

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

Three Sets of Brain Networks

Recognition Networks

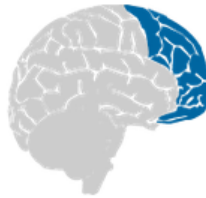
The "what" of learning



How we gather facts and categorize what we see, hear, and read. Identifying letters, words, or an author's style are recognition tasks.

Strategic Networks

The "how" of learning



Planning and performing tasks. How we organize and express our ideas. Writing an essay or solving a math problem are strategic tasks.

Affective Networks

The "why" of learning



How learners get engaged and stay motivated. How they are challenged, excited, or interested. These are affective dimensions.

CAST <http://www.cast.org/udl/>

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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)

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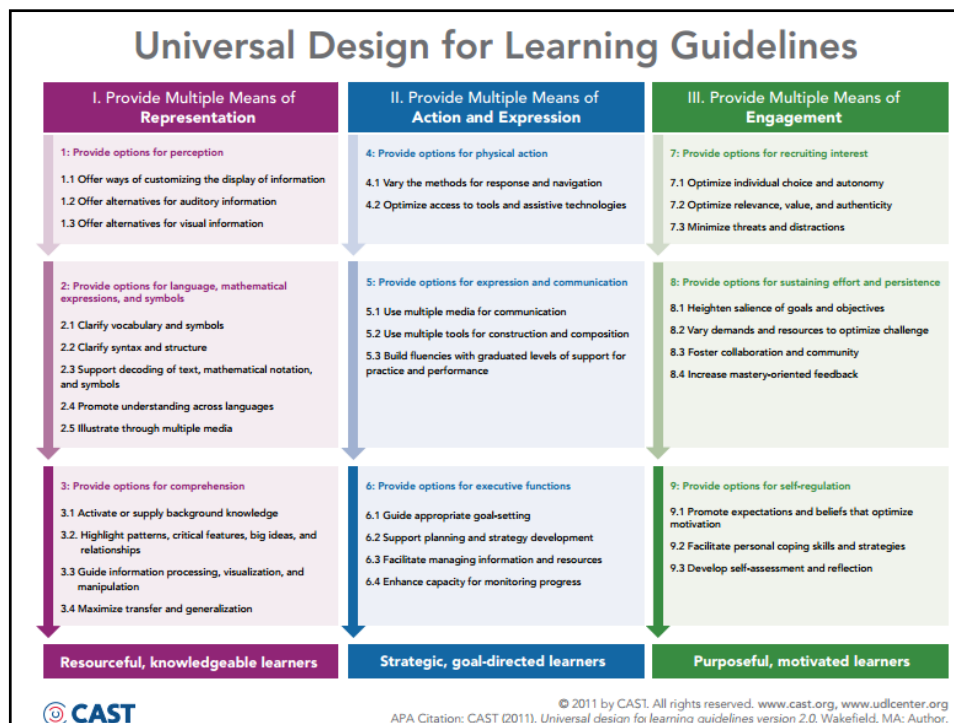
UDL Guidelines

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

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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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I. Provide Multiple Means of Representation

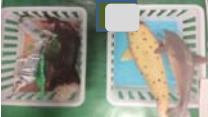
Perception

Language, expressions, and symbols

Comprehension


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,”



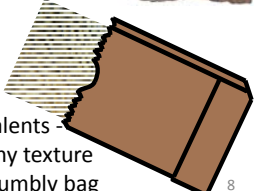
Customize the display of information by using real objects to examine patterns in rock layers and fossils



Provide support for visual or auditory information during an introduction to weather related hazards



Tactile equivalents - scratchy texture in a crumbly bag



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I. Provide Multiple Means of Representation

Perception


Language, expressions, and symbols

Comprehension

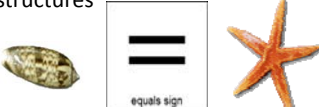
Guideline 2:

Provide options for language, mathematical notation, and symbols

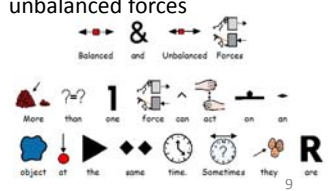
A digital book with an embedded glossary looking at biodiversity (UDL Book Builder, CAST)



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



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



Using visuals and concrete objects to understand mathematical symbols

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I. Provide Multiple Means of Representation

Perception


Language, expressions, and symbols

Comprehension

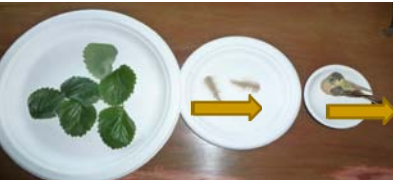
Guideline 3:

Provide options for comprehension


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



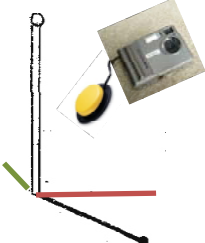
Collect examples and non-examples of objects that are magnetic before working on magnetic forces



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



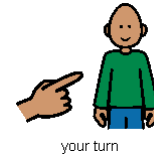
Help supply background knowledge by taking students outside at different times on a sunny day to measure the length of shadows



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

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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?

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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

Keystone Assessment

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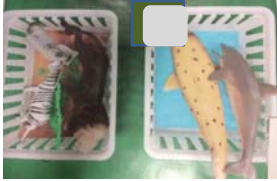
II. Provide Multiple Means of Action and Expression

Physical action

Expression and communication

Executive function


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


Communicate!
Communicate!
Communicate!



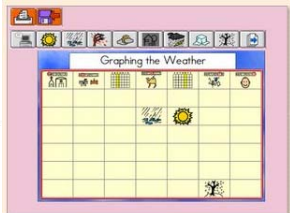
Customizable instructional software can be accessed through an alternate keyboard with custom overlays for direct touch, switch access or scanning when collecting or graphing weather data from different parts of the world



Stamp or circle a prediction or record data relative to energy



Camera Mouse is FREE



Classroom Suite Activity Exchange

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II. Provide Multiple Means of Action and Expression

Physical action

Expression and communication


Executive function

Guideline 5: Provide options for expression and communication



Making a selection using an eye-gaze board selecting animals that have a specific structure


Communicate!
Communicate!
Communicate!



Use graphing software to graph data about the distribution of water on the earth (NCTM, Illuminations)


Renewable energy includes wind

Use choices and a bingo dauber to mark the results of an experiment using force




Use sentence strips to support communication about energy and fuel


Use graphing software to graph data about the distribution of water on the earth (NCTM, Illuminations)



Complete a chart supporting an argument that plants get what they need to grow from air and water



Instructional Resource Guide on Prompting and Instructional Strategies (NCSC)



Keystone Assessment

II. Provide Multiple Means of Action and Expression

Physical action

Expression and communication

Executive function

Guideline 6: Provide options for executive function

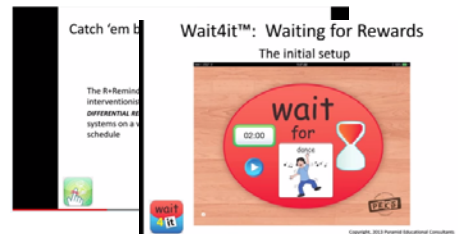
Use mini-schedules to support students' efforts and help plan



Use charts to set goals and self monitor progress in science

...sit down quietly and be ready to learn		Yes No	Yes No	Yes No	Yes No	Yes No
...listen to directions		All Some None	All Some None	All Some None	All Some None	All Some None
...follow directions the first time I am asked x3		All Some None	All Some None	All Some None	All Some None	All Some None
...work on my own		All Some None	All Some None	All Some None	All Some None	All Some None
...answer questions the first time I am asked		All Some None	All Some None	All Some None	All Some None	All Some None

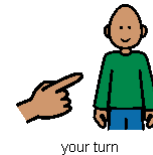
Embed prompts and supports to stop and think before acting and gradually extend time between rewards (PECS apps)



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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?

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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?

Keystone Assessment

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III. Provide Multiple Means of Engagement

Recruiting interest

Sustaining effort and persistence

Self-regulation

Guideline 7: Provide options for recruiting interest



Work with partners instead of a larger group on the transfer of energy

A chance to go outside
to collect data on
weather patterns

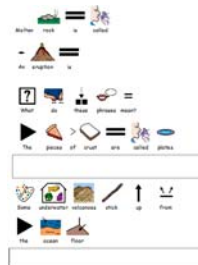


Use a child's passion to spark
an interest in research of
ecosystems



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



Keystone Assessment

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III. Provide Multiple Means of Engagement

Recruiting interest

Sustaining effort and persistence

Self-regulation

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

Provide prompts and reminders to maximize focus

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

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

Keystone Assessment

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III. Provide Multiple Means of Engagement

Recruiting interest

Sustaining effort and persistence

Self-regulation

Guideline 9: Provide options for self-regulation

Show respect

Make learning a priority

Act responsibly

Realize you can be a friend

Treat others kindly

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

great job

good job

try harder

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

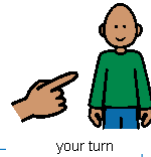
Managing frustration by knowing when to take a break

Typical peers provide models of appropriate behavior

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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?

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Principle I: Provide Multiple Means of Representation

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

Keystone Assessment

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I. Provide Multiple Means of Representation


Perception

Language, expressions, and symbols


Comprehension

Guideline 1:


Provide options for perception



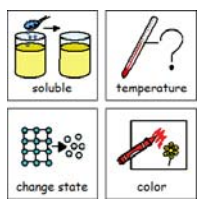
Use manipulatives to supply information in different modalities to work with the flow of energy among organisms across multiple ecosystems




Use voice output to clarify directions



"Observe any changes. Record the color, change of state,"



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



Keystone Assessment

I. Provide Multiple Means of Representation

Perception


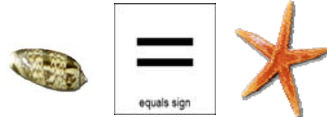
Language, expressions, and symbols

Comprehension


Guideline 2:

Provide options for language, mathematical notation, and symbols

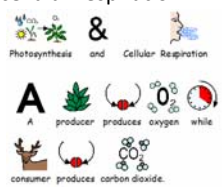
Multimedia dictionary using an alternate keyboard and custom overlay to support vocabulary while comparing the appearance of anatomical structures

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



Keystone Assessment

I. Provide Multiple Means of Representation


Perception

Language, expressions, and symbols

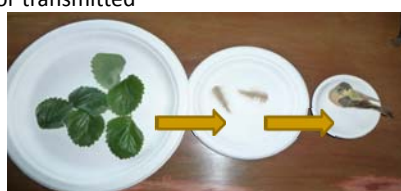
Comprehension

Guideline 3: Provide options for comprehension

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




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

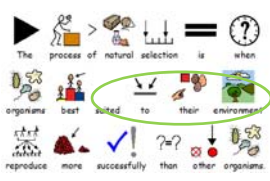


A graphic organizer provides a model in understanding the flow of energy through trophic levels

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

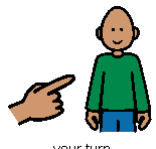


Tactile highlighting using Wikistix supports comprehension of how animals evolved over time due to natural selection



NAAC/CAST 25

Time to Process



your turn

1. Wwhat 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?

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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

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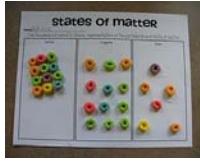
II. Provide Multiple Means of Action and Expression

Physical action

Expression and communication

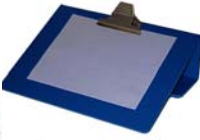
Executive function

Guideline 4: Provide options for physical action




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


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






Draw to show human impact on global temperatures







Classroom Suite
Activity Exchange

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II. Provide Multiple Means of Action and Expression

Physical action

Expression and communication

Executive function

Guideline 5: Provide options for expression and communication

Make a selection of organisms based on characteristics using an eye-gaze board

Communicate!
Communicate!
Communicate!

Use real objects to ask a question and perform an experiment to show observations and support a hypothesis

What does a plant need in order to survive

Use graphing software to graph data on wave length (NCTM, Illuminations)

The nucleus is the control center

Use sentence strips to support communication to describe structures inside a cell

Instructional Resource Guide on Prompt and Instructional Strategies (NCSC)

Complete a chart predicting genetic variable outcomes

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II. Provide Multiple Means of Action and Expression

Physical action

Expression and communication

Executive function

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

...sit down quietly and be ready to learn		Yes	Yes	Yes	Yes	Yes
		No	No	No	No	No
...listen to directions		All	All	All	All	All
		Some	Some	Some	Some	Some
...follow directions the first time I am asked x3		All	All	All	All	All
		Some	Some	Some	Some	Some
...work on my own		All	All	All	All	All
		Some	Some	Some	Some	Some
...answer questions the first time I am asked		All	All	All	All	All
		Some	Some	Some	Some	Some

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

Catch 'em b

Wait4it™: Waiting for Rewards

The initial setup

wait for

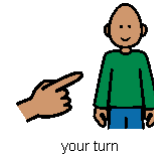
02:00

PECS

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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?

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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?

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III. Provide Multiple Means of Engagement

Recruiting interest


Sustaining effort and persistence

Self-regulation


Guideline 7: Provide options for recruiting interest




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




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



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



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

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III. Provide Multiple Means of Engagement

Recruiting interest


Sustaining effort and persistence

Self-regulation

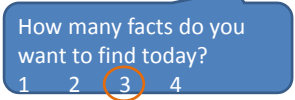
Guideline 8: Provide options for sustaining effort and persistence




I am not ready to work




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



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



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.

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III. Provide Multiple Means of Engagement

Recruiting interest

Sustaining effort and persistence

Self-regulation

Guideline 9: Provide options for self-regulation

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

Managing frustration by knowing when to take a break

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

great job

good job

try harder

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

Typical peers provide models of appropriate behavior

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

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Time to Process

your turn

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?

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Resources

- CAST. Affective Networks audio
<http://udlonline.cast.org/page/module1/l148/> retrieved 7.12.14
- CAST. Recognition Networks audio
<http://udlonline.cast.org/page/module1/l144/?jsessionid=725BAD7A60189A4300983EC941DD11CC> retrieved 7.12.14
- CAST. Strategic Networks audio
<http://udlonline.cast.org/page/module1/l152/> retrieved 7.12.14
- CAST. UDL Guidelines.
<http://www.udlcenter.org/aboutudl/udlguidelines> retrieved 7.12.14
- CAST. UDL Online Modules.
<http://udlonline.cast.org/page/module1/l3/> retrieved 7.12.14