

Universal Design for Learning Applied to Science Curriculum

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[http://www.montgomeryschoolsmd.org/
departments/hiat](http://www.montgomeryschoolsmd.org/departments/hiat)

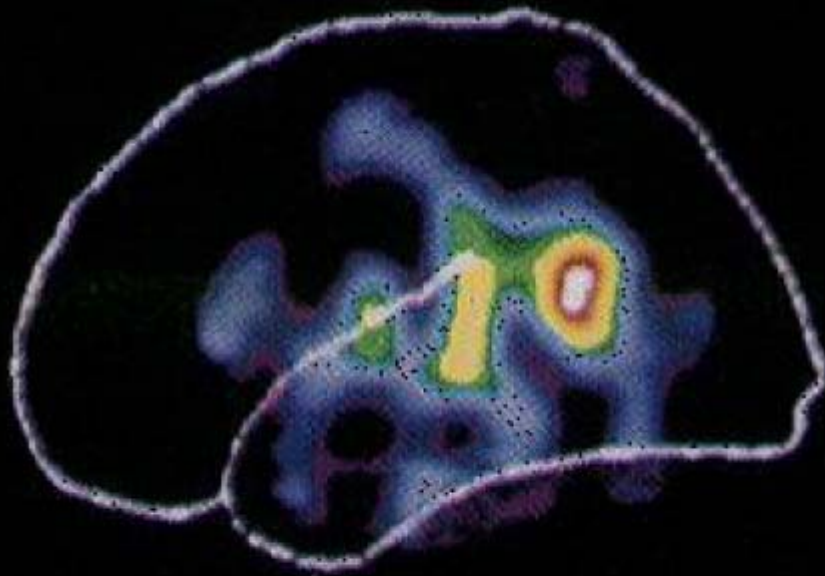
UDL is the practice of embedding flexible strategies into the curriculum during the planning process so that ALL students can access a variety of learning solutions.



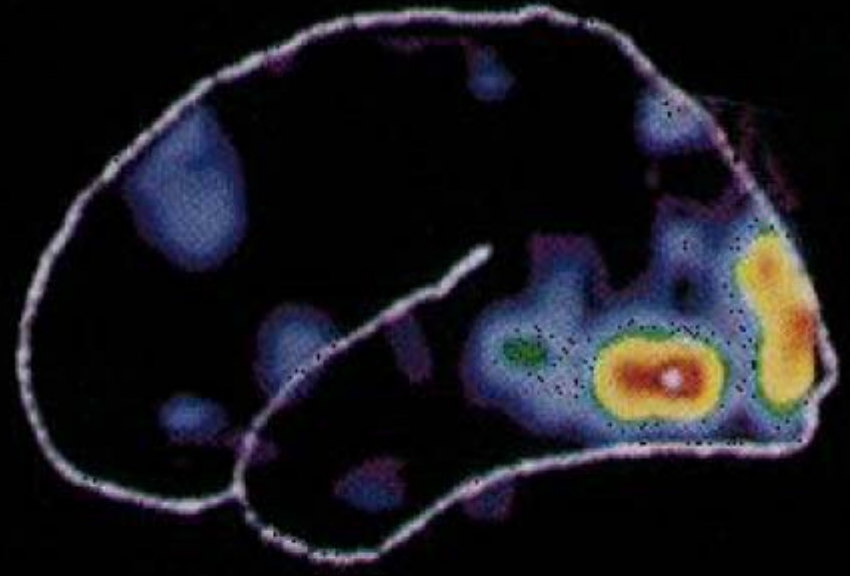
UDL is built on the premise that there is no one kind of learning

- Learning differs across tasks
- Learning differs across development
- Learning differs across individuals

Learning differs across tasks

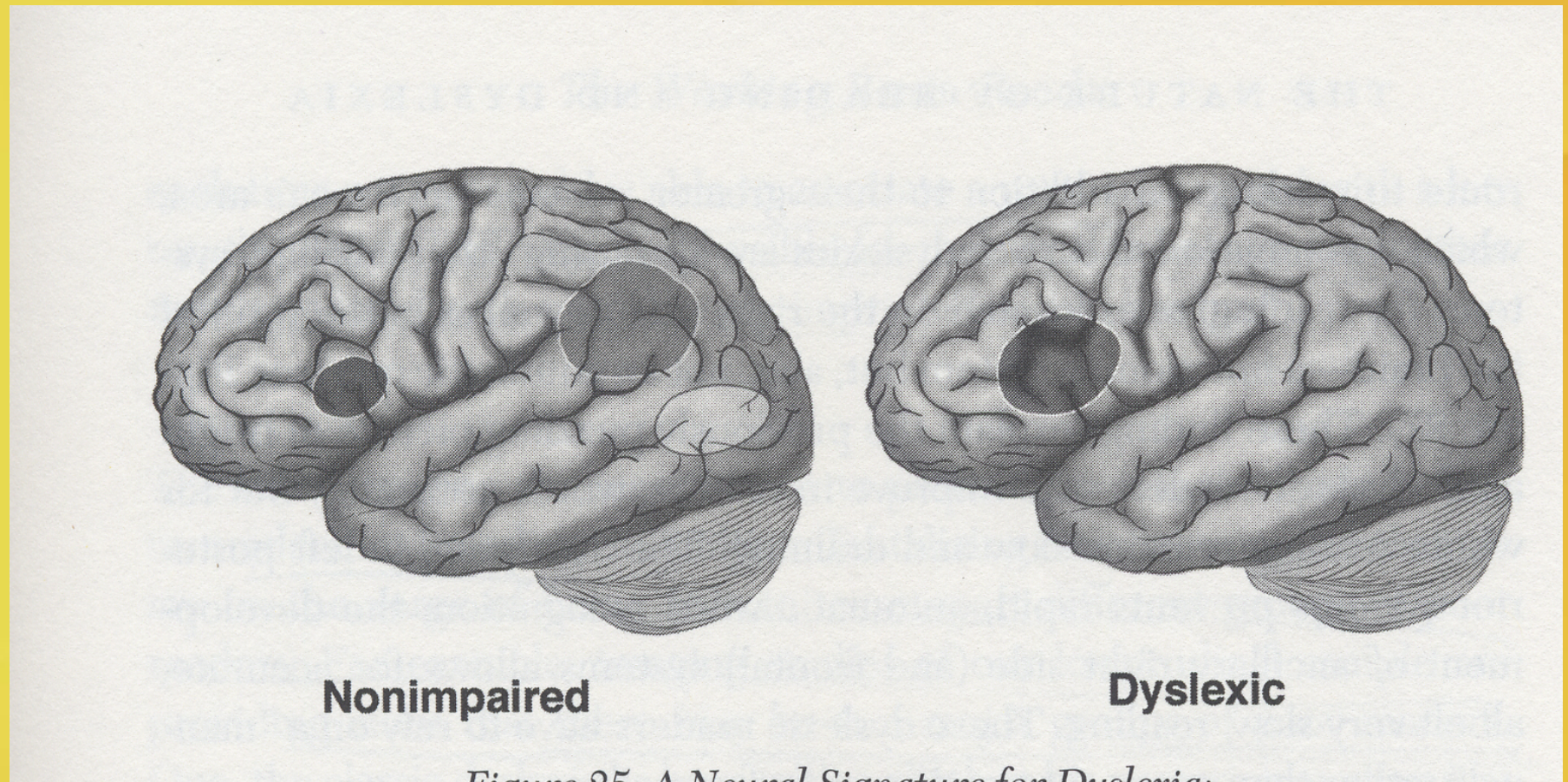


HEARING WORDS



SEEING WORDS

Learning differs across individuals.



Shaywitz, S.(2003). ^{MCPS/HIAT/2007}Overcoming Dyslexia.NY: Knopf

UDL strategies for instruction are frontloaded rather than retrofitted.



- More efficient in the long run.
- Benefits more students
- More acceptable to students

Universal design for learning (UDL) is a framework for removing barriers by anticipating the needs of all students





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Universal Design and Education

- In the mid 1990's, the concept of universal design was applied to education (www.cast.org)
- UDL is a national initiative at this time in the educational world because the technology is available to make it happen.



Historical Context

- In 1975, PL 94-142 promoted “education for all.”
- This was huge step forward, focusing more attention on the individualized needs of students with disabilities.
- This resulted in an IEP driven curriculum that was parallel to the general education curriculum.

In special education classrooms, students made progress, but grew further behind compared to peers.

Upon graduation, this resulted in students having fewer post secondary opportunities.

IDEA focuses on access, participation AND progress in relation to peers.

We now know that....

- Special education staff can no longer work separately from general education.
- General educators and special educators need to collaborate to design good instruction with a shared understanding of standards and benchmarks.
- No single medium and method will work for all students.
- Differentiated instructional (DI) strategies as well as flexible materials benefit all students (UDL).

Is UDL only for students with IEPs?

No

UDL is a framework to support the range of learners that exist in typical classrooms.

This would include gifted students, disengaged students, ELL students, as well as, students with documented disabilities.



...harnesses the power and flexibility of modern technology.

Technology provides the flexibility needed to adjust to learner differences.

Using a curriculum that is rooted in 3 UDL principles...

Teachers provide:

1. Flexible ways of presenting lesson content
2. Flexible options for student engagement
3. Flexible methods of expression, and assessment

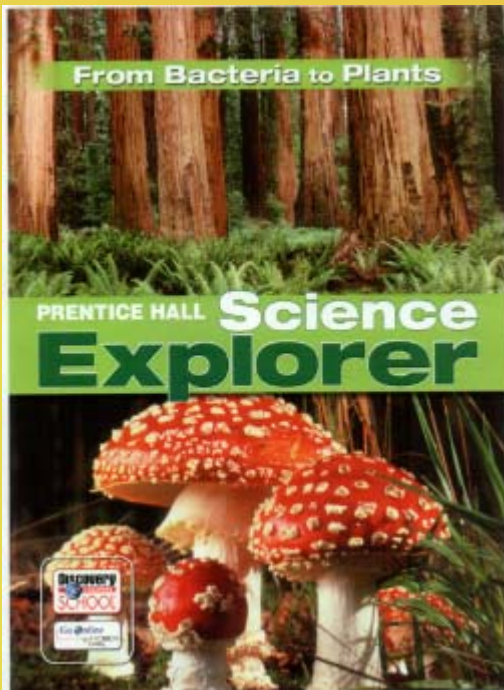
Students have:

1. Options for how they learn
2. Choices which will engage student interest
3. Choices for how they demonstrate their learning

#1 Flexible ways of presenting lesson content

Options for how students learn

Traditional Book (7th Grade)



Section 1
Protists

Reading Preview
Key Concept

- What are the characteristics of animal-like, plantlike, and funguslike protists?

Key Terms

- protist • protozoan
- pseudopod
- contractile vacuole • cilia
- symbiosis • mutualism
- algae • pigment • spore

Target Reading Skill
Outlining As you read, make an outline about protists that you can use for review. Use the red section headings for the main topics and the blue headings for the subtopics.

Lab zone **Discover Activity**
What Lives in a Drop of Pond Water?

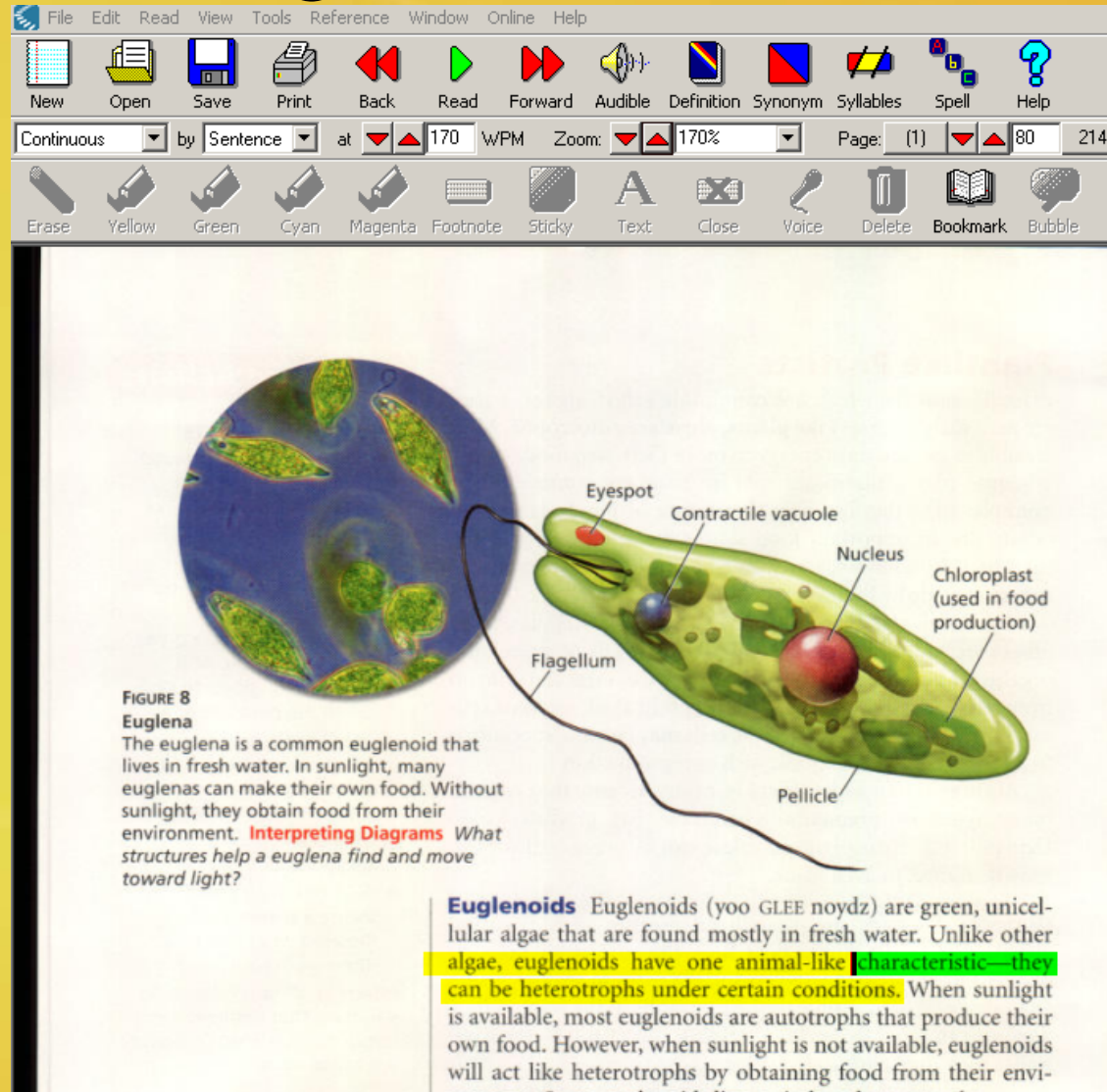
- Use a plastic dropper to place a drop of pond water on a microscope slide.
- Put the slide under your microscope's low-power lens. Focus on the objects you see.
- Find at least three different objects that you think might be organisms. Observe them for a few minutes.
- Draw the three organisms in your notebook. Below each sketch, describe the movements or behaviors of the organism. Wash your hands thoroughly when you have finished.

Think It Over
Observing What characteristics did you observe that made you think that each organism was alive?

Protists
I. What is a protist?
II. Animal-like protists
A. Protozoans with pseudopods
B.
C.

Look at the objects in Figure 1. What do they look like to you? Jewels? Beads? Stained glass ornaments? You might be surprised to learn that these beautiful, delicate structures are the walls of unicellular organisms called diatoms. Diatoms live in both fresh water and salt water and are an important food source for many marine organisms. They have been called the "jewels of the sea."

Reading E-text with Kurzweil



The screenshot displays the Kurzweil software interface, which includes a menu bar (File, Edit, Read, View, Tools, Reference, Window, Online, Help) and a toolbar with icons for various functions like New, Open, Save, Print, Back, Read, Forward, Audible, Definition, Synonym, Syllables, Spell, and Help. Below the toolbar, there are settings for reading speed (170 WPM) and zoom (170%). The main content area shows a diagram of a Euglena cell, a green, oval-shaped organism with a long, thin flagellum. The diagram is labeled with various internal structures: Eyespot, Contractile vacuole, Nucleus, Chloroplast (used in food production), and Pellicle. To the left of the diagram is a circular inset showing a group of Euglena cells in a blue liquid environment. Below the diagram, there is a caption and a paragraph of text.


FIGURE 8
Euglena
The euglena is a common euglenoid that lives in fresh water. In sunlight, many euglenas can make their own food. Without sunlight, they obtain food from their environment. **Interpreting Diagrams** What structures help a euglena find and move toward light?

Euglenoids Euglenoids (yoo GLEE noydz) are green, unicellular algae that are found mostly in fresh water. Unlike other algae, euglenoids have one animal-like characteristic—they can be heterotrophs under certain conditions. When sunlight is available, most euglenoids are autotrophs that produce their own food. However, when sunlight is not available, euglenoids will act like heterotrophs by obtaining food from their environment.

A more flexible method of presentation

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Support materials on the textbook publisher's website



Student

[Hot Links](#)

[Internet Activities](#)

[Self-Test](#)

GO TO

RESOURCE CENTER

[Reference Links](#)

[BACK TO From Bacteria to Plants Home](#)

SCIENCE EXPLORER: From Bacteria to Plants


CHAPTER 3

PROTISTS AND FUNGI

The euglena in the illustration at the right is a protist that can make its own food when sunlight is present.

Phytoplankton—protists that are an important link in the ocean food chain—also have the ability to use the sun's energy to make food.

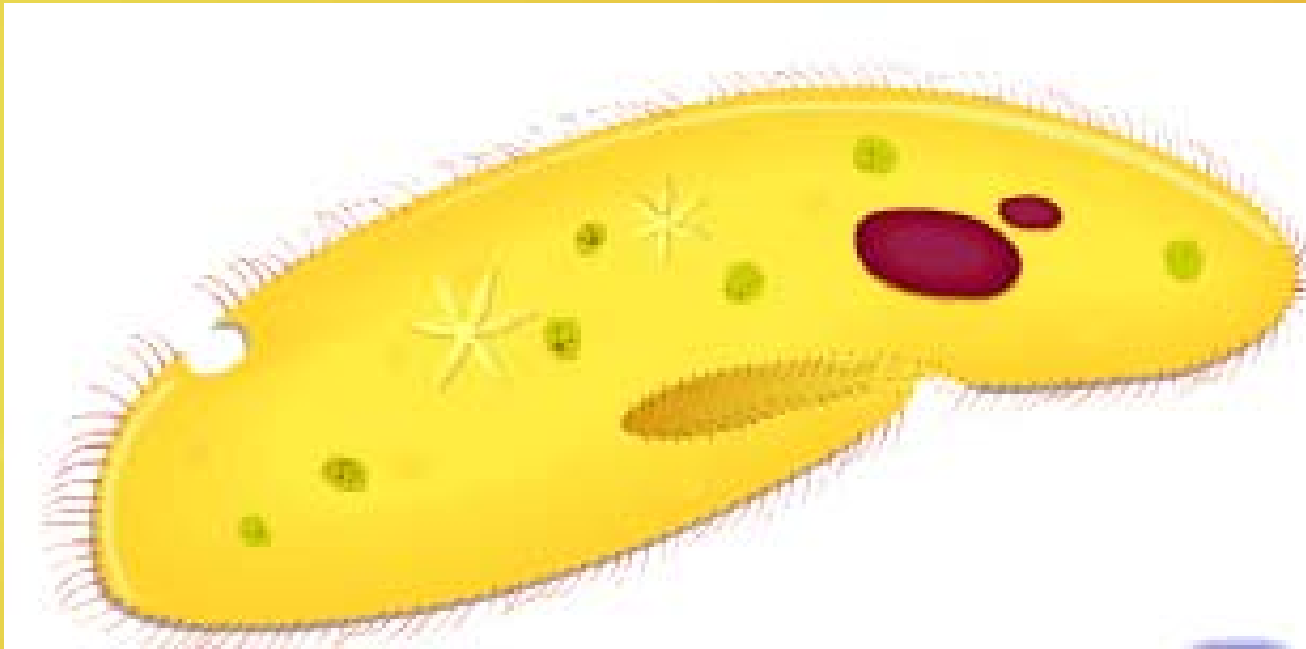
In this chapter's Internet Activity, you'll see how the concentration of phytoplankton in Earth's oceans varies depending on season and location. Just click on Internet Activities at the left.



SCIENCE NEWS Online
THE WEEKLY NEWSMAGAZINE OF SCIENCE

Science News [topic pages](#) provide a list of articles related to this chapter.

Using the textbook publisher's
link to an animation of a
paramecium



PowerPoint to re-teach or review

Kingdom of Fungi

- Most are made up of many cells.
- They cannot move from place to place.
- They feed off of other organisms by absorbing nutrients from living or dead organisms (heterotrophs).
- Includes mushrooms, molds, yeast, lichen, and mildew.



PowerPoint to re-teach or review

Kingdom Plantae

- Most are made up of many cells (multi-cellular)
 - They are autotrophs (they make their own food through photosynthesis)
 - Included in this kingdom are mosses, ferns, and flowering plants.
- Mo
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#2 Flexible options for student engagement

Giving students choices

Traditional lab directions vs. lab directions with graphic supports

INTRODUCTORY CHEMISTRY

DRAFT 9/5

INSTRUCTIONS FOR EACH LAB STATION

Testable Question: How can physical and chemical changes be distinguished from one another?
(Write your prediction in the space provided on the student resource sheet.)

Directions- LAB STATION #1:

Balloon Magic

1. Examine the bottle and balloon. Be sure the balloon is securely sealed on the bottle.
2. Place the plastic soda bottle into the warm water bath. Let stand for 2 minutes.
3. Place the plastic soda bottle into the cold water bath for 1 minute. (If the ice has melted, you may need to add more.)
4. Record observations under Data Collection.

**If this is your last station, clean up the materials and wait for directions from the teacher.*

Directions - LAB STATION #2: Crazy Candle

1. Use the lighter provided to light the candle.
2. Cover the candle with an upside down beaker.
3. Observe for 2- 3 minutes.
4. Record observations under Data Collection.

**If this is your last station, clean up the materials and wait for directions from the teacher.*

Directions - LAB STATION #3: Shake It Up

1. Hold the bottle with your thumb or finger over the top.
2. Gently shake the bottle 10 times.
3. Let the bottle stand while observing the contents.
4. Record observations under Data Collection.

**If this is your last station, clean up the materials and wait for directions from the teacher.*

Directions - LAB STATION #4: Tricky Tablet

1. Fill 1/3 of a 35 mm film container with water.
2. Place a piece of tablet in the container and immediately seal the container.
3. Rest the container on the desk or table-top and step back. Wait 2-3 minutes.
4. Record observations under Data Collection.

**If this is your last station, clean up the materials and wait for directions from the teacher.*

Crazy Candle

1. Use the lighter provided to light the candle.



2. Cover the candle with an upside down beaker.



3. Observe for 2 – 3 minutes.



4. Record observations under Data Collection.



If this is your last station, clean up the materials and wait for directions from the teacher.

Biodiversity Video Segment with Closed Captions

Discovery EDUCATION unitedstreaming

SEARCH WITHIN All Content [Advanced Search](#)

Home > Search Results: biodiversity > Full Video Details

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Full Video Video Segments Citations Related Materials

Fossils: Windows Into the Past (20:00)

This video contains 9 segments.


Select To Add

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Biodiversity: How Fossils Illustrate the Past (01:17)	<input type="checkbox"/>
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THE DIVERSITY OF LIFE IS REMARKABLE.

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Biology: The Science of Life: The Living Cell (15:13)



Description:

Explore the structure and function of the living cell. All living things, from simple pond dwelling creatures, like these, to complex animals and plants are made from the same building blocks called cells. Cells are defined as the simplest structures that can carry out all of the activities characteristic of life. That is, can reproduce, grow and develop, respond to their surroundings, and so on. Cells are like miniature factories which use raw materials and energy to create their amazing product which is none other than life itself. Large organisms are multicellular and are made from many different cells. The cells of multicellular organisms have become specialized to perform all sorts of tasks such as those carried out by muscles and blood. In contrast, many of the smallest organisms, such as the Protist paramecia, are unicellular and possess just one cell.

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Grades: 6-8 [cc](#) [edit](#)

Rating: ★★☆☆☆
(44 ratings submitted)

Video Segments

This video is composed of 12 segments:

- [Cells: The Basic Units of Life](#) (01:49)
- [Protoplasm, the Cell Membrane, and the Cell Wall](#) (01:37)
- [The Nucleus and Cytoplasm](#) (09:18)
 - [The Cytoplasm](#) (01:14)
 - [The Nucleus](#) (01:04)

Citations

Citation (MLA)

[Biology: The Science of Life: The Living Cell](#). United Learning. 2001.
unitedstreaming. 13 November 2007
<<http://streaming.discoveryeducation.com/>>

Citation (APA)

[Biology: The Science of Life: The Living Cell](#). United Learning
(2001). Retrieved November 13, 2007, from

#3 Flexible methods of expression, and assessment

**Options for how students
demonstrate their learning**

Give students a choice of tools:

Choices to express new learning:

- Paper and pencil
- MS Word
- Portable word processors (AlphaSmart/NEO)
- PowerPoint
- Windows Movie Maker



Traditional vs. added graphic supports for recording lab results (8th grade)

DRAFT 9/5

INTRODUCTORY CHEMISTRY

Name _____ Date _____ Period _____

Chemical and Physical Changes of Matter

Matter	Changes that can happen
Tree	
Rock	
Water	
Air	

Prediction: _____

Data Collection:





Lab Stations #	Physical Change or Chemical Change	Rationale for your Choice
1		
2		
3		
4		

Summary:

Describe how physical and chemical changes may be distinguished. Be sure to include supporting evidence from the investigation.






Name : _____ Date: _____ Period: _____

Chemical and Physical Changes of Matter

Matter	Changes that can happen
Tree 	
Rock 	
Water 	
Air 	

Prediction: 

+ Data Collection:

Lab Station	Physical (P) or Chemical (C) Change	Rationale (reason) for your choice 
Balloon Magic 		
Crazy Candle 		
Shake it Up 		
Tricky Tablet 		

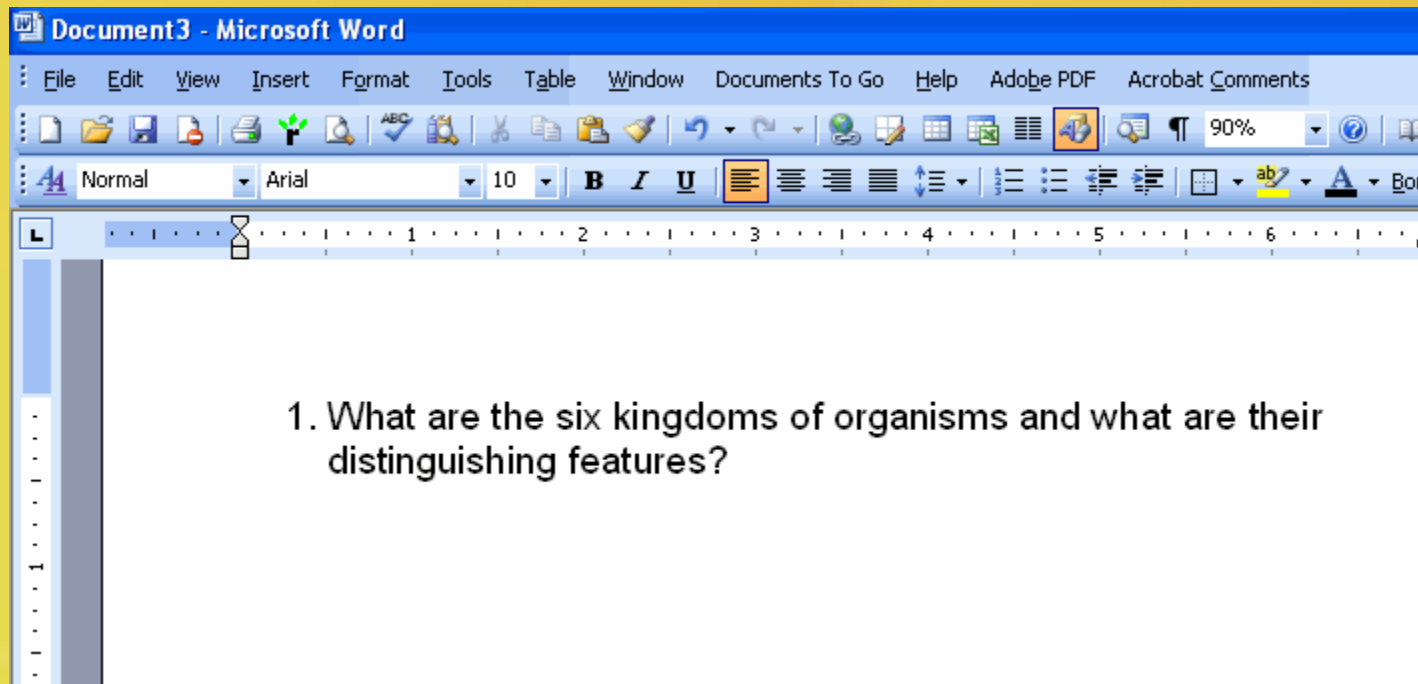
Traditional means of assessment

1. What are the six kingdoms of organisms and what are their distinguishing features?

6th Grade Science Preassessment



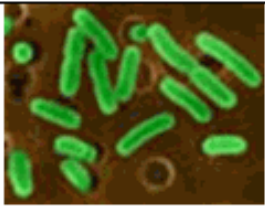
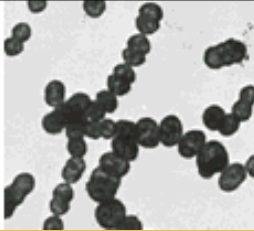
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Flexible means of assessment



Typing instead of writing for students who need handwriting and spelling support.

Organizer and pictures to aid recall

Kingdom	Makes own food	Many cells	Complex cells	Where are they found?
 Plants	Yes	Yes	Yes	
 Animals	No	Yes	Yes	
 Archebacteria	Both	No	No	In extreme environments
	Both	No	No	everywhere

UDL – Differentiated Instruction – and Assistive Technology – What's the difference?

- Both DI and UDL are frameworks for instruction, but UDL is a framework that guides instructional materials as well as methods.
- UDL focuses on the flexible capacity of new media, and therefore, the use of digitized instructional materials.
- AT is concerned with individuals – UDL is concerned with all students

How do you incorporate the principles of UDL into lesson planning?

UDL Planning Form

Unit of Study in the MCPS Curriculum:

Grade level:

Standards:

Indicators:

Essential Understandings:



Current MCPS Instructional Delivery and assignments as described in Instructional guides	Challenges for some students	UDL solutions Methods and materials that offer multiple means of:		
		<i>Engagement:</i>	<i>Presentation:</i>	<i>Expression (Including Assessment)</i>
Printed reading materials	Student cannot see small text. Student cannot decode at grade level. Student has difficulty comprehending vocabulary.			
Lecture/whole class presentation	Student is distractible and misses information. Student has difficulty processing verbal information. Student has difficulty comprehending material content.			
Writing assignment	Student cannot handwrite legibly. Student cannot outline and organize ideas. Student has difficulty with written language. Student struggles with spelling.			

Current MCPS Instructional Delivery and assignments as described in Instructional guides	Challenges for some students	UDL solutions		
		Methods and materials that offer multiple means of: <i>Engagement:</i>	<i>Presentation:</i>	<i>Expression</i> (including Assessment)
Pre and post assessments quizzes	Student cannot read questions. Student cannot retrieve key content vocabulary with ease. Student needs test taking preparation.			
Organizational skills/work habits	Student had difficulty understanding or sequencing tasks. Student has difficulty staying on task. Student has difficulty completing homework. Student is reluctant to ask for help.			
Research	Student has difficulty with organization. Student may not be able to abstract important content.			
Oral report	Student has speech difficulties. Student has difficulty presenting orally in front of peers.			
Drawing	Student cannot draw to represent objects or math/science concepts			
Group project	Student has difficulty interacting with peers.			

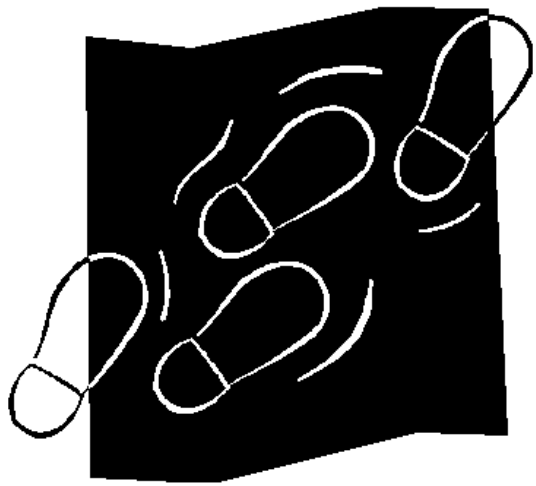
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The current vision.....

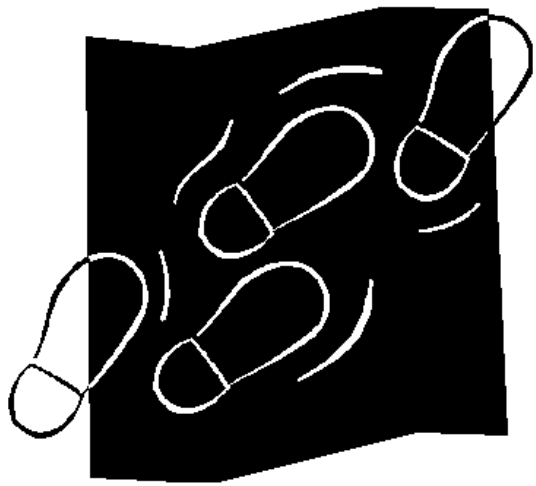
- School districts across the country are working toward UDL.
- MCPS, like other districts, is making a commitment to move toward UDL.



Stepping forward....

Opportunities

- Increase awareness of UDL principles.
- Make a commitment as a school to make curriculum materials more flexible.
- School collaboration to shift to a more universally designed curriculum.
- Examine computer availability and lab scheduling at your school.



Stepping forward....

- Self-education to learn to create flexible, digital materials.
- In-school and out-of-school training on the tools available at your school.
- Use the Web to locate curriculum specific digital materials.
- Build an a personal and school inventory of digital materials.

What resources are available to you to move toward UDL?

- E-TIPS: Educators using Technology to Improve the Performance of Students
- In-School Project-Based Training
- Textbook publisher resources on line