

## Using Universal Design for Learning (UDL) to Support Elementary 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

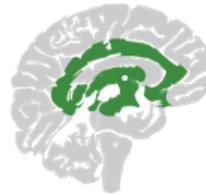
The "how" of learning



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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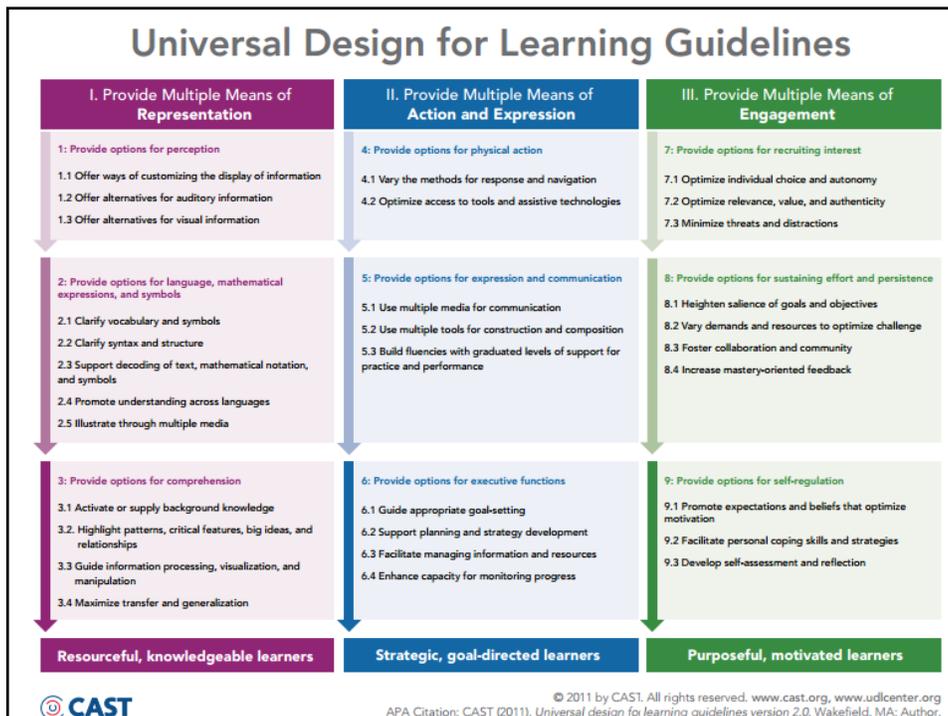
# UDL Guidelines

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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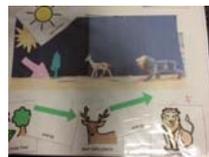
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### I. Provide Multiple Means of Representation

#### Perception

Language, expressions, and symbols

Comprehension



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



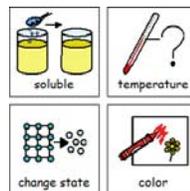
## Guideline 1: Provide options for perception

Use voice output to clarify directions

“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



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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

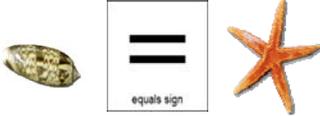
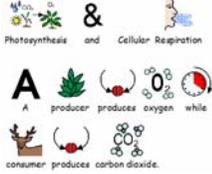
Use a digital book with an embedded glossary while explaining how the cell and parts of a cell contribute to the function as a whole (UDL Book Builder, CAST)

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

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



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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 chemical reactions

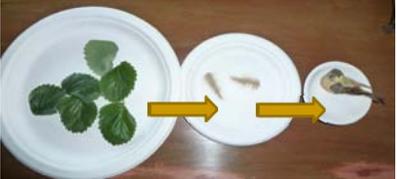
Collect examples and non-examples of electromagnetic waves to show that waves are reflected, absorbed or transmitted

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

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

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

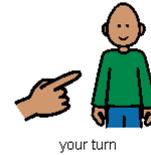



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## Time to Process



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 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



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



Classroom Suite Activity Exchange

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Camera Mouse is FREE

Draw to show human impact on global temperatures

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

states of matter

**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!



The nucleus is the control center

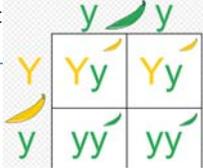
Use sentence strips to support communication to describe structures inside a cell



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

Instructional Resource Guide on Prompt and Instructional Strategies (NCSC)

Complete a chart predicting genetic variable outcomes



What does a plant need in order to survive



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

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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

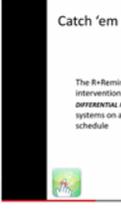
Use mini-schedules to support students' efforts and help plan

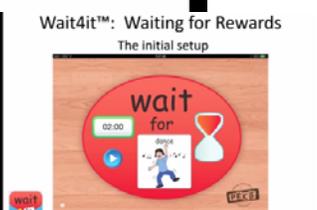


Use charts to set goals and self monitor progress in science

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

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





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## Time to Process



your turn

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



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

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



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



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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.



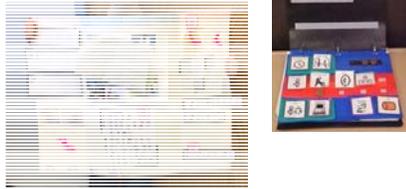
Use a visual timer to limit the distraction of length of work session

How many facts do you want to find today?

1 2 **3** 4

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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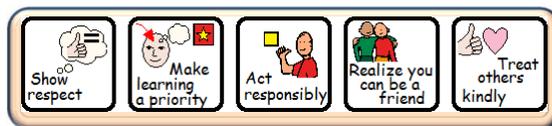
**III. Provide Multiple Means of Engagement**

Recruiting interest

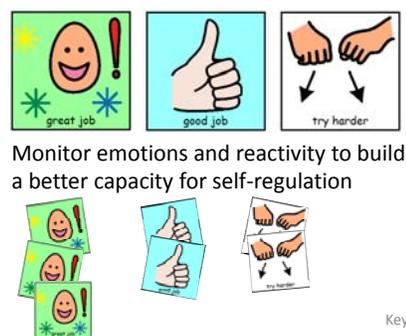
Sustaining effort and persistence

**Self-regulation**

## Guideline 9: Provide options for self-regulation



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



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

Managing frustration by knowing when to take a break

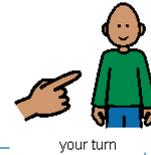
Typical peers provide models of appropriate behavior




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## Time to Process



1. 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  
<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