Science Education: Students with Significant Cognitive Disabilities

PowerPoint Slides to be used in conjunction with the Facilitator’s Guide
Recommended citation:

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Session Agenda

• Introduction
• Session Goals and Objectives
• Set the Course
• Grade-Aligned Science Instruction
• Science Wonder Stories
• Teaching the Language of Science
Session Agenda, continued

• Task-Analytic Science Instruction
• Concept Statements
• Summary
• Evaluation
Introduction

• Teachers may be nervous to teach to students with significant cognitive disabilities science.

• Science content can be overwhelming and very abstract for students with severe disabilities.

• Let’s start with the opportunity to consider Calli, a 10th grade student with multiple disabilities.
Introduction, continued

• Watch the slide show at http://mast.ecu.edu/modules/sscd_se/lib/media/slides01/SlideShow.html.
Anchors Aweigh

Science Instruction for Students with Significant Intellectual Disabilities

(www.pdclipart.org)
10th grade Biology Standard

Competency Goal: The learner will develop an understanding of the continuity of life and the changes of organisms over time.

Objectives: Analyze the molecular basis of heredity including: DNA replication. Protein synthesis (transcription, translation). Gene regulation.

Compare and contrast the characteristics of asexual and sexual reproduction.

Interpret and predict patterns of inheritance.

• Dominant, recessive and intermediate traits.
• Punnett squares.

North Carolina Science Standards
Cons
- Teacher pt. of view
- Parent pt. of view
- Student pt. of view

Pros
- Teacher pt. of view
- Parent pt. of view
- Student pt. of view
Session Goal and Objectives

- The goal of this session is to describe the strands of science and generate an outline for science lessons based on a three-part strategy to access science state standards in all grade levels (K-12) for students with significant cognitive disabilities.
Session Goal and Objectives, continued

• The session will cover:
  – the national strands of science,
  – grade aligned alternate achievement in science,
  – a three-part planning process for science instruction, and
  – inquiry science for students with significant intellectual disabilities.
Session Objectives, continued

Objectives: Participants will be able to:

1. Identify the eight categories of content standards of science based on the National Science Education Standards (NSES).

2. Identify what inquiry science looks like for students with significant intellectual disabilities.
Session Objectives, continued

3. Identify the components of a wonder story based on a state standard.

4. Select an inquiry task analysis to meet a state science objective.

5. Identify components of a three step planning strategy to generate grade-aligned science instruction.
Set the Course

• When planning instruction for all students it is important to base our instruction on research and evidence-based practices.
• Think about Calli; it will not be easy to plan instruction for her linked to the grade level standards unless we understand what content and skills are taught in science.
• We will also need to know instructional strategies that can be used to teach the content and skills.
Set the Course, continued

- To learn more about research-based practices and the national standards in science watch the slide show at [http://mast.ecu.edu/modules/sscd_se/lib/media/slides02/SlideShow.html](http://mast.ecu.edu/modules/sscd_se/lib/media/slides02/SlideShow.html)
Set the Course, continued

• Now, take a few minutes to explore the National Science Education Standards website at http://books.nap.edu/openbook.php?record_id=4962&page=103.

• Pay special attention to the standard on Inquiry as Science. NSES stresses the importance of teaching science as inquiry.
Set the Course, continued

- Watch the video clip at http://mast.ecu.edu/modules/sscd_se/lib/media/dw1.html to hear Dr. Warren DiBiase, a science content expert at the University of North Carolina at Charlotte talk more about Inquiry Science.
Set the Course, continued

• Inquiry science is the process in which scientists conduct “science.”

• When planning science instruction for all students, think about the opportunity for hands-on-learning.

• Often teachers of science in all grade levels spend too much time emphasizing the language of science.
Set the Course, continued

• It has been said that science should NOT be taught as a foreign language, meaning an overemphasis on vocabulary instruction.

• Before we begin to talk about HOW to instruct science, we need to make sure that we have a clear understanding of how to align science instruction to state standards for students with significant cognitive disabilities.
This is a model for “Aligned Instruction”. To have strong instruction aligned to the state standards it is important to make sure the curriculum (e.g., IEP, state standards, instructional programs) match with what is really being taught in the classroom, the instruction. Finally, once the instruction and the curriculum match, students should be assessed on the same content and skills.
Grade-Aligned Science, continued

• Let’s look at an example of an extended standard for 6th grade science.

• From the North Carolina Standard Course of Study, Table 1 illustrates the grade level achievement Competency Goal and Objectives.

• Below that is the Extended Standard written for students working on alternate achievement standards.
Grade-Aligned Science, continued

• Students with significant intellectual disabilities need instruction in science linked to the general curriculum standards with an alternate achievement standard.

• From http://www.dpi.state.nc.us/curriculum/ncecs:

  http://www.dpi.state.nc.us/curriculum/ncecs:
Competency Goal 3: The learner will build an understanding of the geological cycles, forces, processes and agents which shape the lithosphere

Objectives:

3.01 Evaluate the forces that shape the lithosphere including: Crustal plate movement. Folding and faulting. Deposition. Volcanic Activity. Earthquakes.

3.02 Examine earthquake and volcano patterns.

3.03 Explain the model for the interior of the earth.


3.06 Evaluate ways in which human activities have affected Earth's pedosphere and the measures taken to control the impact: Vegetative cover. Agriculture. Land use. Nutrient balance. Soil as a vector.

3.07 Assess the use of technology and information systems in monitoring lithospheric phenomenon.

3.08 Conclude that the good health of environments and organisms requires: Monitoring of the pedosphere. Taking steps to maintain soil quality. Stewardship.
<table>
<thead>
<tr>
<th>Symbolic Access Points</th>
<th>Early Symbolic Access Points</th>
<th>Pre-symbolic Access Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classify soil types by properties</td>
<td>Demonstrate knowledge of forces and geological processes that cause change</td>
<td>Demonstrate awareness of forces and geological processes cause change</td>
</tr>
<tr>
<td>Demonstrate understanding of forces and processes that cause change</td>
<td>Classify soil by type</td>
<td>Demonstrate awareness of rocks vs. soil</td>
</tr>
<tr>
<td>Demonstrate understanding of human impact on natural resources and soil</td>
<td>Demonstrate knowledge of human impact on natural resources and soil</td>
<td>Demonstrate awareness of human impact on natural resources and soil</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Grade-Aligned Science, continued

• These types of content standards help delineate and prioritize the instructional efforts of teachers for students.

• North Carolina has also provided symbolic access points to their extended standards to help provide instructional access to each standard for all students.
Grade-Aligned Science, continued

• Based on the standard above, let’s look at an example of aligned instruction for Calli.

• Remember, we want to make sure that our instruction for Calli matches with the standard in content and performance (as much as possible).
<table>
<thead>
<tr>
<th>General Education Expectation</th>
<th>Example of Student Achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>State Standard:</strong></td>
<td>Option 1: Calli will activate a switch to listen to a science story about landforms.</td>
</tr>
<tr>
<td>The learner will build an understanding of the geological cycles, forces, processes and agents which shape the lithosphere</td>
<td>-Content? <strong>NO</strong>&lt;br&gt;-Performance? <strong>NO</strong></td>
</tr>
<tr>
<td><strong>Extended Standard:</strong></td>
<td>Option 2: Calli will use pictures to identify forces (wind, water, ice)</td>
</tr>
<tr>
<td>Identify and analyze forces that cause change in landforms over time.</td>
<td>-Content? <strong>YES</strong>&lt;br&gt;-Performance? <strong>Some</strong></td>
</tr>
<tr>
<td><strong>Content:</strong></td>
<td>Option 3: Calli will select force and match with landform change (picture, model)</td>
</tr>
<tr>
<td>Forces that shape landforms</td>
<td>-Content? <strong>YES</strong>&lt;br&gt;-Performance? <strong>YES</strong></td>
</tr>
<tr>
<td><strong>Performance:</strong></td>
<td></td>
</tr>
<tr>
<td>Identify and analyze</td>
<td></td>
</tr>
</tbody>
</table>
Grade-Aligned Science, continued

• For example, in Option 1 Calli is activating a switch to listen to a story:
  – The story is about landforms, but Calli is not learning about forces that shape the land. In this option, Calli is not really doing anything aligned to science; she is really just activating a switch.
  – While this may be an important skill to teach Calli to participate in read-aloud text, it is not a good example of content or student performance linked to the science standard.
Grade-Aligned Science, continued

• Option 2 starts to align to the content but still is not a good example of performance that is linked to the grade level standard.
  
  – Calli uses pictures to identify the forces that change and shape the lithosphere, but does not analyze what each force does to the land. This is an example that links to both the content and performance.
Grade-Aligned Science, continued

• In Option 3, however, the level of match to performance is much greater.
  – Calli selects the force AND matches the force to the landform model that shows the change.
  – It is important when aligning instruction that both the content and performance (as much as possible) match the state standard, otherwise we may spend too much time teaching students skills that don’t really match to grade level standards.
Activity – Grade-Aligned Science

• Look at the standard below in Table 2, think of an example that is aligned to both the content and performance.

Table 2

<table>
<thead>
<tr>
<th>Subject: Physical Science</th>
<th>Grade Level: 9-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competency Goal 3: The learner will analyze energy and its conservation</td>
<td></td>
</tr>
<tr>
<td>Objectives:</td>
<td></td>
</tr>
<tr>
<td>3.01 Investigate and analyze storage of energy: Kinetic energy. Potential energies: gravitational, chemical, electrical, elastic, nuclear. Thermal energy.</td>
<td></td>
</tr>
<tr>
<td>Extended Standard: Observe, measure and demonstrate knowledge of the storage and transfer of energy • Potential energy • Kinetic energy</td>
<td></td>
</tr>
</tbody>
</table>
# Activity, continued

What is the content?

<table>
<thead>
<tr>
<th>Pick one:</th>
<th>Analyze energy</th>
<th>Storage and transfer of Energy</th>
<th>Conservation</th>
</tr>
</thead>
</table>

What is the performance?

<table>
<thead>
<tr>
<th>Pick one:</th>
<th>Identify</th>
<th>Observe</th>
<th>Observe, measure and demonstrate knowledge</th>
</tr>
</thead>
</table>
Activity, continued

• Good! The content is *the storage and transfer of Energy: Potential and Kinetic*. The performance is to *observe, measure, and demonstrate knowledge*.

• When science instruction is aligned to grade level standards it will include all of the bold words above. Remember, not all students will be able to observe, measure, and demonstrate knowledge in the same way.
Activity, continued

• You may need to think about how students are able to “show what they know” and try to plan instruction that is Universally Designed.

• If a student is not yet able to perform all three performance skills immediately, it may be appropriate to introduce each skill one at a time, building skills throughout the school year.
Activity, continued

• Based on this example, would it be a well-aligned skill to ask Calli to conduct an experiment and push the car across the table and identify if the car is an example of Kinetic or Potential Energy?

• Does it match in content? YES.

• Does it match in performance? YES. BUT... Can we do better on the match of performance? Are we really looking at content and performance?
<table>
<thead>
<tr>
<th>Observe?</th>
<th>YES</th>
<th>Push car and watch it roll across tabletop.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure?</td>
<td>NO</td>
<td>If may not be appropriate to measure the energy with the formula for energy; however, Calli could identify the speed with common vocabulary used such as fast or slow.</td>
</tr>
<tr>
<td>Demonstrate Knowledge?</td>
<td>YES</td>
<td>Identify form of energy as Kinetic vs. Potential.</td>
</tr>
</tbody>
</table>
Science Wonder Stories

• We have reviewed how to make sure the skills we plan to teach are aligned to grade-level standards, and also spent some time talking about some of the research on teaching science and the National Science Education Standards.

• We will learn more about a process you can use to build your own standards-based science lessons, based on research by Browder et al. (2010).
Science Wonder Stories, continued

• Using stories to build context in science is the first step.
• Here is a model for teaching grade-aligned science instruction to students with significant cognitive disabilities.
• Watch the slide show or follow the slides http://mast.ecu.edu/modules/sscd_se/lib/media/slides03/SlideShow.html to learn about creating science wonder stories.
Science Wonder Stories
What is a Wonder Story?

• Provides Context
• Anticipatory Set for engagement
• Link to the State Standard
• Generates a purpose
• Based in fact
Have you ever wondered?

Do you like to cook in the kitchen? Sometimes when we cook, we need to freeze different food items. Sometimes when we cook, we need to boil different food items. When we freeze things they get very cold. When we boil things they get very hot. It is important to be safe in the kitchen so we don't get hurt. It can be helpful when cooking and to stay safe so we know the freezing point or boiling point of our food items. What would you like to learn?
Subject: Earth/Environmental Science  Grade Level: 3
Competency Goal 3: Will make observations and use appropriate technology to build an understanding of the earth/moon/sun system

Objectives:
3.01 Observe that light travels in a straight line until it strikes an object and is reflected and/or absorbed.
3.02 Observe that objects in the sky have patterns of movement including: Sun, Moon, Stars
3.03 Using shadows, follow and record the apparent movement of the sun in the sky during the day.
3.04 Use appropriate tools to make observations of the moon.
3.05 Observe and record the change in the apparent shape of the moon from day to day over several months and describe the pattern of changes.
3.06 Observe that patterns of stars in the sky stay the same, although they appear to move across the sky nightly.

Extended Standard: Explore, observe, communicate and investigate the relationships and patterns of movement of the earth, moon and sun.
After dinner, I take a warm bath and mom says, "Put on your PJs." I go to my room and look out my window. There are a lot of stars in the sky, and the night is dark. But tonight, the night sky is brighter than it was last night. I see something big, round, and white in the night sky. I know that it must be the moon. I reach out my window and try to touch it! I can't reach it! It must be very far away. The moon looks different tonight than other nights. Other nights I see a moon that looks like a bright, white banana in the sky. Are both of those things the moon? Some nights I see something that looks like a plate cut in half. Tonight, I see a big, white circle. Are all of those things the moon? I am not sure. I wonder if it is a kite or a planet or a plate in the sky? I wonder did the moon change shapes? I ask myself....

"Does the moon change shape?"
Activity - Science Wonder Stories

• The first step in teaching science content aligned to state standards is to identify the standard you plan to teach to and generate a wonder story that aligns.

• It is fun to get creative, have fun with the stories, and end each story with the question you would like to prompt students to generate predictions to answer.
Activity, continued

• Now it is your turn. Take a few minutes to generate a draft wonder story to align to one of the following science standards.

  – 4th grade Earth Science: Show that different rocks have different properties.
  – 6th grade Life Science: Evaluate the significant role of decomposers.
  – 9-12th grade Physical Science: Identify substances through the investigation of physical properties: Melting point. Boiling point.
Story-Based Problems, continued

• Video Recap: In the video, a high school teacher read a story about a class voting on what book has been their favorite.

• The teacher used the story to embed the data or facts.

• The teacher read the story while students read along with her.

• Students identified the facts in the story as the read, as well as the problem “What book was voted the favorite?”
Story-Based Problems, continued

• Did you notice the various different ways students participated in this portion of the math lesson?
  – Some students read along with the teacher independently;
  – Others were prompted by the teacher to locate the important information in the story (e.g., *Lord of the Rings*);
  – Other students had one-to-one assistance (e.g., paraprofessional, peer) read with them.
Teaching the Language of Science

• Science instruction requires many new terms for students.
  – It may be helpful to review common terminology that will be used in the lesson.
  – Make sure that students understand what is being asked in a lesson and the terminology to describe what they are experiencing. For example, the term “solution” is used in Chemistry. Students will need to understand what substance is being described in the experiment.
Language of Science, continued

• It is important to teach the vocabulary in science to gain content knowledge; however, the focus of science lessons should extend further than only vocabulary acquisition.

• Watch video at http://mast.ecu.edu/modules/sscd_se/lib/media/vocab.html (from Teaching to the Standards: Science by Attainment Company)
Language of Science, continued

• The teacher is reviewing science vocabulary words and picture representations of the vocabulary, allowing students to demonstrate sight word acquisition.

• Pay special attention to how the teacher asks students to match pictures with words to demonstrate comprehension of sight words.
Language of Science, continued

• Video Recap: In the video, a high school teacher reviewed the vocabulary from a biology unit with her students.
• Did you notice that she was asking her students to show comprehension of new concepts by matching vocabulary words to picture symbols?
Language of Science, continued

• When students came to the board to review the vocabulary, she handed them a word and asked them to identify the word first then match to the picture symbol.

• This is a great strategy to allow students to use sight word identification, but also measure comprehension at the same time.
Language of Science, continued

• Now, watch video at http://mast.ecu.edu/modules/sscd_se/lib/media/td.html

• The teacher is using Systematic Instruction (i.e., constant time delay) to teach science vocabulary.

• She introduces the science vocabulary for the unit prior to instruction of this lesson.
Language of Science, continued

• Notice how she differentiates the number of flash cards for students based on their current symbolic level.

• The teacher also does a great job correcting students who are not able to answer correctly, using the errorless teaching strategy embedded in time delay.
Language of Science, continued

• Video Recap: In the video, a middle school teacher used systematic instruction to review the unit vocabulary words and pictures for a lesson in chemistry.
• She provided students multiple (2-4) words or pictures and asks them to match the “word to the picture.”
Language of Science, continued

• Similar to the earlier video, this teacher is measuring her student’s comprehension of the vocabulary.

• Did you notice what the teacher does if the student doesn’t know the correct answer? She does not draw attention to the wrong answer; rather directs the student to the correct answer and moves on.
Language of Science, continued

• Because of this technique, time-delay is known as “errorless learning”.
• This video is a good example of a teacher who uses this 1:1 teaching strategy within a small group lesson.
• Notice how quickly she assesses each student and moves onto the next. Time-delay is a quick paced strategy.
Task Analytic Science Instruction

• In the video, the students went through a process (i.e., systematic instruction) to start a science lesson by reviewing the science vocabulary they would need to know in the lesson.

• They had already read a wonder story and identified the question at the bottom of their wonder story.
Task Analytic Instruction, continued

• Now, it is time to think about what steps the students need to go through to ask and answer questions, making their learning “inquiry based.”

• Watch the slide show or follow the next slides on Task Analytic Instruction http://mast.ecu.edu/modules/sscd_se/lib/media/slides04/SlideShow.html.
Following a Science Task Analysis
Designing an Inquiry Lesson

<table>
<thead>
<tr>
<th>Essential Feature</th>
<th>Variations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learner engages in scientifically oriented questions</td>
<td>Learner poses a question</td>
</tr>
<tr>
<td>Learner gives priority to evidence in responding to questions</td>
<td>Learner determines what constitutes evidence and collects it</td>
</tr>
<tr>
<td>Learner formulates explanations from evidence</td>
<td>Learner formulates explanations after summarizing evidence</td>
</tr>
<tr>
<td>Learner connects explanations to scientific knowledge</td>
<td>Learner independently examines other resources and forms the links to explanations</td>
</tr>
<tr>
<td>Learner communicates and justifies explanations</td>
<td>Learner forms reasonable and logical argument to communicate explanation</td>
</tr>
<tr>
<td>Learner selects among questions, poses new questions</td>
<td>Learner is directed to collect certain data</td>
</tr>
<tr>
<td>Learner is directed in process of formulating explanations from evidence</td>
<td>Learner is given possible ways to use evidence to formulate explanation</td>
</tr>
<tr>
<td>Learner is coached in development of communication</td>
<td>Learner is provided broad guidelines to use to sharpen communication</td>
</tr>
<tr>
<td>Learner sharpens or clarifies a question provided by the teacher, materials, or other source</td>
<td>Learner is given data and asked to analyze</td>
</tr>
<tr>
<td>Learner is given data and told how to analyze</td>
<td>Learner is provided with evidence</td>
</tr>
<tr>
<td>Learner engages in a question provided by the teacher, materials, or other source</td>
<td>Learner is given steps and procedures for communication</td>
</tr>
</tbody>
</table>

Inquiry Task Analytic Instruction
Inquiry Task Analysis

1. Introduce Lesson

- Elementary: “Wonder Story” and/or Science Schedule
- Middle: “Wonder Story” and/or Science Schedule
- High School: “Wonder Story” and/or Science Schedule (specific science standard)

2. Review Target Vocabulary

- Word/picture/objects

3. Ask “Do you know what this is?”

- “I know”/ “I don’t know”
  “What is it?”
- Yes, it is a _____.
- Yes, it is a ________.

Science Inquiry Task Analysis developed by Project MASTERY, UNC Charlotte
Target Vocabulary

pollution

solution
### KWHL Chart

<table>
<thead>
<tr>
<th>What do we <strong>K</strong>now?</th>
<th>What do we <strong>W</strong>ant to know?</th>
<th>How can we find out?</th>
<th>What did we <strong>L</strong>earn?</th>
</tr>
</thead>
<tbody>
<tr>
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</table>

<table>
<thead>
<tr>
<th>Student's name</th>
<th>Prediction</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

## Inquiry Task Analysis

### 4. Fill in K “Know” on KWHL Chart

<table>
<thead>
<tr>
<th>Attend to</th>
<th>Fill in</th>
<th>Self-direct</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

### 5. Ask “What do you want to know?”

<table>
<thead>
<tr>
<th>Pose question.</th>
<th>Pose question.</th>
<th>Pose question.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I want to know</td>
<td>I want to know</td>
<td>I want to know</td>
</tr>
<tr>
<td>_____</td>
<td>_____</td>
<td>_____</td>
</tr>
</tbody>
</table>

### 6. Fill in the W “Want to know” on KWHL Chart

<table>
<thead>
<tr>
<th>Attend to</th>
<th>Fill in</th>
<th>Self-direct</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Inquiry Task Analysis

7. Ask “What do you think will happen in the experiment, What is your prediction”

| Yes/no | choice | choice |

8. Wait for student to initiate response with materials

| manipulate | manipulate | manipulate |

9. Fill in H “How” on KWHL chart

| Attend to | Fill in | Self-Direct |
Inquiry Task Analysis

<table>
<thead>
<tr>
<th>10. Conduct Experiment</th>
<th>participate</th>
<th>participate</th>
<th>participate</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. Read Concept Statement</td>
<td>Read/text point</td>
<td>Read/text point</td>
<td>Read/text point</td>
</tr>
<tr>
<td>12. Fill in L “Learn” on KWHL chart</td>
<td>Attend to</td>
<td>Fill in</td>
<td>Self-direct</td>
</tr>
</tbody>
</table>
Concept Statement

Solute + solvent = solution

Putting something in our water that harms living things is pollution.
13. Review Experiment Results

<table>
<thead>
<tr>
<th>Yes/no</th>
<th>choices</th>
<th>Generate / choices</th>
</tr>
</thead>
</table>

14. Concept Summarization

<table>
<thead>
<tr>
<th>Fill in</th>
<th>Fill in</th>
<th>Fill in</th>
</tr>
</thead>
</table>
Concept Summarization

Solute + solvent = _______________________

Putting something in our water that harms living things is _______________________

- cooking
- pollution
- candy
Task Analytic Instruction, continued

• The slides included each step of a task analysis that can be used to teach science.
• For a sample task analysis visit UNC Charlotte’s Project MASTERY website at http://education.uncc.edu/access/2009 Curriculum Summit.htm.
Task Analytic Instruction, continued

• In the task analysis, students and teachers use a know, what, how, learn (KWHL) chart to organize thoughts and questions during the inquiry lesson.

• A copy of a KWHL chart you can use in your own teaching is available at http://mast.ecu.edu/modules/sscd_se/lib/documents/KWHL_chart.pdf.
Task Analytic Instruction, continued

<table>
<thead>
<tr>
<th>K</th>
<th>W</th>
<th>H</th>
<th>L</th>
</tr>
</thead>
</table>

Task Analytic Instruction, continued

- Watch the next video for *Steps 3 and 4 of the Task Analysis* at [http://mast.ecu.edu/modules/sscd_se/lib/media/kchart.html](http://mast.ecu.edu/modules/sscd_se/lib/media/kchart.html).

- The teacher starts the learning process with a chance for students to touch and feel the materials to identify what they are using in the lesson and then ask a question regarding the materials.
Task Analytic Instruction, continued

- These video clips feature steps in the task analysis and help clarify what they look like.
- Watch each video and pay special attention to the way teachers prompt students, looking for active engagement and responding from each and every student.
Task Analytic Instruction, continued

• In the video for *Steps 3 and 4 of the Task Analysis* the teacher prompts the students to organize what they “Know” about the materials.

• This step allows students to practice everyday skills such as asking questions, as well as identify important characteristics of the science materials to be used in the lesson. The students use the K of the “KWHL chart” to record their answers.
Task Analytic Instruction, continued

- Watch the next video at http://mast.ecu.edu/modules/sscd_se/lib/media/prediction.html. This shows Step 7 (Prediction) of the Task Analysis.

- The teacher asks the students to identify what leaf will have cells. Students respond in various different ways, take note of the multiple formats of the question, and how students answer.
Task Analytic Instruction, continued

• Watch the next video at http://mast.ecu.edu/modules/sscd_se/lib/media/Experiment.html. This shows Step 10 of the Task Analysis.
Task Analytic Instruction, continued

- Watch the next video at http://mast.ecu.edu/modules/sscd_se/lib/media/Results3.html. This shows Steps 13 and 14 of the Task Analysis.

- Then watch the video at http://mast.ecu.edu/modules/sscd_se/lib/media/Results4.html which shows Steps 12, 13 and 14 of the Task Analysis.
Task Analytic Instruction, continued

• Notice that Step 13 is directly related to the science experiment from that lesson (e.g., birds’ feathers in oily water is harmful, oil in water is pollution); and Step 14 is reporting the overall concept learned in the lesson (e.g., putting things in our waters is pollution).
Task Analytic Instruction, continued

• Watch the final video at http://mast.ecu.edu/modules/sscd_se/lib/media/Inclusion.html. It shows Steps 9, 7, 8 and 10 of the Task Analysis in an inclusive science class.
Task Analytic Instruction, continued

• Notice how the teacher instructs the students to first identify how they will find out more information (H of the KWHL chart), then they make a prediction about what will happen.

• It is possible that steps of the science task analysis may fit better in a different order.
Concept Statements

- In the videos above you may have noticed the use of a concept statement to help students identify the “Big Idea” of the lesson.

- For example, in the microbiology lesson students were taught that a living leaf has cells. This concept is specific to the lesson.
Concept Statements, continued

• While specific information is important to gain content knowledge, also think about the main idea of this lesson or unit.

• Science curriculum can often be very overwhelming and massive.

• When addressing general curriculum access in science, it may be helpful to consider the “Big Idea” or concept statement.
Concept Statements, continued

• In the microbiology lesson, the teacher identified specific vocabulary for students to learn (e.g., cells), as well as a concept statement (e.g., living things have cells).

• The concept statement is something that can be taught and tested throughout the lesson or unit.
Concept Statements, continued

• While students are learning the science concept, multiple lessons can be taught to help students generalize the concept to new materials and situations.

• Generalization should be embedded into all instruction, creating a rich scientific environment with practical, personally relevant teaching (e.g., animals have cells, people have cells = animals and people are living).
Concept Statements, continued

• On the next slide is an example of a concept statement.

• The concept statement would be taught during Step 11 of the Science Task Analysis with the whole sentence complete.

• Finally during Step 14, students would have an opportunity to demonstrate their learning by filling in the blank of the statement when provided multiple (3-4) options.
Figure 1: Example of science vocabulary word, picture, and concept statement used to align with 6th grade science unit on Energy (Jimenez, 2010).
Concept Statements, continued

- Remember that students may need objects to respond.
- To answer the concept statement, they may use several objects to demonstrate understanding of the statement, by matching the object in the blank.
Concept Statements, continued

Options:
1. Given a sample science lesson plan (any) – complete a blank Science lesson planner.
2. Given a sample science lesson plan (any) or a previously viewed science lesson – identify at least 3 modifications/adaptations that can be used to help specific students with sensory needs participate in the inquiry lesson.
Concept Statements, continued

• Now, let’s look at one final example of a planning chart that can be used to help organize and implement science.

• We’ll use the example from above (Microbiology: Cells) to see how the teacher used this chart to plan her instruction following collaboration with the general education science teacher to determine the “big idea” of this lesson.
Science Lesson Planner

Unit: Microbiology: Cell Theory Lesson 1: Cells

Key Vocabulary Word(s):
(For Unit): Cell, Living, Cell Division, Nucleus

Concept Statement:
Living things have cells.

Inquiry Experiment(s):
Using alive and paper leaves (fake), students will use a microscope (adapted with TV projection) to see the cells in the living leaf vs. the fake leave.

Extension Activity/ Real World Application:
Identification that we are living and have cells. In lesson 4 we will start to talk about cells in our bodies; nutrition and germs.

Generalization:
Identification of living vs. not living things in the environment. Animals and people.
Concept Statements, continued

• For more information on a conceptual model of science, visit UNC Charlotte’s Project MASTERY website at http://education.uncc.edu/access/Conceptual_Model_Brochures.htm.

• It is important to note for this population of students that it may be unreasonable to expect students to follow all steps of the task analysis independently.
Concept Statements, continued

• Teachers will need to prioritize which, if not all, steps specific students are working towards mastery on.

• Recognize the opportunity for students to participate in more steps within the process as mastery occurs.
Concept Statements, continued

• Also, consider strategies to allow students to participate in steps that may not follow a traditional method.

• For example, strategies for a non-verbal student might involve assistive technology; for a non-verbal student with limited mobility, strategies might include eye-gaze toward material demonstrating the concept to show understanding.
Summary

• Science instruction for students with significant intellectual disabilities should include instruction that is grade-aligned to science standards in the area of Life, Earth and Space, and Physical Science with an emphasis on Science as Inquiry.

• The use of science Wonder Stories can provide students a personally relevant context to learn science.
Summary, continued

• A KWHL chart can be used to help students organize what they Know, Want to know, How they will learn, and what they Learned during science inquiry lessons.

• Finally, the use of systematic instruction, specifically a task analysis, can be used to break down the steps of the science problem, allowing students to gain mastery of each step in order to become more independent.
Focus and Reflection Questions

1. How does systematic instruction, specifically task-analysis, support science inquiry for students with moderate and severe disabilities? Why should teachers use systematic instruction to teach academics?
Focus and Reflection Questions, continued

2. How could an inquiry science lesson (as outlined in this module) be used in an inclusive classroom? What components would work as they were shown, what steps would need to be changed? How would you adapt or modify those steps to allow all students to make progress in the general curriculum?
Application & Extension Activities

1. Using a state science standard for a given grade-level, develop an adapted inquiry based lesson plan. Some documents that can be included in the lesson plan are: (1) Science Lesson Planner, (2) Task Analysis with specific notes to how each step is addressed within the lesson plan, (3) Sample of an adapted vocabulary card and concept statement using a symbol writer software and/or Google images, etc.
2. Participant uses a sample lesson plan provided and/or their own, and teaches a lesson (videotapes) and reflects on practice and their implementation of the task-analytic steps.
Self-Assessment

• A self-assessment with response feedback is available at [http://mast.ecu.edu/modules/sscd_se/quiz/](http://mast.ecu.edu/modules/sscd_se/quiz/). Participants may take this assessment online to evaluate their learning about content presented in this module.
Session Evaluation

• A form for participants to evaluate the session is available in the Facilitator’s Guide.