can be cut and packaged in envelopes prior to the class session. If preferred, instructors can also create their own puzzle pieces by using a large card or half sheet of 8 ½" x 11" paper for each strand, a paper strip for each of the substrands (including the wording "At around 48 months of age" and "At around 60 months of age" on a line below each substrand name), and a paper strip for each of the foundations. The number of puzzle sets needed will depend on how instructors decide to group the students—individually, in pairs, or in small groups.

If instructors have access to several copies of the *California Preschool Learning Foundations, Volume 3*, students could use them to compare their organization of the puzzle pieces with the actual structure of the science strands, substrands, and foundations. Two resources that students can also use to check their work are included with this instructional guide: (1) Handout 2 which lists the science domain strands, substrands, and foundations and (2) a summary of the strands, substrands, and foundations in Appendix B. An electronic version of both of these documents will be available when this instructional guide is online at www.wested.org/facultyinitiative.

Information Delivery



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There are four strands in the science domain: Scientific Inquiry, Physical Sciences, Life Sciences, and Earth Sciences. The first strand, Scientific Inquiry, is about the skills and specific language related to science. The other strands are about the content areas of science. Each strand has two substrands, and the substrands in the Physical Sciences, Life Sciences, and Earth Sciences are very similar. The first substrand is about properties and characteristics, and the second substrand is about changes. These two substrands represent the two unifying concepts in science. A table



summarizing these strands, substrands, and the number of foundations for each substrand can be found on page 59 of the *California Preschool Learning Foundations, Volume 3*. It is provided here for your reference:

| Strand | Substrand | Foundation |
|--------------------|---|------------|
| Scientific Inquiry | 1.0 Observation and Investigation | 1.1 |
| | | 1.2 |
| | | 1.3 |
| | | 1.4 |
| | | 1.5 |
| | | 1.6 |
| | 2.0 Documentation and Communication | 2.1 |
| | | 2.2 |
| Physical Sciences | 1.0 Properties and Characteristics of Nonliving Objects and Materials | 1.1 |
| | | |
| | 2.0 Changes in Nonliving Objects and Materials | 2.1 |
| | | 2.2 |
| Life Sciences | 1.0 Properties and Characteristics of Living Things | 1.1 |
| | | 1.2 |
| | | 1.3 |
| | | 1.4 |
| | 2.0 Changes in Living Things | 2.1 |
| | | 2.2 |
| Earth Sciences | 1.0 Properties and Characteristics of Earth Materials and Objects | 1.1 |
| | | |
| | 2.0 Changes in the Earth | 2.1 |
| | | 2.2 |
| | | 2.3 |



| Strand | Substrand | Foundation |
|----------------|--------------------------------------|------------|
| Earth Sciences | 2.0 Changes in the Earth (continued) | 2.4 |

Summaries of the contents of each strand are found on pages 52–59. If students are not very familiar with the process of scientific inquiry or any of the three science content areas, it may be helpful to review them with the students through lecture or assigned reading and discussion.

Active Learning



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Getting it started

For students who are exploring the *California Preschool Learning Foundations* for the first time, instructors may choose to begin the learning experience by asking them to read the introductory sections on pages xi–xiv of the *California Preschool Learning Foundations, Volume 3*. For example:

- “Introduction” opening paragraphs (pp. xi–xii)
- “Content of this Volume” (p. xii)
- “Organization of the Foundations” (pp. xiii–xiv)

This material provides basic background information about what the foundations are, how they’re organized, and their relation to the *Common Core State Standards*.

After the students have a basic understanding of the purpose and organizational structure of the foundations, introduce the science domain and its strands by asking students to read the section titled “Science Domain” on page xiii or presenting an overview of the four strands. Also be sure that the students understand what the designations “*At around 48 months of age*” and “*At around 60 months of age*” mean. Explanations for these designations can be found on page xiii.



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Keeping it going

Show students the puzzle pieces and explain that they are to arrange the pieces to illustrate the organizational structure of the science domain. They can begin by finding the cards with the four strands and continue by placing the appropriate substrands and foundations under each strand. Remind students to also consider



whether each foundation best fits under the 48 months or 60 months category.

Students can work individually or in a group, but having students work in pairs or a larger group allows for an exchange of ideas as students decide where each substrand and foundation should be placed. Promoting this kind of discussion may also prompt students to engage more fully with the content.

Putting it together

After the puzzles have been completed, ask students to compare their organizational structures with those of other students. Suggest that they look for and discuss any differences. Students can then check their puzzles with the actual organization of the foundations on pages 61–83 or pages 108–112 of the *California Preschool Learning Foundations, Volume 3*; with Handout 2 for this learning experience; or Appendix B of this instructional guide. If their completed puzzles are different from the organization of the foundations, ask students to explain their choices and consider why the foundations are ordered the way they are.

Taking it further

Ask students to read the foundations and focus on the differences between “*At around 48 months of age*” and “*At around 60 months of age*” for the same foundation. Discuss some of the following questions:



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- What pattern do you notice between the foundations at the two different age groups?
- If the difference between the foundations at the two age groups is the wording “in greater detail,” “with greater detail,” or “an increased ability to,” how would you decide if a child has acquired the skills and knowledge for the foundation at the 48-month age level or the 60-month age level? What information about the child would you need?

Online Options

If the class has online-discussion capability, an instructor led discussion of the questions and points in this section could occur online with students.

If students have copies of the foundations with the examples, ask them to look at a few examples in each standard. If students do not have copies, ask for volunteers to read aloud the examples for a few foundations from the instructor’s copy of the *California Preschool Learning Foundations, Volume 3*. Ask students to point out how the examples illustrate the differences in



knowledge and skills that children are able to demonstrate. Discuss what students would need to help them apply the foundations in their work with children.

Another approach/way

Depending on the number of students in the class and the time available for this learning experience, instructors may decide to assign each group of students the substrands and foundations for only one strand rather than all four strands. The groups of students would then present their completed puzzles for their assigned strand to the whole class. Students could compare their work with the actual foundations either before or after the presentations. If students do the comparisons after the presentations, doing this step as a whole class would ensure that all the students see the correct ordering of the foundations.

Reflection



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After the students have reviewed and discussed their puzzles, ask them to respond to the following questions:

- As you look at the completed puzzles or organizational structure of the foundations in the science domain, what stands out for you?
- Which specific foundations were easier to place? Why? Which ones were more challenging? Why?
- What are some examples you have seen of any of these foundations?
- Which strand is the least familiar to you? How could you learn more about that strand?



Science: Putting Together the Science Domain Puzzle

| Scientific Inquiry | |
|---|---|
| At around 48 months of age | At around 60 months of age |
| <i>Observation and Investigation</i> | |
| Demonstrate curiosity and raise simple questions about objects and events in their environment. | Demonstrate curiosity and an increased ability to raise questions about objects and events in their environment. |
| Observe objects and events in the environment and describe them. | Observe objects and events in the environment and describe them in greater detail. |
| Begin to identify and use, with adult support, some observation and measurement tools. | Identify and use a greater variety of observation and measurement tools. May spontaneously use an appropriate tool, though may still need adult support. |
| Compare and contrast objects and events and begin to describe similarities and differences. | Compare and contrast objects and events and begin to describe similarities and differences in greater detail. |
| Make predictions and check them, with adult support, through concrete experiences. | Demonstrate an increased ability to make predictions and check them (e.g., may make more complex predictions, offer ways to test predictions, and discuss why predictions were correct or incorrect). |
| Make inferences and form generalizations based on evidence. | Demonstrate an increased ability to make inferences and form generalizations based on evidence. |

 Science Domain:
 Learning Experience 3
 Handout 1 – Science: Putting Together the Science Domain Puzzle



| <i>Documentation and Communication</i> | |
|--|---|
| Record observations or findings in various ways, with adult assistance, including pictures, words (dictated to adults), charts, journals, models, and photos. | Record information more regularly and in greater detail in various ways, with adult assistance, including pictures, words (dictated to adults), charts, journals, models, and photos, or by tallying and graphing information. |
| Share findings and explanations, which may be correct or incorrect, with or without adult prompting. | Share findings and explanations, which may be correct or incorrect, more spontaneously and with greater detail. |
| Physical Sciences | |
| At around 48 months of age | At around 60 months of age |
| <i>Properties and Characteristics of Nonliving Objects and Materials</i> | |
| Observe, investigate, and identify the characteristics and physical properties of objects and of solid and nonsolid materials (size, weight, shape, color, texture, and sound). | Demonstrate increased ability to observe, investigate, and describe in greater detail the characteristics and physical properties of objects and of solid and nonsolid materials (size, weight, shape, color, texture, and sound). |
| <i>Changes in Nonliving Objects and Materials</i> | |
| Demonstrate awareness that objects and materials can change; explore and describe changes in objects and materials (rearrangement of parts; change in color, shape, texture, temperature). | Demonstrate an increased awareness that objects and materials can change in various ways. Explore and describe in greater detail changes in objects and materials (rearrangement of parts; change in color, shape, texture, temperature). |



| | |
|--|---|
| Observe and describe the motion of objects (in terms of speed, direction, the ways things move), and explore the effect of own actions (e.g., pushing, pulling, rolling, dropping) on making objects move. | Demonstrate an increased ability to observe and describe in greater detail the motion of objects (in terms of speed, direction, the ways things move), and to explore the effect of own actions on the motion of objects, including changes in speed and direction. |
| Life Sciences | |
| At around 48 months of age | At around 60 months of age |
| <i>Properties and Characteristics of Living Things</i> | |
| Identify characteristics of a variety of animals and plants, including appearance (inside and outside) and behavior, and begin to categorize them. | Identify characteristics of a greater variety of animals and plants and demonstrate an increased ability to categorize them. |
| Begin to indicate knowledge of body parts and processes (e.g., eating, sleeping, breathing, walking) in humans and other animals. | Indicate greater knowledge of body parts and processes (e.g., eating, sleeping, breathing, walking) in humans and other animals. |
| Identify the habitats of people and familiar animals and plants in the environment and begin to realize that living things have habitats in different environments. | Recognize that living things have habitats in different environments suited to their unique needs. |
| Indicate knowledge of the difference between animate objects (animals, people) and inanimate objects. For example, expect animate objects to initiate movement and to have different insides than inanimate objects. | Indicate knowledge of the difference between animate and inanimate objects, providing greater detail, and recognize that only animals and plants undergo biological processes such as growth, illness, healing, and dying. |



| <i>Changes in Living Things</i> | |
|--|--|
| Observe and explore growth and changes in humans, animals, and plants and demonstrate an understanding that living things change over time in size and in other capacities as they grow. | Observe and explore growth in humans, animals, and plants and demonstrate an increased understanding that living things change as they grow and go through transformations related to the life cycle (for example, from a caterpillar to butterfly). |
| Recognize that animals and plants require care and begin to associate feeding and watering with the growth of humans, animals, and plants. | Develop a greater understanding of the basic needs of humans, animals, and plants (e.g., food, water, sunshine, shelter). |
| Earth Sciences | |
| At around 48 months of age | At around 60 months of age |
| <i>Properties and Characteristics of Earth Materials and Objects</i> | |
| Investigate characteristics (size, weight, shape, color, texture) of earth materials such as sand, rocks, soil, water, and air. | Demonstrate increased ability to investigate and compare characteristics (size, weight, shape, color, texture) of earth materials such as sand, rocks, soil, water, and air. |
| <i>Changes in the Earth</i> | |
| Observe and describe natural objects in the sky (sun, moon, stars, clouds) and how they appear to move and change. | Demonstrate an increased ability to observe and describe natural objects in the sky and to notice patterns of movement and apparent changes in the sun and the moon. |



| | |
|--|--|
| <p>Notice and describe changes in weather.</p> | <p>Demonstrate an increased ability to observe, describe, and discuss changes in weather.</p> |
| <p>Begin to notice the effects of weather and seasonal changes on their own lives and on plants and animals.</p> | <p>Demonstrate an increased ability to notice and describe the effects of weather and seasonal changes on their own lives and on plants and animals.</p> |
| <p>Develop awareness of the importance of caring for and respecting the environment and participate in activities related to its care.</p> | <p>Demonstrate an increased awareness and the ability to discuss in simple terms how to care for the environment, and participate in activities related to its care.</p> |



Science

Scientific Inquiry

1.0 Observation and Investigation

| <i>At around 48 months of age</i> | <i>At around 60 months of age</i> |
|---|---|
| 1.1 Demonstrate curiosity and raise simple questions about objects and events in their environment. | 1.1 Demonstrate curiosity and an increased ability to raise questions about objects and events in their environment. |
| 1.2 Observe ¹ objects and events in the environment and describe them. | 1.2 Observe objects and events in the environment and describe them in greater detail. |
| 1.3 Begin to identify and use, with adult support, some observation and measurement tools. | 1.3 Identify and use a greater variety of observation and measurement tools. May spontaneously use an appropriate tool, though may still need adult support. |
| 1.4 Compare and contrast objects and events and begin to describe similarities and differences. | 1.4 Compare and contrast objects and events and describe similarities and differences in greater detail. |
| 1.5 Make predictions and check them, with adult support, through concrete experiences. | 1.5 Demonstrate an increased ability to make predictions and check them (e.g., may make more complex predictions, offer ways to test predictions, and discuss why predictions were correct or incorrect). |
| 1.6 Make inferences and form generalizations based on evidence. | 1.6 Demonstrate an increased ability to make inferences and form generalizations based on evidence. |

1. Other related scientific processes, such as classifying, ordering, and measuring, are addressed in the foundations for mathematics.

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2.0 Documentation and Communication

| <i>At around 48 months of age</i> | <i>At around 60 months of age</i> |
|---|--|
| 2.1 Record observations or findings in various ways, with adult assistance, including pictures, words (dictated to adults), charts, journals, models, and photos. | 2.1 Record information more regularly and in greater detail in various ways, with adult assistance, including pictures, words (dictated to adults), charts, journals, models, photos, or by tallying and graphing information. |
| 2.2 Share findings and explanations, which may be correct or incorrect, with or without adult prompting. | 2.2 Share findings and explanations, which may be correct or incorrect, more spontaneously and with greater detail. |

Physical Sciences

1.0 Properties and Characteristics of Nonliving Objects and Materials

| <i>At around 48 months of age</i> | <i>At around 60 months of age</i> |
|---|--|
| 1.1 Observe, investigate, and identify the characteristics and physical properties of objects and of solid and nonsolid materials (size, weight, shape, color, texture, and sound). | 1.1 Demonstrate increased ability to observe, investigate, and describe in greater detail the characteristics and physical properties of objects and of solid and nonsolid materials (size, weight, shape, color, texture, and sound). |

2.0 Changes in Nonliving Objects and Materials

| | |
|--|---|
| 2.1 Demonstrate awareness that objects and materials can change; explore and describe changes in objects and materials (rearrangement of parts; change in color, shape, texture, temperature). | 2.1 Demonstrate an increased awareness that objects and materials can change in various ways. Explore and describe in greater detail changes in objects and materials (rearrangement of parts; change in color, shape, texture, form, and temperature). |
|--|---|

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2.0 Changes in Nonliving Objects and Materials (*continued*)

| <i>At around 48 months of age</i> | <i>At around 60 months of age</i> |
|---|---|
| 2.2 Observe and describe the motion of objects (in terms of speed, direction, the ways things move), and explore the effect of own actions (e.g., pushing pulling, rolling, dropping) on making objects move. | 2.2 Demonstrate an increased ability to observe and describe in greater detail the motion of objects (in terms of speed, direction, the ways things move), and to explore the effect of own actions on the motion of objects, including changes in speed and direction. |

Life Sciences

1.0 Properties and Characteristics of Living Things

| <i>At around 48 months of age</i> | <i>At around 60 months of age</i> |
|--|--|
| 1.1 Identify characteristics of a variety of animals and plants, including appearance (inside and outside) and behavior, and begin to categorize them. | 1.1 Identify characteristics of a greater variety of animals and plants and demonstrate an increased ability to categorize them. |
| 1.2 Begin to indicate knowledge of body parts and processes (e.g., eating, sleeping, breathing, walking) in humans and other animals. ² | 1.2 Indicate greater knowledge of body parts and processes (e.g., eating, sleeping, breathing, walking) in humans and other animals. |
| 1.3 Identify the habitats of people and familiar animals and plants in the environment and begin to realize that living things have habitats in different environments. | 1.3 Recognize that living things have habitats in different environments suited to their unique needs. |
| 1.4 Indicate knowledge of the difference between animate objects (animals, people) and inanimate objects. For example, expect animate objects to initiate movement and to have different insides than inanimate objects. | 1.4 Indicate knowledge of the difference between animate and inanimate objects, providing greater detail, and recognize that only animals and plants undergo biological processes such as growth, illness, healing, and dying. |

2. The knowledge of body parts is also addressed in the *California Preschool Foundations (Volume 2)* for health. In science, it also includes the knowledge of body processes. Knowledge of body parts is extended to those of humans and other animals.

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2.0 Changes in Living Things

| <i>At around 48 months of age</i> | <i>At around 60 months of age</i> |
|--|--|
| 2.1 Observe and explore growth and changes in humans, animals, and plants and demonstrate an understanding that living things change over time in size and in other capacities as they grow. | 2.1 Observe and explore growth in humans, animals, and plants and demonstrate an increased understanding that living things change as they grow and go through transformations related to the life cycle (for example, from a caterpillar to butterfly). |
| 2.2 Recognize that animals and plants require care and begin to associate feeding and watering with the growth of humans, animals, and plants. | 2.2 Develop a greater understanding of the basic needs of humans, animals, and plants (e.g., food, water, sunshine, shelter). |

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Earth Sciences

1.0 Properties and Characteristics of Earth Materials and Objects

| <i>At around 48 months of age</i> | <i>At around 60 months of age</i> |
|---|--|
| 1.1 Investigate characteristics (size, weight, shape, color, texture) of earth materials such as sand, rocks, soil, water, and air. | 1.1 Demonstrate increased ability to investigate and compare characteristics (size, weight, shape, color, texture) of earth materials such as sand, rocks, soil, water, and air. |

2.0 Changes in the Earth

| | |
|---|--|
| 2.1 Observe and describe natural objects in the sky (sun, moon, stars, clouds) and how they appear to move and change. | 2.1 Demonstrate an increased ability to observe and describe natural objects in the sky and to notice patterns of movement and apparent changes in the sun and the moon. |
| 2.2 Notice and describe changes in weather. | 2.2 Demonstrate an increased ability to observe, describe, and discuss changes in weather. |
| 2.3 Begin to notice the effects of weather and seasonal changes on their own lives and on plants and animals. | 2.3 Demonstrate an increased ability to notice and describe the effects of weather and seasonal changes on their own lives and on plants and animals. |
| 2.4 Develop awareness of the importance of caring for and respecting the environment and participate in activities related to its care. | 2.4 Demonstrate an increased awareness and the ability to discuss in simple terms how to care for the environment, and participate in activities related to its care. |

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