Unit 3: Science:
Key Topic 4: Universal Design, Individualizing, and Family Partnerships

Focus Statement

Students explore the concepts of universal design for learning, individualization, and partnerships with families as part of curriculum planning to support children's learning in the sciences.

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
- Child, Family, and Community
- Introduction to Curriculum
- Principles and Practices of Teaching Young Children
- Health, Safety, and Nutrition
- Teaching in a Diverse Society
- Practicum-Field Experience

Instructional Methodologies

- Class discussion
- Class presentation
- Creation of a visual representation
- Development of resource tool
- Lecture
- Pairs or small groups
- Panel/guest speaker
- Peer review and feedback
- Reflective discussion

- Role playing
- 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.

- Child Development and Learning
- Culture, Diversity, and Equity
- Relationships, Interactions, and Guidance
- Family and Community Engagement
- Dual-Language Development
- Observation, Screening, Assessment, and Documentation
- Special Needs and Inclusion
- Learning Environments and Curriculum
- Health, Safety, Nutrition
- Leadership in Early Childhood Education
- Professionalism
- Administration and Supervision

Unit 3: Science
Key Topic 4: Universal Design, Individualizing, and Family Partnerships

Before You Start

This key topic prompts students to consider the importance of ensuring that all children have access to the materials and classroom experiences that support their learning of science concepts and skills. Universal design for learning, individualization, and partnering with families are ways that teachers can support this access.

By examining and reflecting on these three areas, students—as teachers—can address the many diverse characteristics that children bring to the preschool classroom such as their unique temperaments, interests, and abilities; cultural and linguistic backgrounds; family beliefs, values, and structures; socioeconomic backgrounds; and neighborhood and community environments, opportunities, and resources. Partnering with families is one way to learn about these characteristics. Practicing principles and strategies of universal design for learning and individualization is a way to plan curriculum that helps all children learn.

Universal design for learning, individualization, and partnering with families are each presented as a separate subtopic. The following considerations are provided for some of the active learning experiences in each one:

Subtopic 1: Universal Design. There are two suggested options for the learning experience for this first subtopic. The first approach is to ask students to prepare a presentation on the concept of universal design for learning after reviewing and discussing concepts and examples in the science domain of the *California Preschool Curriculum, Volume 3*. If this approach is used, faculty may wish to spread this learning experience over a few class sessions so that students have time to prepare their presentations.

The second approach to this subtopic is to invite guest speakers to share how they use universal design for learning in their programs. Suggestions for presenters include early childhood special education teachers, speech and language therapists, occupational therapists, assistive technology specialists, preschool teachers with experience in including children with disabilities in their classes, and parents or other family members of children with disabilities or special needs.

Subtopic 2: Individualization. In this subtopic, students are assigned a number of interactions and strategies to review for examples of individualization. It may be helpful to use the table in the "Information Delivery" section of this key topic that summarizes the

number of interactions and strategies by substrand in deciding the number of interactions and strategies per student. Handout 1 is also provided with this key topic that lists the interactions and strategies by strand and substrand for the science domain. An electronic version of this handout will be available when this instructional guide is online at http://facultyinitiative.wested.org/.

This subtopic can also be made richer by asking students to address characteristics of children and families in their community. For example, there may be a significant number of families who regularly and/or fairly frequently relocate their residences such as families who are (1) engaged in seasonal work, (2) in the military, or (3) homeless or without permanent and adequate housing. There may be some strategies for individualizing that are very important to ensure that children in these families have opportunities for learning science concepts and skills.

Subtopic 3: Family Partnerships. Two approaches are suggested for the active learning in this subtopic. The first approach has students role-playing ways that teachers can present some of the family engagement suggestions to families. If this approach is used, class time will need to be provided for the presentations and short discussions. With the second approach, students write summaries of how they would present the suggestions to families.

Note: The suggestions in subtopic 1 and subtopic 2 are for children who may need additional supports when planning intentional teaching strategies or materials, whether or not they have an Individualized Education Program (IEP). For any child with an IEP, the design and use of adaptations should be done in collaboration with the early childhood special educator or therapist working with the child and family. Consultation with the family and these specialists is especially important for children who may have more significant physical, sensory, and/or medical conditions.

The same active learning segments for these three subtopics are used in Key Topic 4 of the history–social science domain. Slight modifications are made to reflect the specific content of each domain. This similarity across the two domains is done to allow instructors to use each key topic individually in the domain or to merge the subtopics across both domains.

Information Delivery

Slides 2-4

Background information on the diversity of California's preschool children and families, universal design for learning, and partnering with families can provide an introduction to this key topic. Faculty could choose to provide summary lectures or ask students to read the following material in the *California Preschool Curriculum Framework, Volume 3*:

- California's Preschool Children (pp. 3–5)

- Overarching principle: “Family and community partnerships create meaningful connections” (pp. 7–8)
- Overarching principle: “Individualization of learning includes all children” (p. 8)
- Overarching principle: “Responsiveness to culture and language supports children’s learning” (pp. 8–9)
- Universal Design for Learning (p. 14)
- “Partnering with families in curriculum planning” (p. 35)

Slide 5-8

For 2014 data of the diverse population of children and families in California, refer to the most recent California Children’s Report Card, which can be accessed at http://www.childrennow.org/uploads/documents/2014_CA_Childrens_Report_Card.pdf.

Strands and Substrands	Interactions and Strategies
Strand: Scientific Inquiry	***31***
1.0 Observation and Investigation	22
2.0 Documentation and Communication	9
Strand: Physical Sciences	***16***
1.0 Properties and Characteristics of Nonliving Objects and Materials	8
2.0 Changes in Nonliving Objects and Materials	8
Strand: Life Sciences	***12***
1.0 Properties and Characteristics of Living Things	7
2.0 Changes in Living Things	5
Strand: Earth Sciences	***10***
1.0 Properties and Characteristics of Living Things	5
2.0 Changes in the Earth	5

Active Learning

Subtopic 1: Universal Design for Learning

Slide 9

Getting it started

The extent to which students are familiar with the concept of universal design for learning will impact how the instructor chooses to begin this subtopic. If students have experience with this concept, a review of the section on "Universal Design for Learning" on page 14 of the *California Preschool Curriculum Framework, Volume 3* may not be needed. If the concept is new or less familiar to most students, it will be helpful for students to read and discuss the section.

Slide 10

The *California Preschool Curriculum Framework, Volume 3* includes some examples of the three practices of universal design for learning: multiple means of representation, multiple means of expression, and multiple means of engagement. Ask students to consider the following examples from the curriculum framework and decide if each example demonstrates representation, expression, or engagement:

Slides 11-12

- A teacher might need to hold a hand lens steady for a child. (*California Preschool Curriculum Framework, Volume 3*, p. 159)
- Children can record their observations with drawings, verbal or sign language dictations, or with communication devices. (*California Preschool Curriculum Framework, Volume 3*, pp. 168, 169)
- Provide accommodations for children with physical disabilities to explore a variety of objects and materials in their environments. (*California Preschool Curriculum Framework, Volume 3*, p.180)
- Children can be encouraged to observe changes in plants' growth and "communicate their observations and ideas verbally or by drawing, pointing, or acting with their bodies." (*California Preschool Curriculum Framework, Volume 3*, p. 208)
- When searching for earth materials in nature, there should be consideration "made for children with special needs through assistance by teachers or peers or adaptation of materials so they are able to fully participate and make observations." (*California Preschool Curriculum Framework, Volume 3*, p. 218)

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Slide 13

Keeping it going
Ask students to form pairs or small groups and to choose a vignette. These vignettes are all from the "Bringing it All Together" sections of the strands in the science domain in the *California Preschool Curriculum Framework, Volume 3.* Instructors may wish to assign vignettes to the groups so that a vignette from each strand is discussed. The vignettes can be found in the following pages:

- Scientific Inquiry: pages 172–173
- Physical Sciences: page 193
- Life Sciences: page 212
- Earth Sciences: page 227

Explain to students that their task is to review their vignette and (1) identify any elements of universal design for learning that the teacher used and (2) think of other ways that universal design could be incorporated.

Online Options

Subtopic 1: Students can list their examples of universal design for learning in a document to be shared online and made available for the instructor and their classmates to review. The presentations could be limited to a visual representation that students could also share online (e.g., a short paper, photograph of a poster, PDF of a PowerPoint).

Taking it further
After students have identified different examples of multiple means of representation, expression, and engagement for their vignette, ask them to develop a presentation of the vignette and their ideas. The presentations can take any form the students choose. Examples could include role playing, creating a poster or PowerPoint, facilitating a discussion, or writing a short report. Encourage students to be creative and present the information in a way that is interesting and meaningful to them.

Putting it together
Provide time for the groups to share their presentations with the rest of the class. As each group presents, ask the other students to note two strengths of the presentation and one recommendation for improving it. These are to be given to the presenters for their review.

Conclude this subtopic by having a discussion on the following questions:

Slides 14-15

- What images, words, or phrases are going through your head?
- What did you find easy in identifying examples of universal design for learning in your vignette and including examples in your presentation? What was more challenging?
- What are some insights about universal design for learning that you learned from preparing your presentation? From your classmates' presentations?
- Where do you need more practice or support in applying universal design for learning in science? How could you obtain these?

Another approach

In the *Instructional Guide for the California Preschool Curriculum Framework, Volumes 1* and *2*, another approach to the subtopic Universal Design for Learning is to have a guest speaker or panel discuss the application of the universal design for learning concepts in preschool programs. The details for having a speaker or panel are from the subtopic in the instructional guides for the first two volumes of the curriculum framework and are summarized here for reference.

Explain to students that a guest speaker or panelists will be discussing considerations when planning for children with disabilities or special needs and explaining how universal design for learning is applied in curriculum planning. This presentation is not intended as an in-depth exploration but as an introduction to some of the ways in which curriculum can be adapted to meet the needs of all children, including children with disabilities or special needs.

It would be helpful to provide the presenters with the segment on "Universal Design for Learning" from page 14 of the *California Preschool Curriculum Framework, Volume 3*. Ask them to address the importance of including children with special needs in all activities and learning experiences related to science and to share examples of the three aspects of universal design for learning: multiple means of representation, multiple means of engagement, and multiple means of expression. If the students are not familiar with special education, ask the presenters to also provide a brief overview: referral, assessment, and Individualized Educational Program (IEP) process; service provision; and ways that the special education specialists and parents can partner with the preschool program teachers in planning and/or providing the adaptations for a child with a disability or special need.

Faculty may choose to have the class prepare some questions for the presenters or allow students to spontaneously ask questions during the presentation. Ask students to listen for examples of the three aspects of universal design for learning approaches that support all children's participation in science learning experiences.

After the speakers have left, provide time for the class to reflect on the presentation through individual responses to or a class discussion on the following questions:

Slides 16-17

- What information from the presenter(s) caught your attention or stood out for you?
- What ideas or strategies seemed familiar? Which ones were new?
- What are some key messages or different perspectives that you are taking away from this presentation?
- What supports do you need to more fully implement the universal design for learning concepts to ensure that all children in your program have access to the science curriculum? What are some steps you can take to obtain these supports?

Subtopic 2: Individualization

Getting it started

Slide 18

California's children and families are very diverse in many ways. The section on "California's Preschool Children" on pages 3–5 of the *California Preschool Curriculum Framework, Volume 3* describes some aspects of this diversity. Ask students to review this section and facilitate a class discussion on the key points. Also encourage any students who have experience in early care and education programs to share some of the characteristics of the children and families in their programs. Remind students to use general terms and not identify any specific child or parent.

Online Options

Subtopic 2: If the class has online-discussion capability, faculty could facilitate a discussion on the diverse characteristics of children and families.

Include in the discussion a review of the sixth overarching principle, "Individualization of learning includes all children," which is found on page 8 of the *California Preschool Curriculum Framework, Volume 3*.

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Ask students to provide examples of each of the characteristics listed in this principle: " . . . temperament, family and cultural experiences, language experiences, personal strengths, interests, abilities, and dispositions . . . ." Instructors may also include additional characteristics of the children and families in their community. It will help students in the next subtopic about partnering with families if these examples are recorded either by the students or by the instructor in a way that will make them available to students.

Keeping it going

Assign each student a set of interactions and strategies. The handout accompanying this key topic provides a list of interactions and strategies by strand and substrand. This may be helpful in assigning the interactions and strategies. The number of interactions and strategies per student will depend on the class size and could be done by strand or by substrand.

Online Options

Subtopic 2: Students could post online their examples of individualization for their assigned interactions and strategies for the instructor and their peers to review.

Ask students to individually review their assigned interactions and strategies in the text and look for examples of individualization in that strategy. If none appear to be part of the strategy, students are to think of one example of how they can individualize that strategy.

Taking it further

After students have completed their individual review, ask them to share and discuss their strategies and individualization examples with another student. What similarities or themes did they notice?

Online Options

Subtopic 2: If there is online-discussion capability, faculty could facilitate a discussion on the examples posted by the students. The questions in the "Putting it together" section could be used as individual discussion threads.

Putting it together

Conclude this subtopic by convening the class for a reflective discussion. The following questions can be used as a guide:

Slide 20

- What did you notice when looking for examples of individualization in the interactions and strategies? What stood

out for you?

- What individualization strategies do you feel most confident in being able to use? Which ones might be more difficult?

Slide 21

- Which individualization practices seem the most critical to support children's learning in science?
- What are three new individualization practices that you will use in your teaching of science?

Subtopic 3: Family Partnerships

Slide 22

Getting it started

Ask students to read the fifth overarching principle "Family and community partnerships create meaningful connections" (*California Preschool Curriculum Framework, Volume 3*, pp. 7–8) and identify the key words and concepts that stand out for them. Next ask students to discuss what considerations regarding the diversity of families they should keep in mind when building partnerships with families. If students have not done Subtopic 2 of this key topic, it is suggested that they review the section "California's Preschool Children" (pp. 3–5 of the *California Preschool Curriculum Framework, Volume 3*).

Keeping it going

Ask the class to form small groups and explain that each group is to write a short description of a family that has at least one preschool-aged child who is in an early care and education program. Students may draw on their experiences with families but should be careful to not include any details that could identify a specific child or family. Instructors may wish to provide some guidance to the groups so that the families represent some of the diversity in their communities and portray some of the characteristics described in the *California Preschool Curriculum Framework, Volume 3.*

Taking it further

After the students have completed their descriptions, each group is to exchange its family story with another group. Provide time for each group to read the description and ask the author group for any

Online Options

Subtopic 3: Students could post their descriptions of their families online, and faculty could then assign a family to specific students. The option for writing a summary of how a strategy is shared with the family could be used instead of the role-playing presentations in class.

clarification.

Continue this subtopic by having students find and read the suggestions in the "Engaging Families" sections at the end of each strand in the science domain chapter of the *California Preschool Curriculum Framework, Volume 3*. It may be helpful to provide a brief overview of the organizational structure of the chapter domains if they are not already familiar with the structure. The "Engaging Families" sections are also listed in the table of contents for each strand.

Each group then chooses a suggestion and develops a short role-playing presentation that illustrates how to share that suggestion with their "family." Faculty may choose to assign a strand to each group to ensure that a range of suggestions is selected.

Putting it together
The groups then do their role playing for the whole class. After each presentation, the group also shares any considerations and challenges they discussed while preparing their presentation. The other students can also ask questions, share observations, and contribute other ideas for using that suggestion with other families.

The following questions for individual or group reflection could be used to conclude this subtopic:

Slides 23-24

- What words or images caught your attention?
- What approaches would you feel comfortable using? Which topic or substrand areas do you feel more confident in discussing with families? What concerns do you have?
- What are some new insights that are emerging for you as you think about engaging families in supporting their children's learning science concepts and skills?
- What will you do differently in your communications and interactions with families?

Another approach
Instead of role playing, students could write summaries of how they would present a suggestion to their family. This could be done as a group or individually.

Online Options

Subtopic 3: The option for writing a summary of how a strategy is shared with the family could be used instead of the role-playing presentations in class.

Reflection

This key topic has suggested reflection questions in the "Putting it Together" section for each subtopic. The following set of questions is more general and has been presented for other key topics in this instructional guide.

Slides 25-26

- What are some ideas, concepts, or strategies that you learned from this class session?
- Which ones reinforced what you have already learned or experienced? Which ones were new or caused you to think differently about teaching preschool children and/or engaging their families?
- Why do you think the content of this class session was presented the way it was? How did this approach help you understand the content? What else would have helped?
- How will you decide what to apply from this class session in your work with preschool children and/or their families? What will you do to ensure you will implement what you have decided to use?

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Interactions and Strategies that Support the Science Domain

Strand: Scientific Inquiry	
Substrand 1.0: Observation and Investigation	**Substrand 2.0: Documentation and Communication**
Observe and Describe	***Record and Document***
Facilitate children's observation skills.	Encourage children to record observations and document investigations and findings.
Introduce children to the process of observing.	Introduce children to the idea of recording.
Introduce the term "observe" to children.	Promote the use of different forms to record and document information.
Encourage children to describe their observations.	Consider adaptations for children with special needs.
Invite children to observe objects and phenomena related to the current focus of inquiry.	Encourage children to describe their representations while you write their words.
Invite children to record their observations.	Encourage different means of communication
	Invite children to record collaboratively, using charts, graphs, or models.
Use Scientific Tools	***Communicate***
Promote the use of scientific tools to extend children's observations and investigation of objects.	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*
Introduce children to scientific tools and their function.	Engage children in collaborative discussions.
Suggest language to introduce magnifiers to children.	
Support children in using the tools.	

Strand: Scientific Inquiry	
Substrand 1.0: Observation and Investigation	**Substrand 2.0: Documentation and Communication**
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.	
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: Physical Sciences	
Substrand 1.0: Properties and Characteristics of Nonliving Objects and Materials	**Substrand 2.0: Changes in Nonliving Objects and Materials**
Provide children with opportunities to explore a variety of objects and materials in the daily environment.	*Changes in Objects and Materials*
Prepare yourself and be purposeful about the scientific concepts children will investigate while engaged with objects and materials.	*Movement of Objects*
Engage children in projects that allow them to explore, experiment, and invent with objects and materials for an extended period of time.	Avoid presenting children with activities of "magical" science.
Experiment with materials and objects before offering them to children.	Select activities or projects in which children can vary their actions on objects and observe the immediate reactions to their actions.
Invite children to observe and describe the characteristics and physical properties of the objects and materials they investigate.	Use cooking activities as opportunities to reason about transformations in materials.
Plan opportunities for children to sort and classify objects and materials and reflect on similarities and differences.	Invite children to set up an experiment and collect and analyze data.
Provide children with opportunities to build and experiment with simple machines.	Focus children's attention on the effect of one aspect (variable) at a time.
Provide children with opportunities to investigate the form and function of different tools and machines.	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	
Substrand 1.0: Properties and Characteristics of Living Things	**Substrand 2.0: Changes in Living Things**
Focus children's explorations on key concepts of living things.	Provide children with opportunities to care for plants and animals.
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 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.*
Provide children with tools for explorations of living things.	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.*
Include plants and animals indoors.	Discuss the death of living things.

Strand: Life Sciences	
Substrand 1.0: Properties and Characteristics of Living Things	**Substrand 2.0: Changes in Living Things**
Engage children in close observations of living things. • *Close observations of animals.* • *Close observations of plants.* • *Explorations of fruits and vegetables.*	Invite children to investigate their own growth.
Invite children to share in-home experiences with living things.	
Use books to enrich and extend children's study of living things.	

Strand: Earth Sciences	
Substrand 1.0: Properties and Characteristics of Earth Materials and Objects	**Substrand 2.0: Changes in the Earth**
Take children on a search for earth materials in nature.	Engage children in observing and describing the sun and the moon and other natural objects in the sky.
Invite children to observe, compare, and classify earth materials.	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.*
Invite children to explore and experiment with earth materials.	*Preserving the Environment*
Use opportunities to explore earth materials in the context of studying living things or when exploring other solid and nonsolid materials.	Model and discuss respect for the environment.
Invite children to share in-home experiences with earth materials.	Engage children in caring for and protecting the environment through everyday routine in the preschool environment.
	Collect and use recycled materials.