Using Universal Design for Learning (UDL) to Support Middle School Students with Significant Cognitive Disabilities in Learning Science

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Keystone Assessment

Goals
Participants will:
1. Use the UDL Guidelines to support students with significant disabilities in accessing the Next Generation Science Standards
What is Universal Design for Learning (UDL)?

• UDL is a framework for instruction organized around three principles based on learning sciences (Rose and Gravel, 2010)

• UDL provides a blueprint for creating instructional goals, methods, materials, and assessments that work for everyone—not a single, one-size-fits-all solution but rather flexible approaches that can be customized and adjusted for individual needs

UDL is mentioned in the Higher Education Opportunity Act (HEOA; Public Law 110-315, 2008)
UDL Guidelines are organized according to the three main principles of UDL

- The principles are broken down into nine Guidelines
- Each Guideline has supporting Checkpoints
- Each Checkpoint has examples and resources
**Principle I: Provide Multiple Means of Representation**

- The “what” of learning – how information is perceived and comprehended
- Results in resourceful knowledgeable learners

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**Guideline 1: Provide options for perception**

- Use manipulatives to supply information in different modalities to work with internal and external structures that support survival
- Use voice output to clarify directions
- "Observe the materials. Record the color, hardness, ...." 
- Provide support for visual or auditory information during an introduction to weather related hazards
- Tactile equivalents - scratchy texture in a crumbly bag
- Customize the display of information by using real objects to examine patterns in rock layers and fossils
**Guideline 2:** Provide options for language, mathematical notation, and symbols

A digital book with an embedded glossary looking at biodiversity (UDL Book Builder, CAST)

Multimedia dictionary using an alternate keyboard and custom overlay to support vocabulary while looking at organisms external structures

Using visuals and concrete objects to understand mathematical symbols

Using symbol based text can reduce the cognitive load on a beginning reader while learning about balanced and unbalanced forces

**Guideline 3:** Provide options for comprehension

Use visual prompts and cues to draw attention to critical features while looking at properties of rock

Help supply background knowledge by taking students outside at different times on a sunny day to measure the length of shadows

Tactile highlighting supports comprehension of how animals were different in the past

A graphic organizer provides a model in understanding the flow of energy

NAAC/CAST
Time to Process

1. What do you do as a teacher to ensure your students can understand what you are teaching?
2. Using Multiple Means of Representation, what strategies that have been mentioned could you use to increase access to the Next Generation Science Standards for your students?

Principle II: Provide Multiple Means of Action and Expression

- The “how” of learning
- Encourages additional options for how students demonstrate knowledge in the learning process
- Views learning as a proactive and expressive endeavor
- Requires strategy, organization, and communication
Guideline 4: Provide options for physical action

- Physically interact with materials by hand when considering internal and external structures and functions of those structures.
- Use a slant board (2 inch 3 ring binder) with non-slip surface or high contrast to improve visibility and reach.
- Stamp or circle a prediction or record data relative to energy.
- Customizable instructional software can be accessed through an alternate keyboard with custom overlays for direct touch, switch access or scanning when collecting or graphing weather data from different parts of the world.

Guideline 5: Provide options for expression and communication

- Making a selection using an eye-gaze board selecting animals that have a specific structure.
- Use choices and a bingo dauber to mark the results of an experiment using force.
- Use graphing software to graph data about the distribution of water on the earth (NCTM, Illuminations).
- Renewable energy includes wind.
- Use sentence strips to support communication about energy and fuel.
- Complete a chart supporting an argument that plants get what they need to grow from air and water.
Guideline 6: Provide options for executive function

**Use mini-schedules to support students’ efforts and help plan**

Use charts to set goals and self-monitor progress in science.

Embed prompts and supports to stop and think before acting and gradually extend time between rewards (PECS apps).

Time to Process

1. Consider how your students share what they know and can do.

2. Using *Multiple Means of Action and Expression*, what do you see here that you could use to improve student communication skills and increase student interaction with the Next Generation Science Standards?
Principle III: Provide Multiple Means of Engagement

1. The “why” of learning.
2. What motivates students to learn?
3. What makes students persist when tasks are hard or boring?

Guideline 7: Provide options for recruiting interest

- Use a child's passion to spark an interest in research of ecosystems
- Go on a fossil hunt to look for similarities and differences in organisms in the past and present
- Use age appropriate content to work with peers on the impact of volcanic eruptions
- Work with partners instead of a larger group on the transfer of energy
- A chance to go outside to collect data on weather patterns
Guideline 8: Provide options for sustaining effort and persistence

Create the right amount of challenge when conducting research.

Use a visual timer to limit the distraction of length of work session.

How many facts do you want to find today?
1 2 3 4

Provide specific, timely and frequent feedback.

You have looked very carefully for things that are the same and things that are different when making your comparisons about lifecycles.

Guideline 9: Provide options for self-regulation

Managing frustration by knowing when to take a break.

Provide prompts, guides and checklists that focus on self-regulatory goals.

Typical peers provide models of appropriate behavior.

Pocket reminder - Being part of a school-wide positive behavior program, SMART.

Monitor emotions and reactivity to build a better capacity for self-regulation.
Time to Process

1. At your tables discuss what you do as a teacher to ensure your students are interested in learning.

2. Using *Multiple Means of Engagement*, what do you see here that you could use to increase student engagement to facilitate learning while working with the Next Generation Science Standards?

**Principle I: Provide Multiple Means of Representation**

- The “what” of learning – how information is perceived and comprehended
- Results in resourceful knowledgeable learners
Guideline 1: Provide options for perception

Use manipulatives to supply information in different modalities to work with the flow of energy among organisms across multiple ecosystems.

“Observe any changes. Record the color, change of state, ...”

Provide support for visual or auditory information during an explanation of scale properties of objects in the solar system.

Customize the display of information by using real objects to explain how the rock strata and the geological time scale are used to explain earth’s history.

Guideline 2: Provide options for language, mathematical notation, and symbols

Use a digital book with an embedded glossary while explaining how the cell and parts of a cell contribute to the function as a whole (UDL Book Builder, CAST).

Using symbol based text can reduce the cognitive load on a beginning reader while learning about photosynthesis and cellular respiration.

Multimedia dictionary using an alternate keyboard and custom overlay to support vocabulary while comparing the appearance of anatomical structures.

Using visuals and concrete objects to understand mathematical symbols.
Guideline 3: Provide options for comprehension

Use visual prompts and cues to draw attention to critical features while looking at chemical reactions.

Help supply background knowledge by taking students outside to look at how different organisms interact before examining ecosystems.

Tactile highlighting using Wikistix supports comprehension of how animals evolved over time due to natural selection.

A graphic organizer provides a model in understanding the flow of energy through trophic levels.

Collect examples and non-examples of electromagnetic waves to show that waves are reflected, absorbed or transmitted.

Time to Process

1. What do you do as a teacher to ensure your students can understand *what* you are teaching?

2. Using Multiple Means of Representation, what strategies that have been mentioned that you could use to increase access to the Next Generation Science Standards for your students?
Principle II: Provide Multiple Means of Action and Expression

• The “how” of learning
• Encourages additional options for how students demonstrate knowledge in the learning process
• Learning is a proactive and expressive endeavor
• Requires strategy, organization, and communication

Guideline 4: Provide options for physical action

Use a slant board (2 inch 3 ring binder) with non-slip surface or high contrast to improve visibility and reach

Communicate! Communicate! Communicate!

Customizable instructional software can be accessed through an alternate keyboard with custom overlays for direct touch, switch access or scanning when describing the parts and functions of a cell

Physical interact with materials by hand when making models of solid, liquid and gas to show change in temperature causes a change in state

Draw to show human impact on global temperatures
Guideline 5: Provide options for expression and communication

- Make a selection of organisms based on characteristics using an eye-gaze board.
- Use real objects to ask a question and perform an experiment to show observations and support a hypothesis.
- Use sentence strips to support communication to describe structures inside a cell.
- Complete a chart predicting genetic variable outcomes.

Guideline 6: Provide options for executive function

- Use mini-schedules to support students’ efforts and help plan.
- Use charts to set goals and self monitor progress in science.
- Embed prompts and supports to stop and think before acting and gradually extend time between rewards (PECS apps).
Time to Process

1. Consider how do your students share what they know and can do.
2. Using *Multiple Means of Action and Expression*, what do you see here that you could use to improve student communication skills and increase student interaction with science materials while working with the Next Generation Science Standards?

Principle III: Provide Multiple Means of Engagement

1. The “why” of learning
2. What motivates students to learn?
3. What makes students persist when tasks are hard or boring?
Guideline 7: Provide options for recruiting interest

Use a child’s passion to spark an interest in research of volcanoes and how they change the earth’s surface.

Go on a fossil hunt to look for similarities and differences in organisms in the past and present.

Age appropriate content to work with peers on the impact of carbon emissions on air pollution.

A chance to go pond dipping to collect data on interactions between living and non-living parts of an ecosystem.

Working with partners instead of a larger group on determining spatial arrangement of atoms.

Guideline 8: Provide options for sustaining effort and persistence

Create the right amount of challenge when conducting research.

Use a visual timer to limit the distraction of length of work session.

Provide prompts and reminders to maximize focus.

Provide specific, timely and frequent feedback.

You have completed your experiment carefully to show how soap gets oil off feathers better than just water.

Using UDL Book Builder (CAST) help the student create a digital science notebook to review and share.

How many facts do you want to find today?

1 2 3 4
### Guideline 9: Provide options for self-regulation

**Pocket reminder - Being part of school-wide positive behavior program SMART**

- Show respect
- Make learning a priority
- Act responsibly
- Realize you can be a friend
- Treat others kindly

**Monitor emotions and reactivity to build a better capacity for self-regulation**

**Provide prompts, guides and checklists that focus on self-regulatory goals**

**Typical peers provide models of appropriate behavior**

**Managing frustration by knowing when to take a break**

### Time to Process

1. **What you do as a teacher to ensure your students are interested in learning?**
2. **Using Multiple Means of Engagement, what do you see here that you could use to increase student engagement to facilitate learning while working with the Next Generation Science Standards with your students?**
Resources

• CAST. Affective Networks audio  

• CAST. Recognition Networks audio  

• CAST. Strategic Networks audio  

• CAST. UDL Guidelines.  
  http://www.udlcenter.org/aboutudl/udlguidelines retrieved 7.12.14

• CAST. UDL Online Modules.  