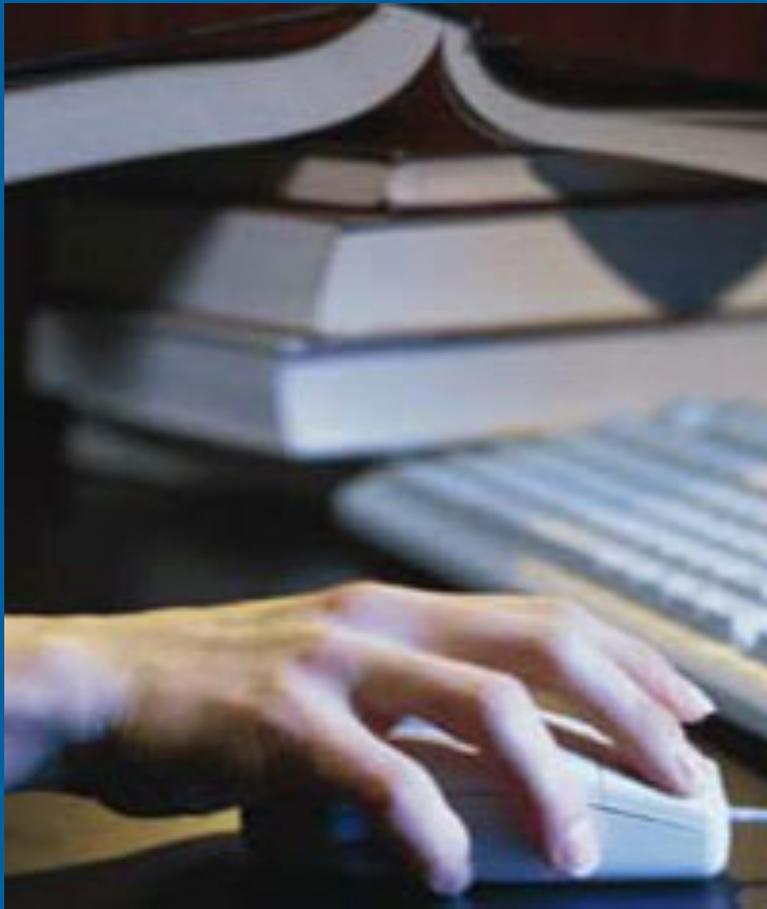


UDL



Universal Design for Learning

UVM

May, 2010

UDL

First, a policy interruption

NIMAS

**The National
Instructional Materials
Accessibility
Standard**



UDL in public policy



..NIMAS is a standard for digital source files that can be used to accurately and reliably produce instructional materials in a variety of alternate formats using the same source file.

UDL in public policy



NIMAS OUTCOMES:

Virtually every textbook in American schools published after 2006 is now available in a digital XML version to any child with a **print disability**.

UDL

**What is the difference between
a Learning Disability
and a Print Disability?**

UDL Who has a print disability?





Who has a print disability?

The Library of Congress regulations (36 CFR 701.6(b)(1)) related to the Act to Provide Books for the Adult Blind (approved March 3, 1931, 2 U.S.C. 135a) provide that "blind persons or other persons with print disabilities" include:

Blind persons whose visual acuity, as determined by competent authority, is 20/200 or less in the better eye with correcting glasses.

Persons whose **visual disability**, with correction and regardless of optical measurement, is certified by competent authority as preventing the reading of standard printed material.

Persons certified by competent authority as unable to read or unable to use standard printed material as a result of **physical limitations**.

Persons certified by competent authority as having a **reading disability resulting from organic dysfunction** and of sufficient severity to prevent their reading printed material in a normal manner.

UDL

In the intervening 70 years, some key advances :

Advances in our understanding of learning

Advances in our understanding of disability

Advances in technology and media

UDL

Part One:

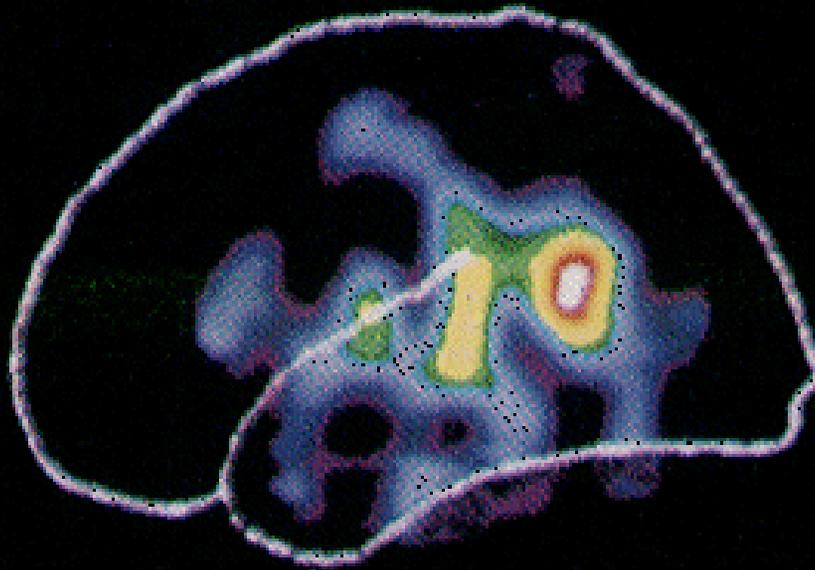
What do we mean by advances in
Learning?

UDL

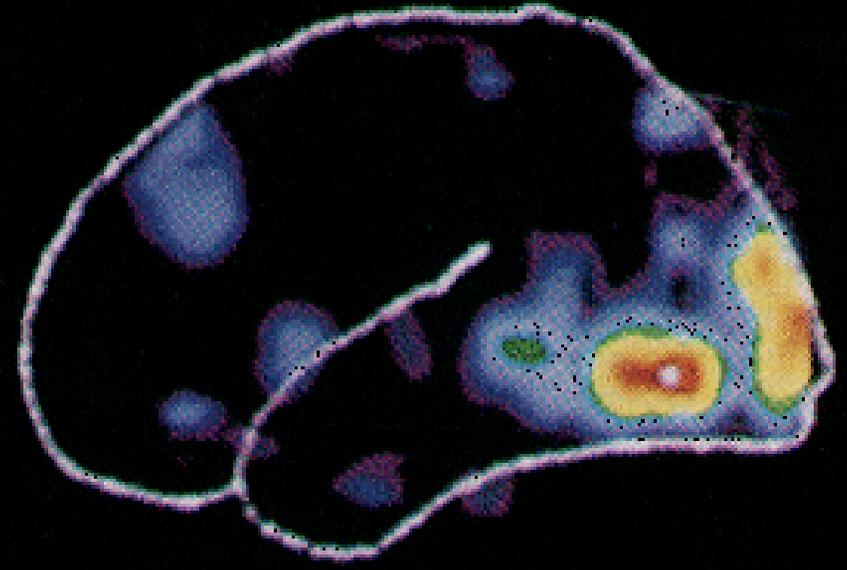
What do we learn from modern neurosciences?

1) All learning abilities and disabilities are organic

UDL



HEARING WORDS



SEEING WORDS

Posner and Raichle,
Images of the Brain

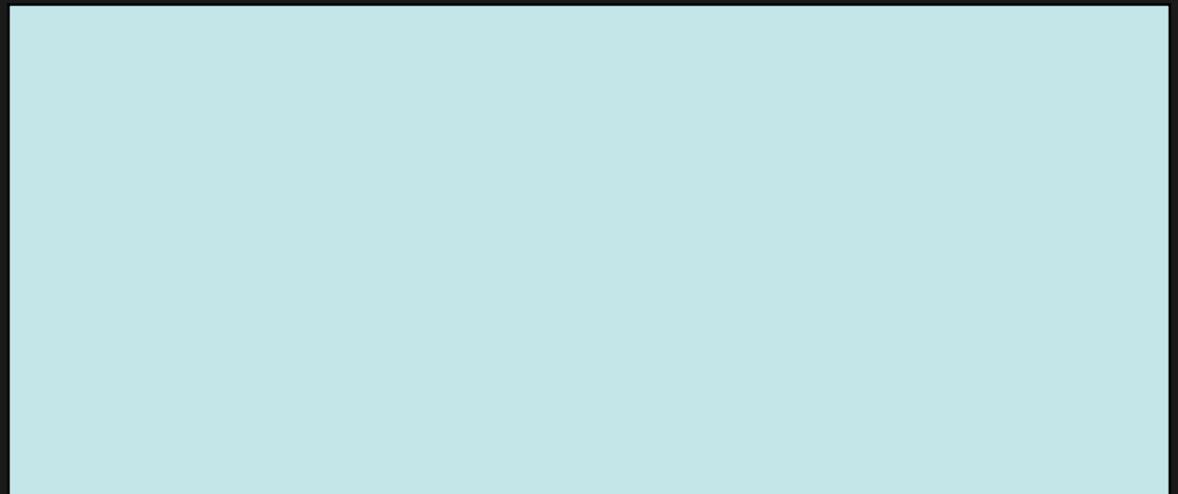
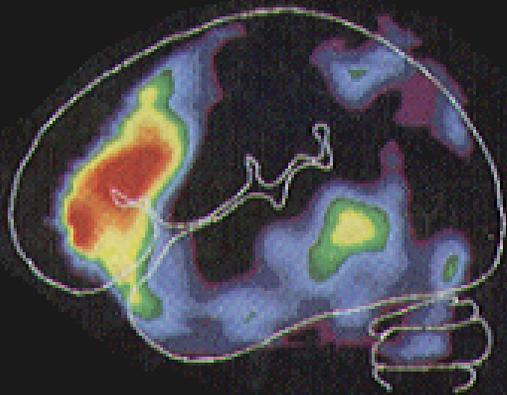
UDL

What learning looks like*

NAIVE

PRACTICED

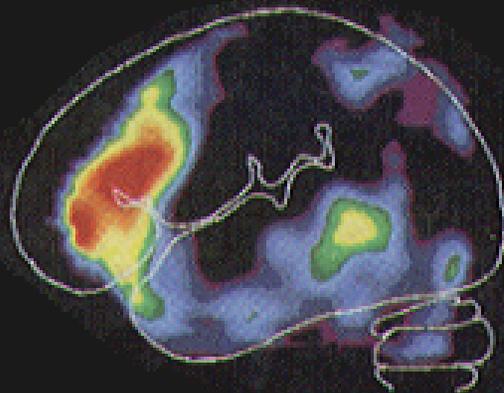
NOVEL



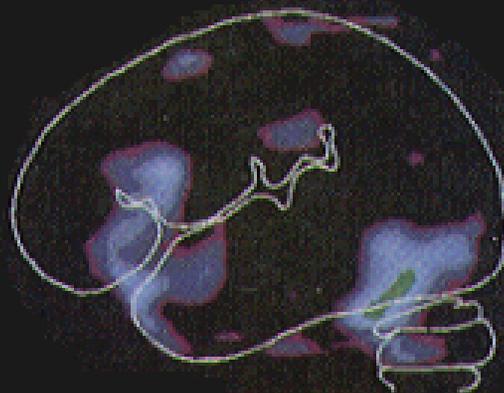
UDL

What learning looks like*

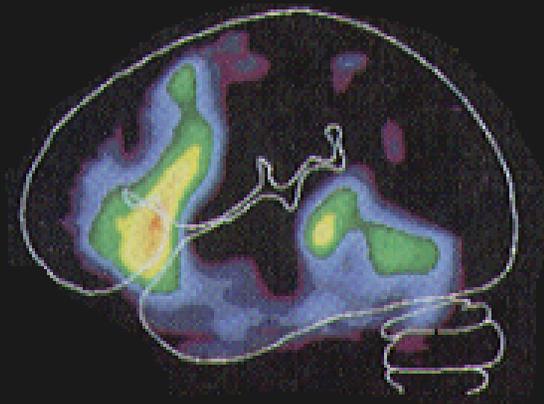
NAIVE



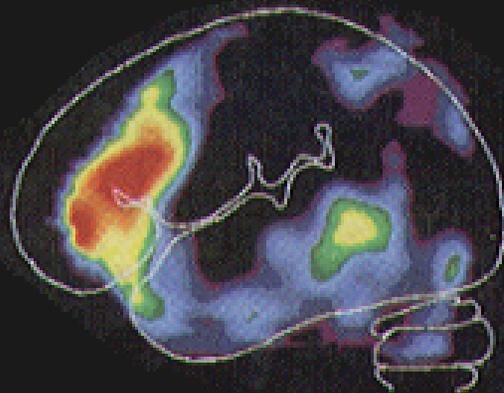
PRACTICED



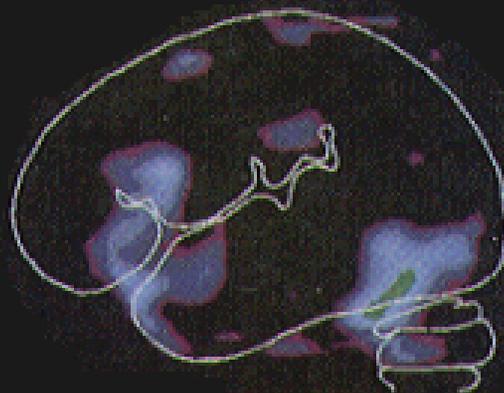
NOVEL



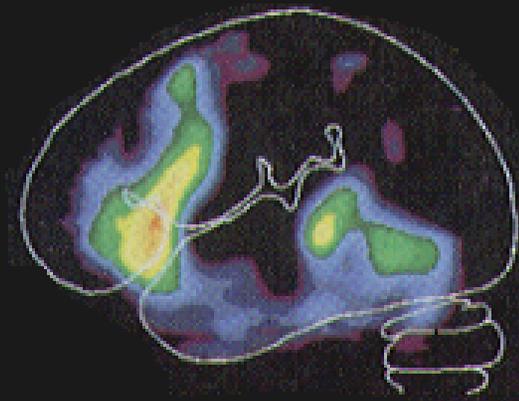
NAIVE



PRACTICED



NOVEL



UDL

What do we learn from modern neurosciences?

2) Learning is differentiated
by Individual

UDL



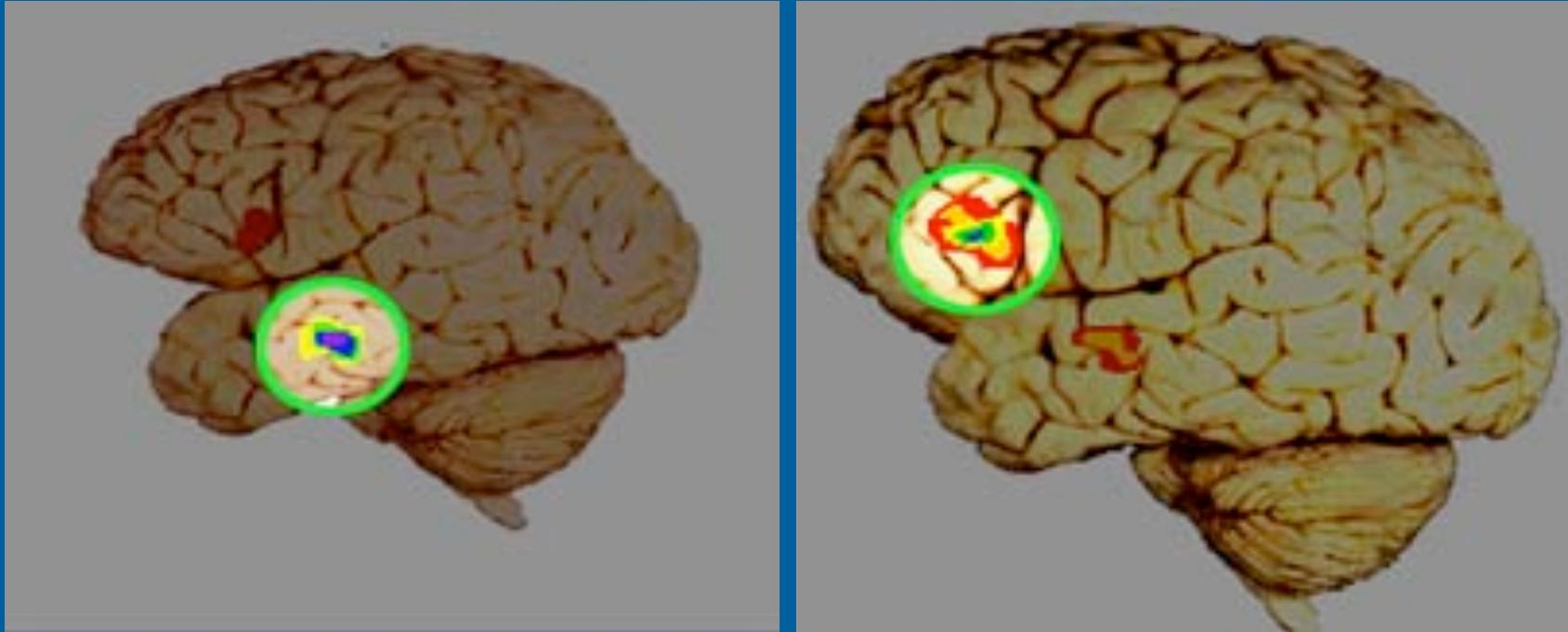
DYSLEXIC



NORMAL

From Shaywitz et al.

UDL

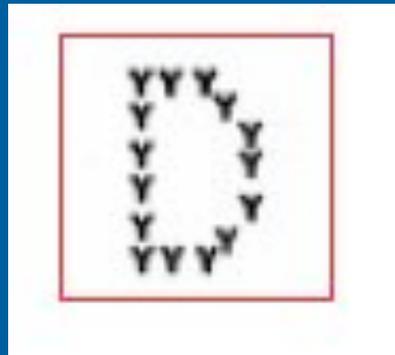


When reading emotion, teens (**left**) rely more on the amygdala, while adults (**right**) rely more on the frontal cortex.

Deborah Yurgelon-Todd, 2000

UDL

Individual Differences in the Means of Representation



Students with
Williams
syndrome

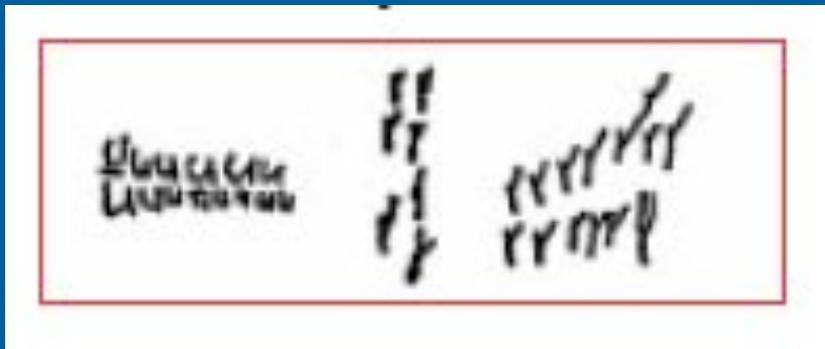
Students with
Down
syndrome

UDL



Students with
Williams Syndrome

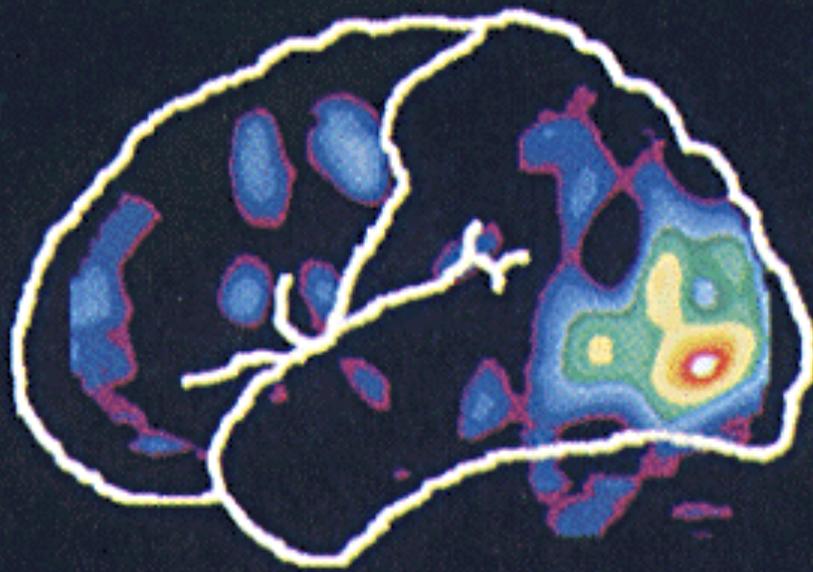
Students with Down
Syndrome



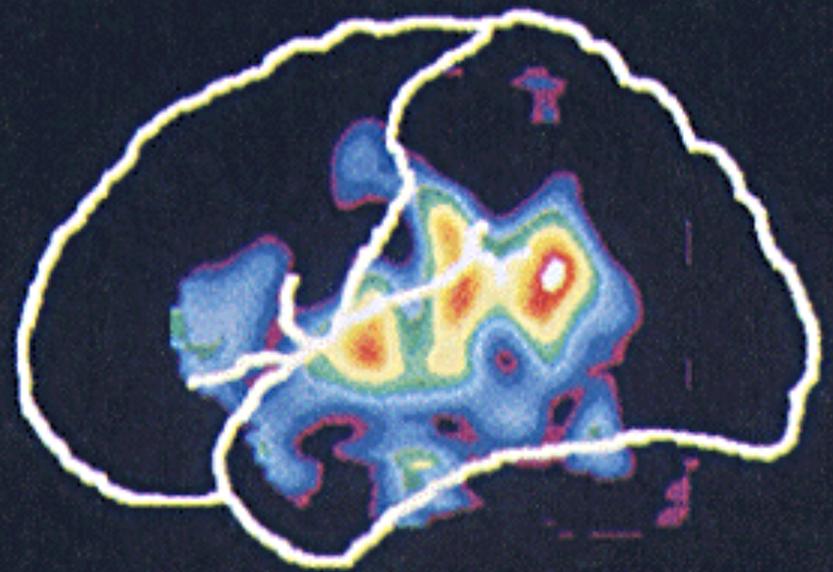
UDL

What do we learn from modern neurosciences?

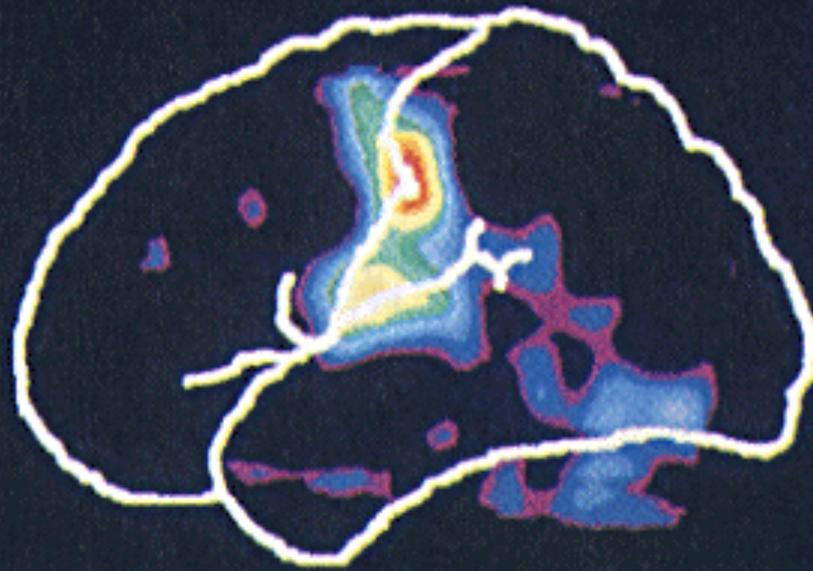
3) Learning is differentiated
by task



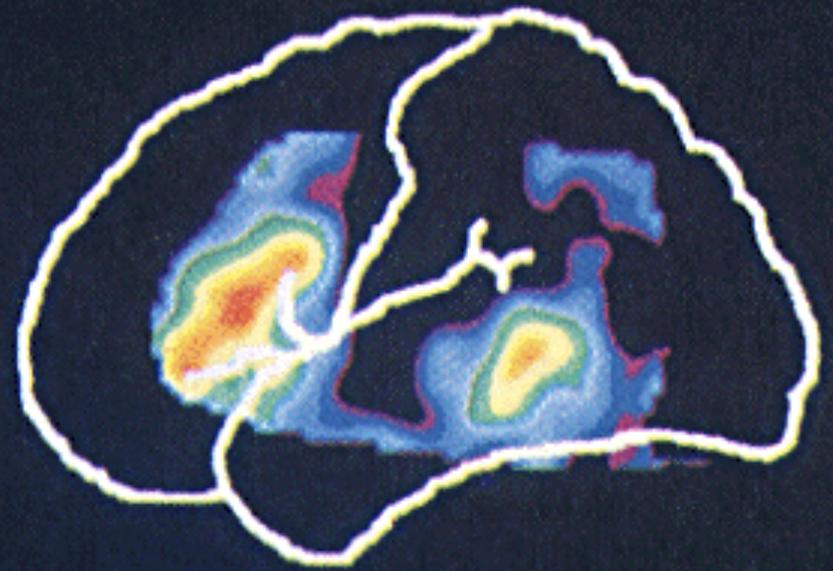
Passively viewing words



Listening to words



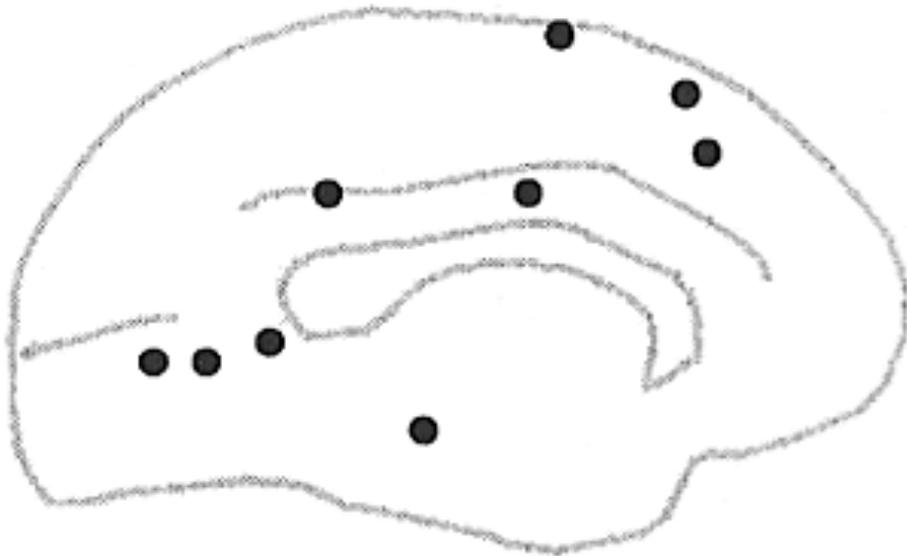
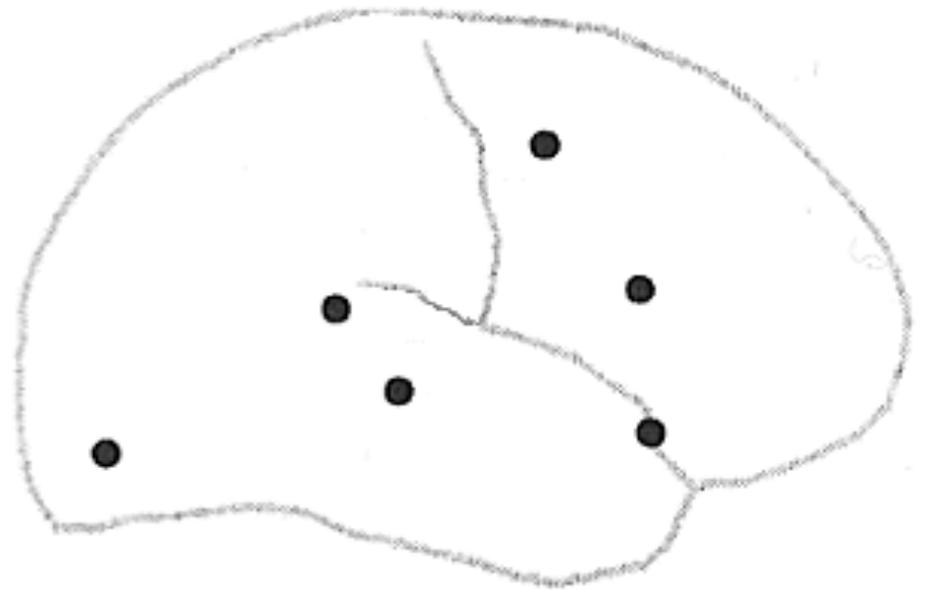
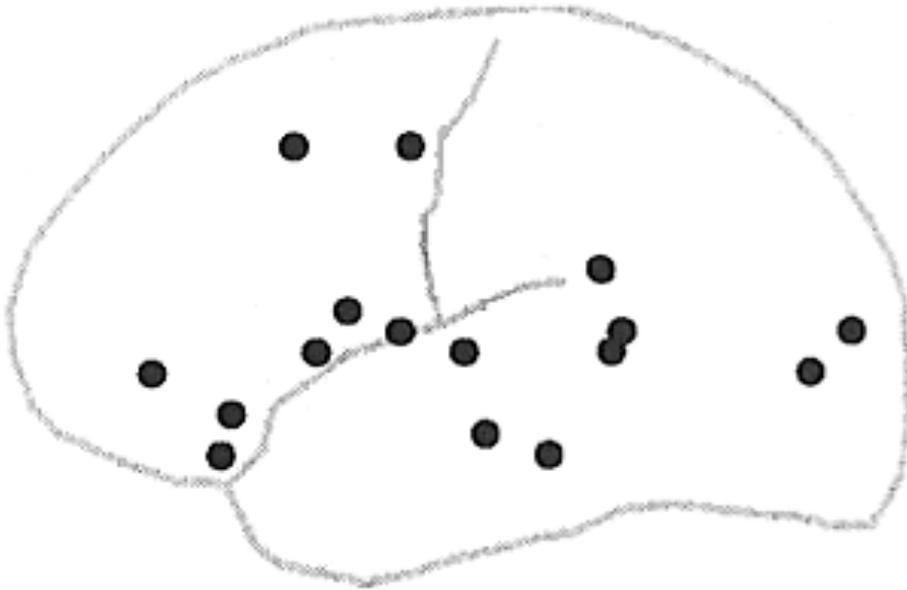
Speaking words



Generating verbs

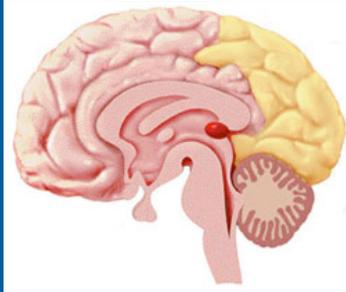
UDL

Reading is differentiated in the Brain



UDL

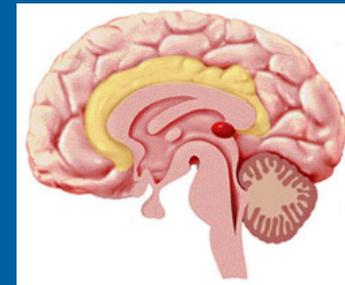
Understanding what learning to read requires



Recognition
networks

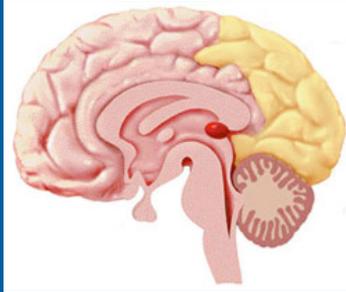


Strategic
networks



Affective
networks

UDL Understanding the science of what learning is



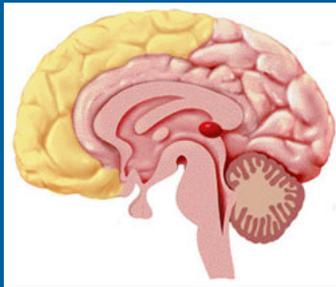
Perceive information in the environment and transform it into useable knowledge

Recognition networks



UDL

Understanding the science of what learning is

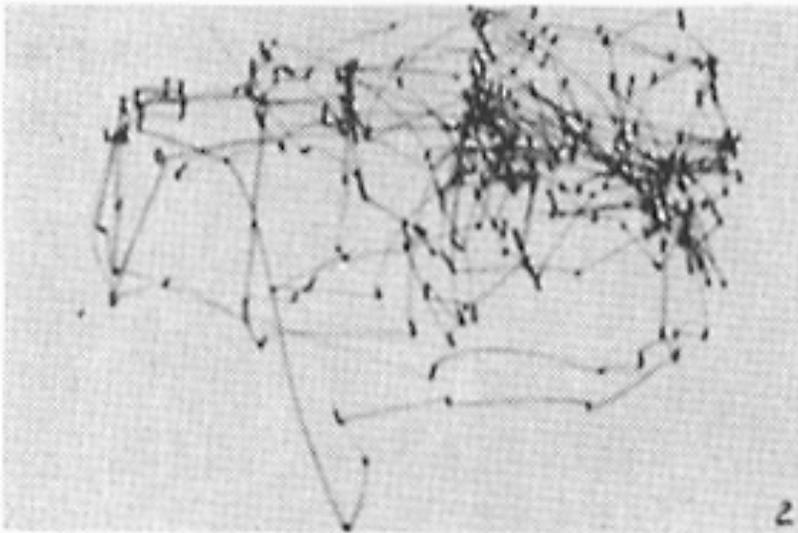
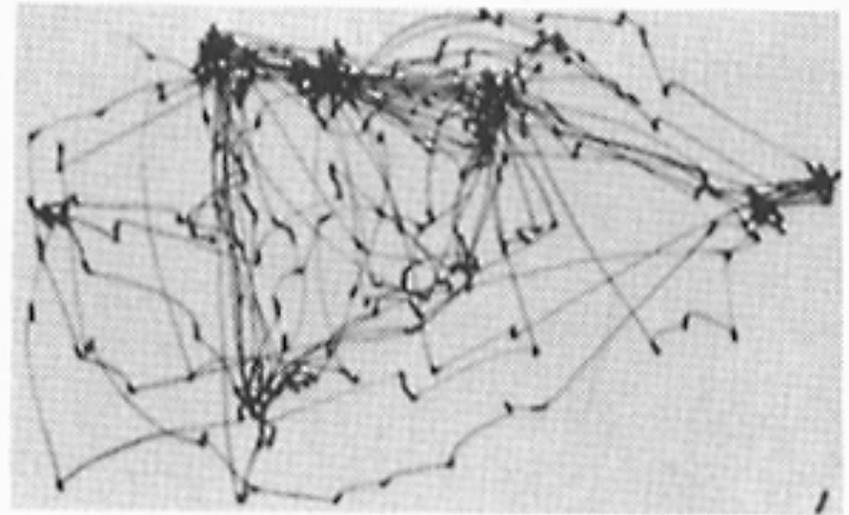


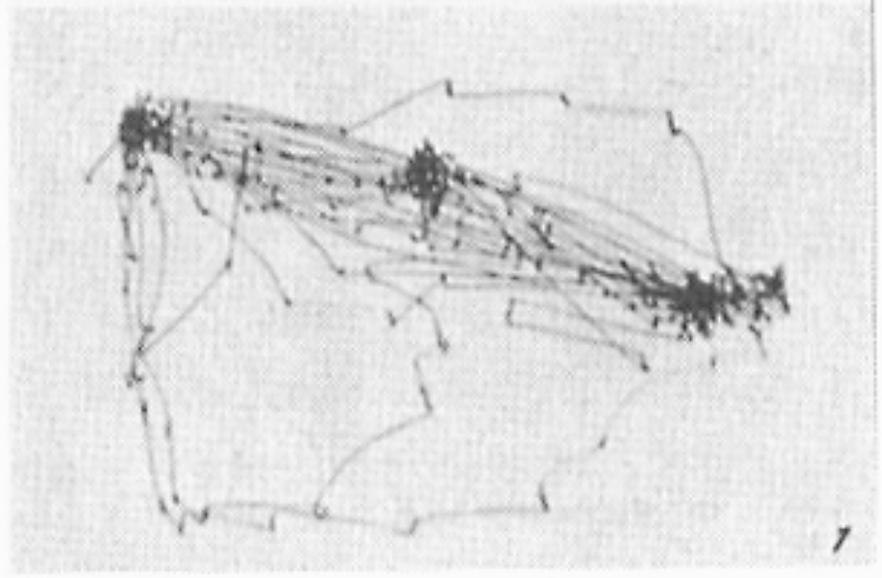
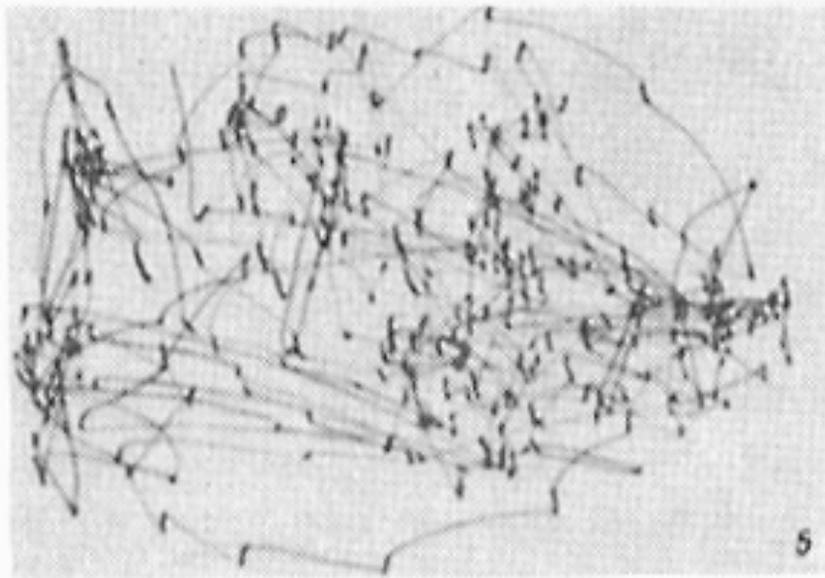
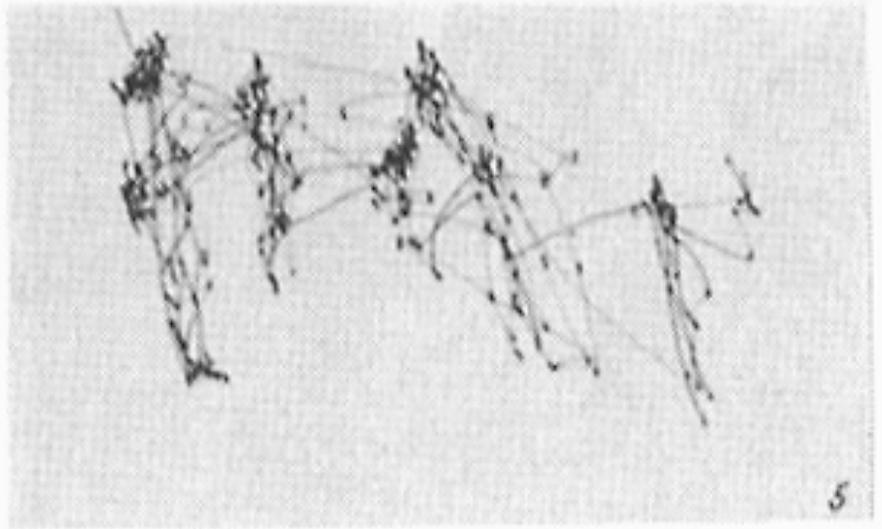
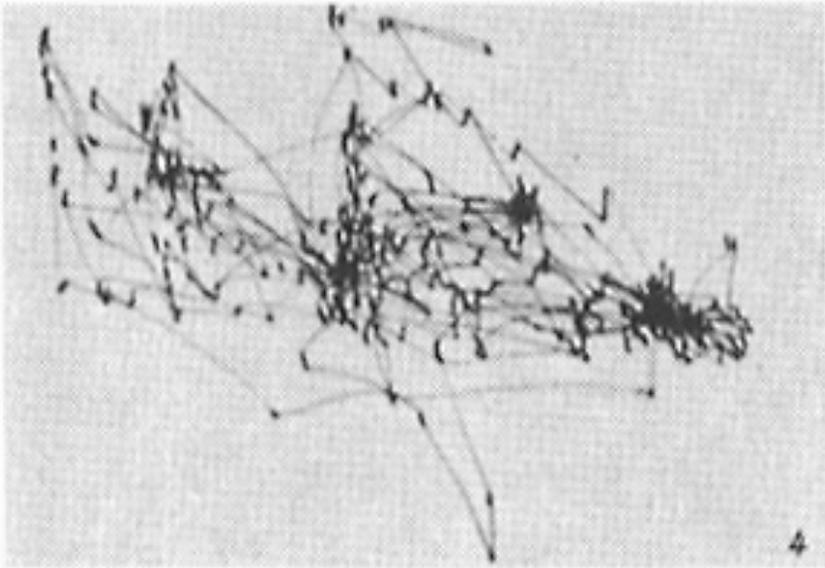
Plan, organize, and initiate purposeful actions on the environment

Strategic networks

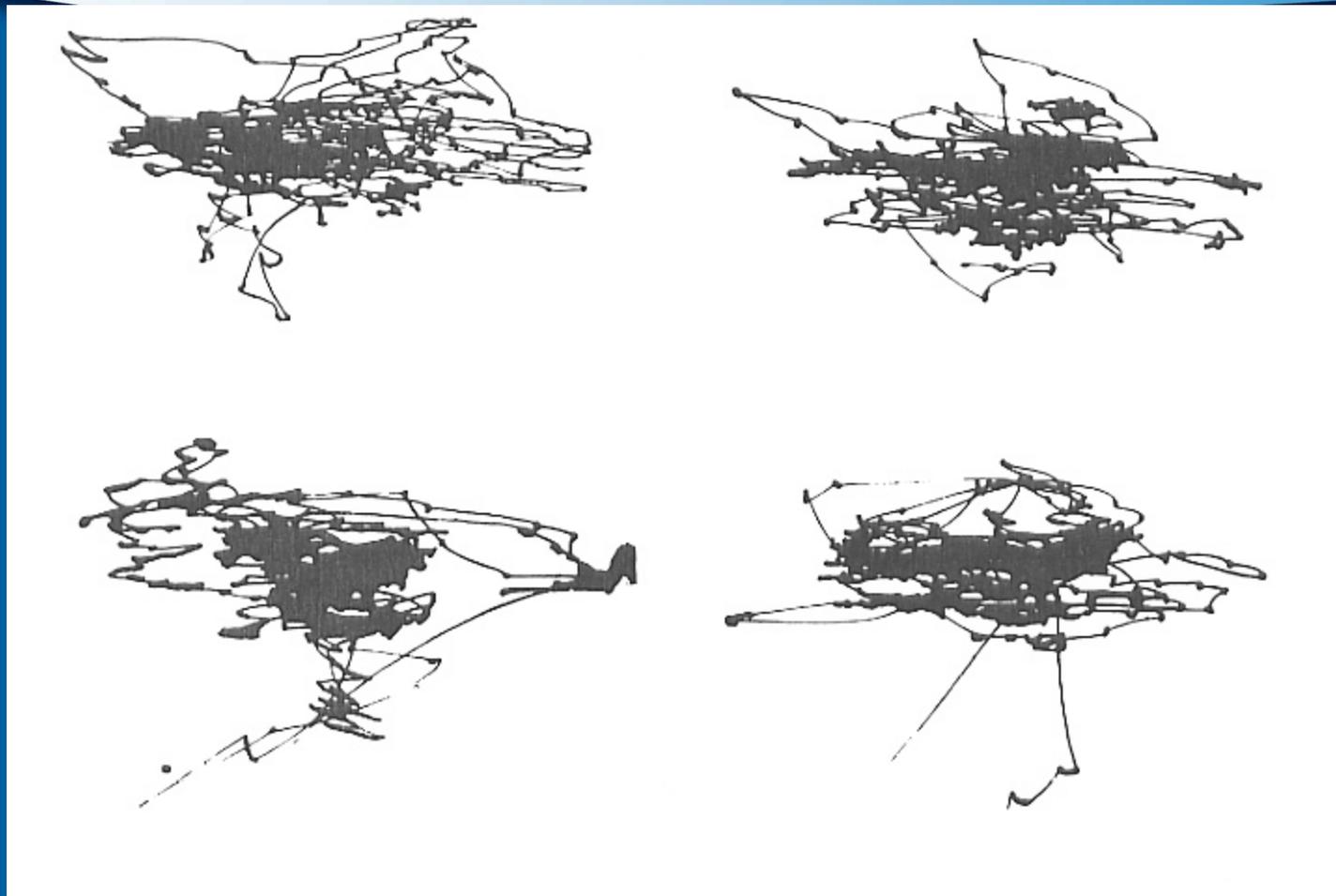
U







UDL



2D Plot - 1-Senses(Complex-Implicit).bmp

The Five Senses
 Humans have five senses: sight, hearing, taste, smell, and touch. Each of these senses has an organ. These sense organs are also part of the nervous system.

Sight
 Eyes are the organs of sight. Light bounces off objects and enters your eyes. This light triggers nerves in the back of the eyes. These nerves send messages to your brain, and you see an object.

Hearing
 Ears are the organs of hearing. All sounds are made by vibrations. Vibrations are quick back and forth movements of air. Think of a drum. When you beat a drum, you make it vibrate. The vibrations travel long distances in waves. The sound waves enter the ears. Tiny bones inside the ears are moved by the vibrations. Nerves pick up the movement and send a signal to the brain. You hear this as sound. People sometimes cup their hands behind their ears to hear better. This directs the sound to the inner ear.

Taste
 The tongue is the organ of taste. People can taste only four types of flavors: sour, sweet, salty, and bitter. Different areas of the tongue taste different flavors. The tip tastes sweet and salty things. The sides taste sour things. The back tastes bitter things. Not all animals have the same sense of taste. Cats do not taste sweet things.

Smell
 The nose is the organ of smell. Think of smelling an onion. Tiny molecules from the onion drift up to your nose. There, the molecules from the onion trigger nerve cells that send a message to your brain.

Touch
 Skin is the organ of touch. Some areas of skin, such as the fingertips, are very sensitive to heat, cold, touch, and pain. These areas have more nerve cells than other areas. The sense of touch protects the body from harm. It works like an alarm system. If something sharp or hot touches your body, you know to move away.

Skin is the human body's largest organ. It serves many functions besides passing sensory messages to the brain. For example, it keeps the body from drying out. As part of the immune system, it also keeps out some harmful bacteria.

Skin has sweat glands in it. Sweat glands make sweat. Sweat is made of water and salt. The water in sweat cools the body when a person gets overheated. So skin also helps the human body stay at the right temperature.

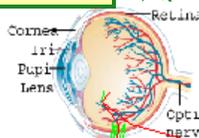
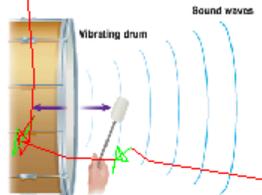
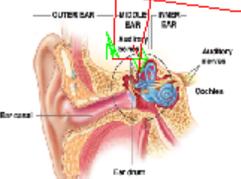
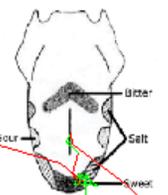
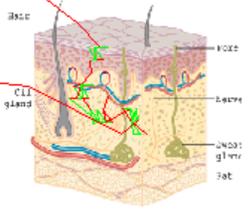
Figure 1.
 The human eye. Light enters from the left and triggers nerves on the right.

Figure 2.
 Beating a drum causes it to vibrate and create sound waves.

Figure 3.
 The human ear showing the tiny auditory bones which are moved by sound vibrations.

Figure 4.
 The four taste areas of the human tongue.

Figure 5.
 Cross section of human skin.

2D Plot - 1-Senses(Complex-Implicit).bmp

The Five Senses
Humans have five senses: sight, taste, smell, touch, and hearing. Each of these senses has an organ. These sense organs are part of the nervous system.

Figure 1
The human eye. Light enters from the left and triggers responses in the light.

Figure 2
Beating a drum causes it to vibrate and create sound waves.

Most people think of more than just sight as the five senses. However, when people lose touch with one of their senses, the other senses become much sharper when the sense of sight is taken away.

Hearing
The human ear is made of tiny bones which are moved by sound vibrations. Vibrations are quick back and forth movements of air. Think of a drum. When you beat a drum, you shake it and create vibrations that travel outwards in waves. The sound waves enter the ears. Tiny bones inside the ears are moved by the vibrations. The ears pick up the movement and send a signal to the brain. You hear this as sound. People sometimes cup their hands behind their ears to hear better. This directs the sound to the inner ear.

Figure 3
The human ear showing the tiny auditory bones which are moved by sound vibrations.

Figure 4
The four taste areas of the human tongue.

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Figure 5
Cross section of human skin.

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Skin has sweat glands in it. Sweat glands make sweat. Sweat is made of water and salt. The water in sweat cools the body when a person gets overheated. So skin also helps the human body stay at the right temperature.

The image contains several diagrams: Figure 1 shows a cross-section of the human eye with labels for Cornea, Iris, Pupil, Lens, Retina, and Optic nerve. Figure 2 shows a vibrating drum with sound waves. Figure 3 shows a cross-section of the human ear with labels for Eardrum, Hammer bone, Anvil bone, Stirrup bone, Cochlea, and Ossicles. Figure 4 shows a map of the human tongue with taste areas labeled: Sour, Bitter, Salt, and Sweet. Figure 5 shows a cross-section of human skin with labels for Duct, Hair, Pore, Sweat gland, and Fat.

UDL

Understanding the science of what learning is



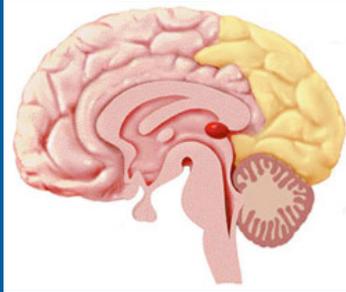
Affective
networks

Monitor the internal and external environment to set priorities and to motivate learning and behavior

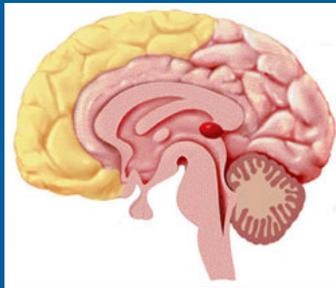


UDL

Individual Differences in Learning to read



Recognition networks



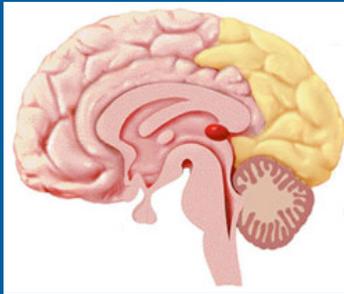
Strategic networks



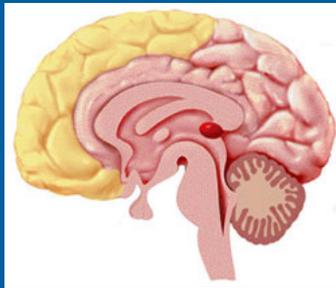
Affective networks

UDL

Types of "learning disabilities" in learning to read



Recognition disabilities



Strategic disabilities



Affective disabilities

UDL

Part Two:

Advances in our
understanding of
Disabilities

UDL

The idea of universal design

Ron Mace introduces concept of "universal design" in architecture.

The design of all products and the built environment to be aesthetic and usable to the greatest extent possible by everyone, regardless of their age, ability, or status in life.



1941-1998

Ron Mace, founder
and program director of
The Center for Universal Design

UVA







U



UDL

Part Three:

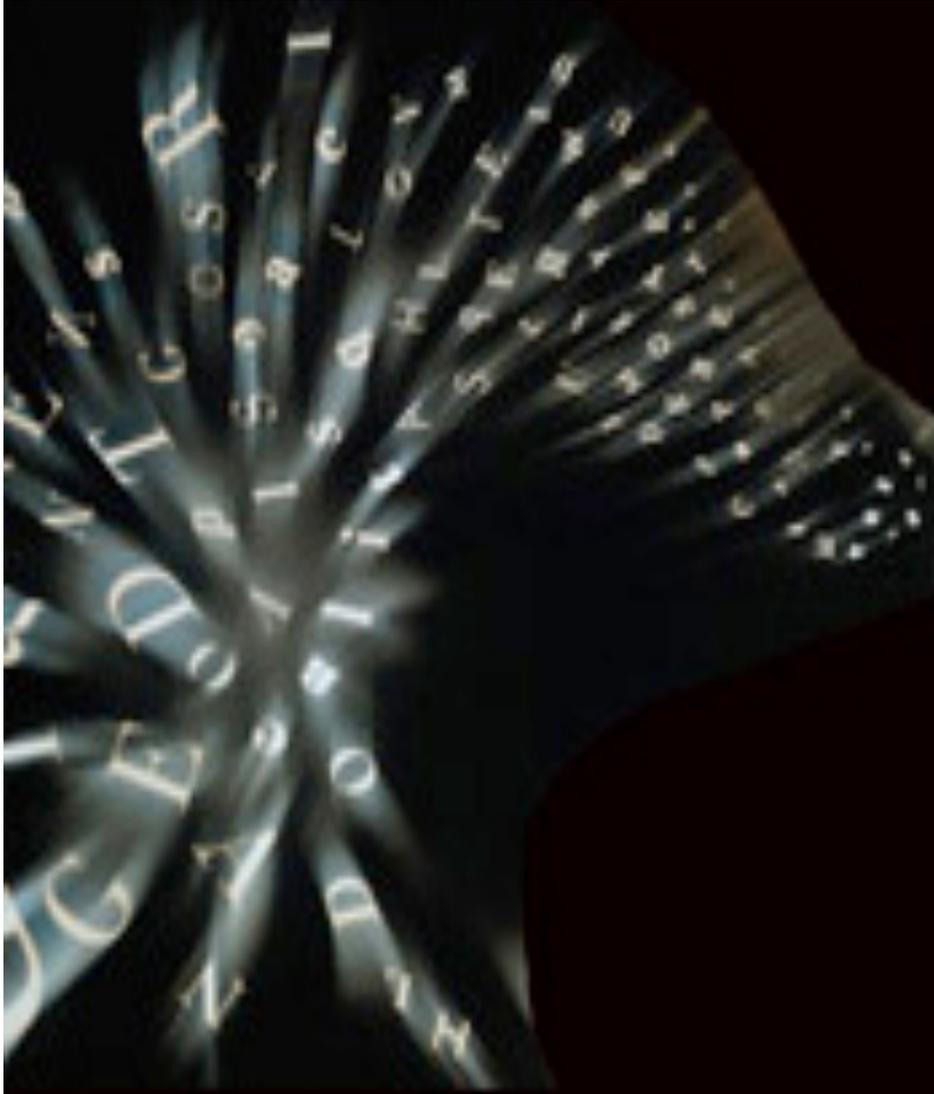
Advances in technology
and media

UDL

New Media



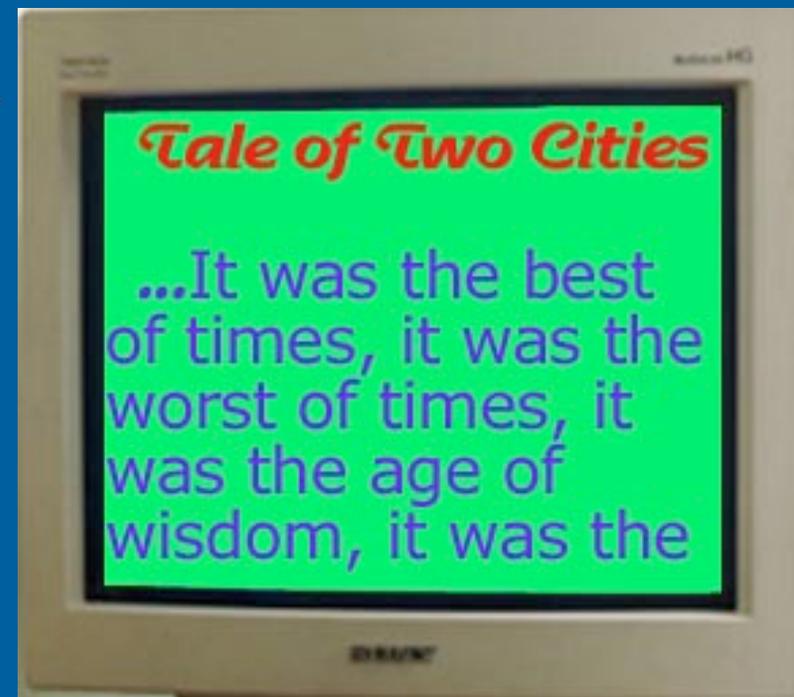
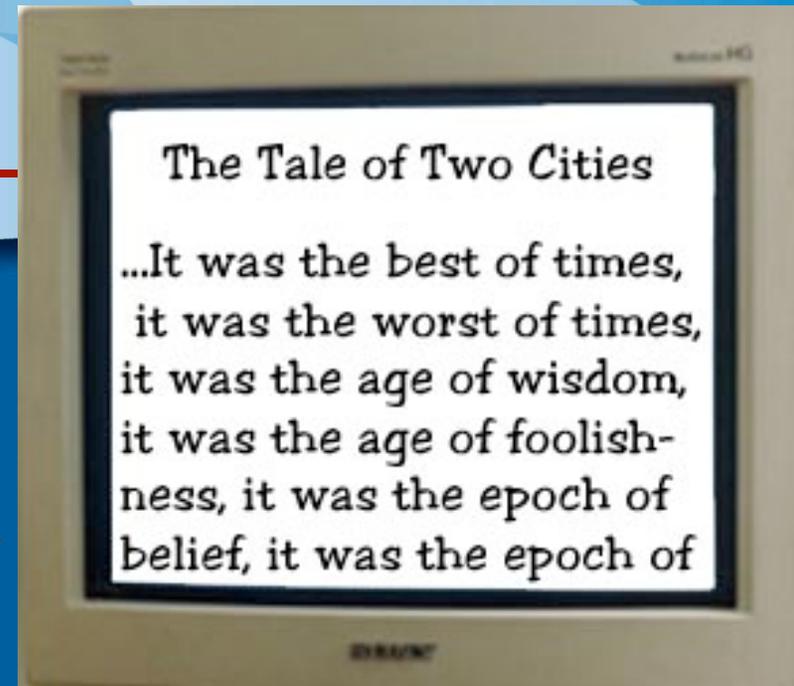
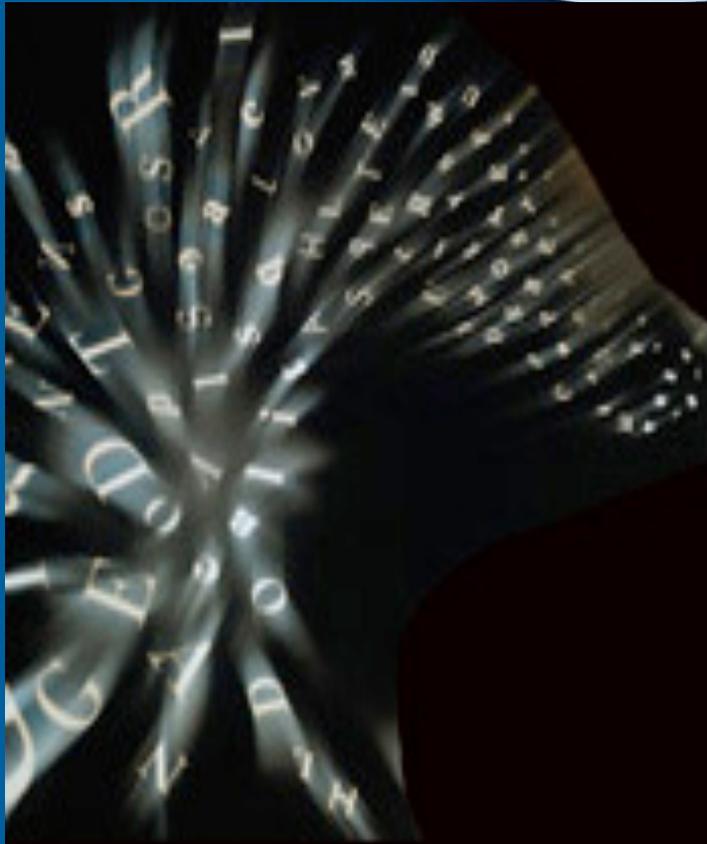
UOL A foundation for flexibility



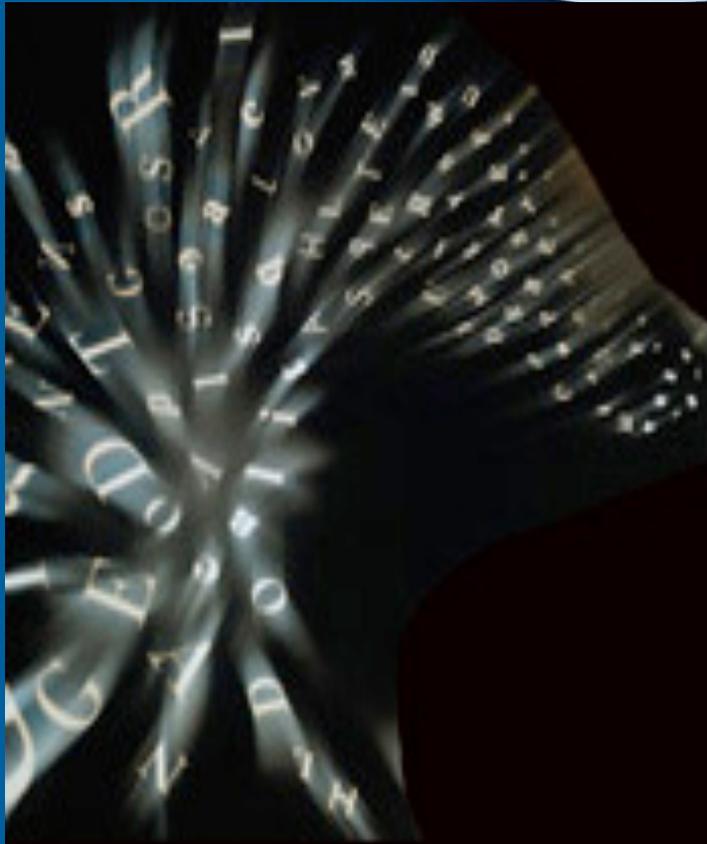
The virtue of NIMAS or XML



WDL Flexible display

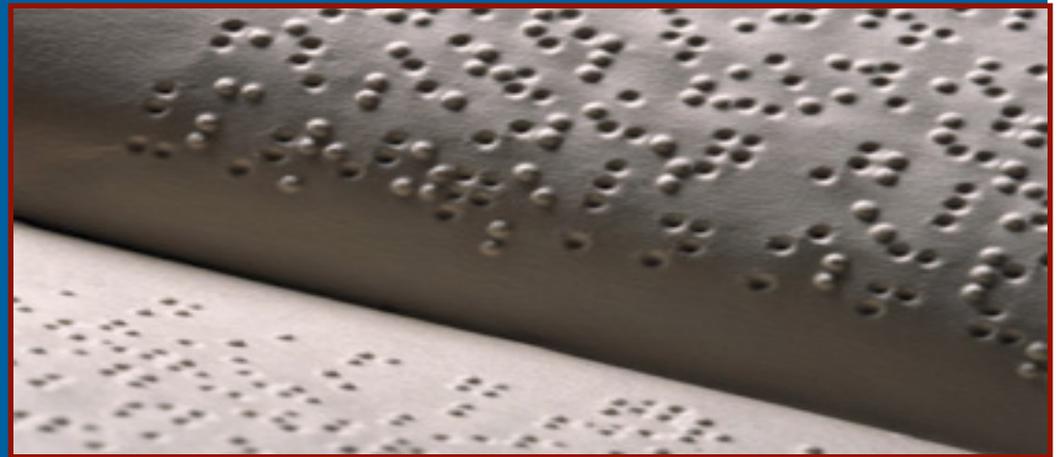


Flexible Display: Multiple Representation



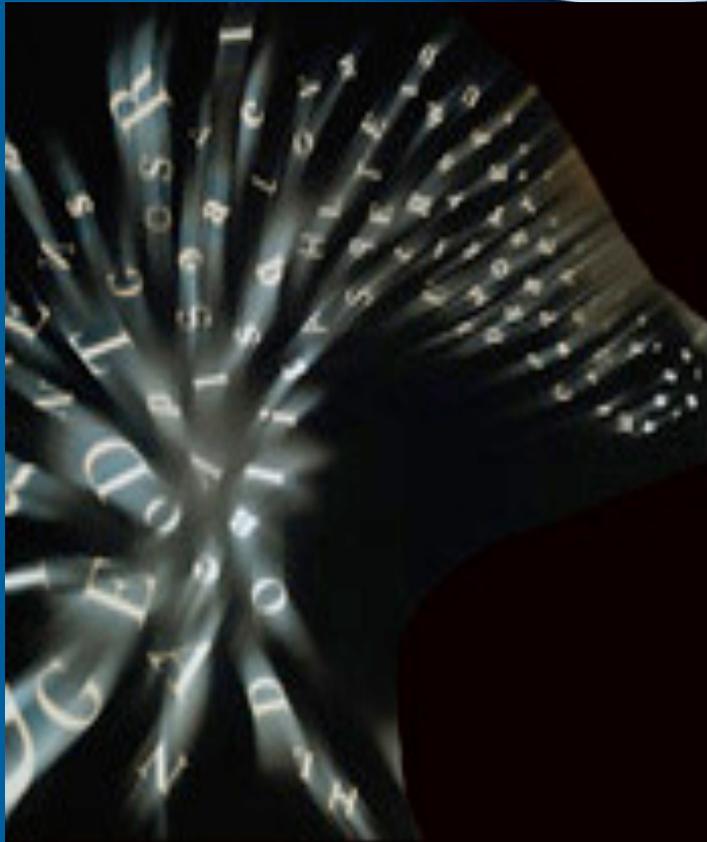
Tale of Two Cities

...It was the best of times, it was the worst of times, it was the age of wisdom, it was the age of



UDL

Multiple representations



CAST eReader - Wearing Down the Land HTML.htm

File Edit View Window Read Format Tools Web Browser

Wearing Down the Land HTML.htm

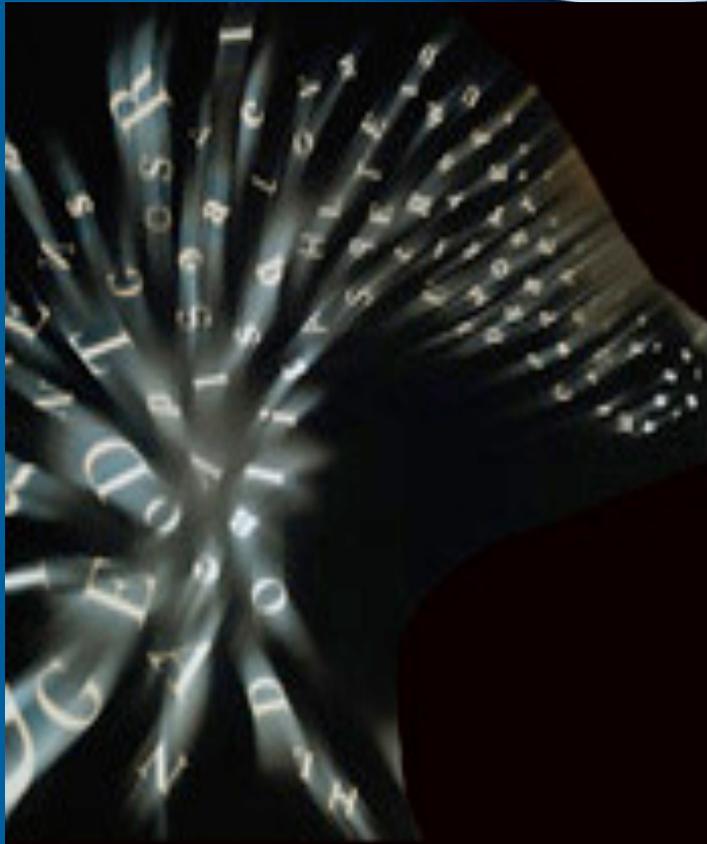
Address: file:///C:/Documents%20and%20Settings/Linda%20Butler

Wearing Down the Land For millions of years the Colorado River has been carving the walls of the Grand Canyon in northern Arizona. It was not until 1869, however, that anyone would try the 277-mile (446-km) trip through the canyon. In that year John Wesley Powell led a group of scientists down the Colorado River. Powell had decided that following the Colorado River through the Grand Canyon would add "to the great sum of human knowledge." Powell strapped a chair to the deck of his boat and set off down the churning, swirling river. During the dangerous 3-month trip, he looked up at canyon walls so high that they threatened to block out the sun. To form the Grand Canyon, the Colorado River has slowly cut its way deeper and deeper through layers of rock.



UDL

Multiple representations



The screenshot shows a web browser window titled "CAST eReader - Browser6". The main content area displays a text article titled "Wearing Down the Land HTML.htm". The article text reads: "Wearing Down the Land For millions of years the Colorado River has been carving the walls of the Grand Canyon in northern Arizona. It was not until 1869, however, that anyone would try the 277-mile (446-km) trip through the canyon. In that year John Wesley Powell led a group of scientists down the Colorado River. Powell had decided that following the Colorado River through the Grand Canyon would add "to the great sum of human knowledge." Powell strapped a chair to the deck of his boat and set off down the churning, swirling river. During the dangerous 3-month trip, he looked up at canyon walls so high that they threatened to block out the sun. To form the Grand Canyon, the Colorado River has slowly cut its way deeper and deeper through layers of rock."

To the right of the text is a 3D avatar of a man with red hair, wearing a blue shirt and tan pants, standing with his hand to his chin in a thinking pose. The avatar is part of a "com3D" interface, with a name "Andy" and a navigation pad below it. The browser's address bar shows a file path: "file:///C:/Program%20Files/Vcom3D/Sign%20mit".



UDL

Designing for individuals



Adjustable Challenge
and Support

UDL Designing for Learning

UDL Editions by CAST - Windows Internet Explorer

http://udleditions.cast.org/

UDL Editions by CAST

Texthelp

About UDL Editions by CAST

UDL Editions take advantage of the flexibility of digital media to reach and engage all learners. Leveled supports and the Texthelp Toolbar balance challenge and support for each learner, ages 10 and up. Select your book to get started!

Universal Design for Learning

CAST is a non-profit research and development organization dedicated to Universal Design for Learning (UDL). UDL research demonstrates that the challenge of diversity can and must be met by making curriculum flexible and responsive to learner differences.

- ▶ [About UDL](#)
- ▶ [UDL Feature Highlights](#)
- ▶ [For More Information](#)

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Universal Learning Editions

I. Representation

Use multiple means of representation

1. Provide options for perception

- Options that customize the display of information
- Options that provide alternatives for auditory information
- Options that provide alternatives for visual information

2. Provide options for language and symbols

- Options that define vocabulary and symbols
- Options that clarify syntax and structure
- Options for decoding text or mathematical notation
- Options that promote cross-linguistic understanding
- Options that illustrate key concepts non-linguistically

3. Provide options for comprehension

- Options that provide or activate background knowledge
- Options that highlight critical features, big ideas, and relationships
- Options that guide information processing
- Options that support memory and transfer

UDL

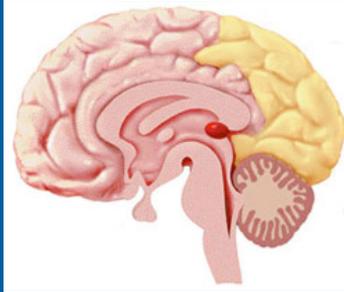
What's the solution?



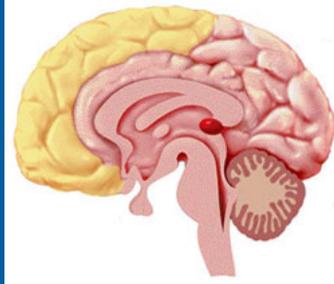
Assistive Technologies
Remedial Education
Therapies
Alternative placements

UDL

Is a set of guidelines for design



Designing the means of representation



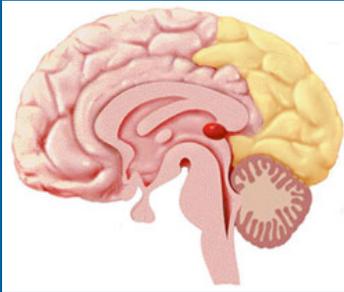
Designing the means of expression



Designing the means of engagement

UDL

As a framework for design



Designing the means of representation

- 1) Designing for Sensory/Perceptual Diversity
- 2) Designing for Linguistic and symbolic diversity
- 3) Designing for Cognitive Diversity

UDL As a framework for design



Print is too disabled as a medium to meet the challenge of diversity

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- Options that provide alternatives for visual information

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- Options that clarify syntax and structure
- Options for decoding text or mathematical notation
- Options that promote cross-linguistic understanding
- Options that illustrate key concepts non-linguistically

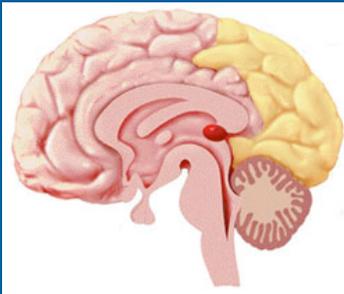
3. Provide options for comprehension

- Options that provide or activate background knowledge
- Options that highlight critical features, big ideas, and relationships
- Options that guide information processing
- Options that support memory and transfer



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Commercial Examples



WiggleWorks

Pearson's AMP
reader



II. Expression

Use multiple means of expression

4. Provide options for physical action

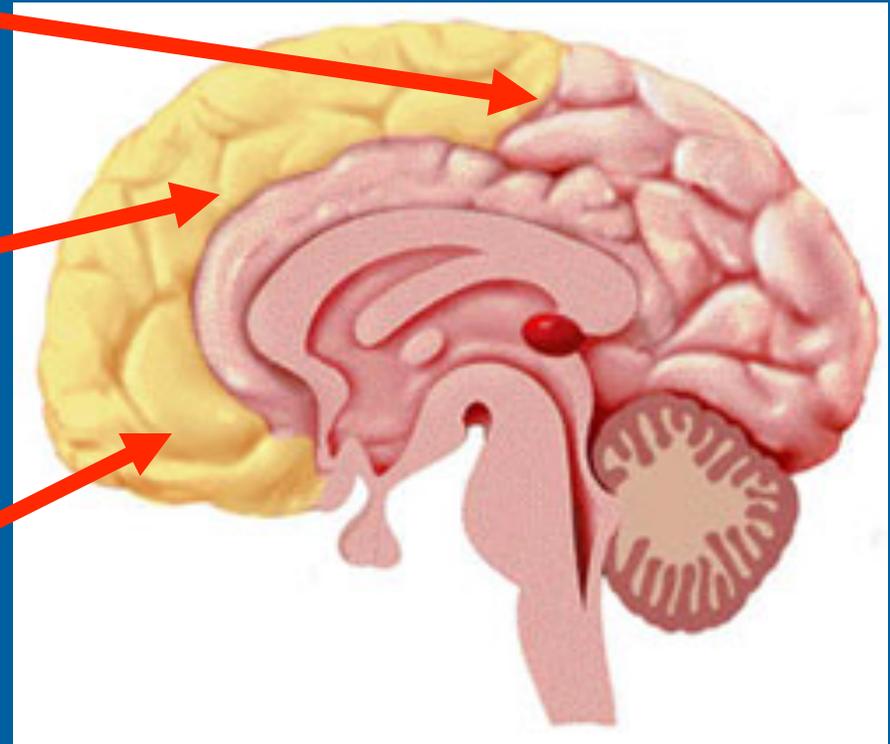
- Options in the mode of physical response
- Options in the means of navigation
- Options for accessing tools and assistive technologies

5. Provide options for expressive skills and fluency

- Options in the media for communication
- Options in the tools for composition and problem solving
- Options in the scaffolds for practice and performance

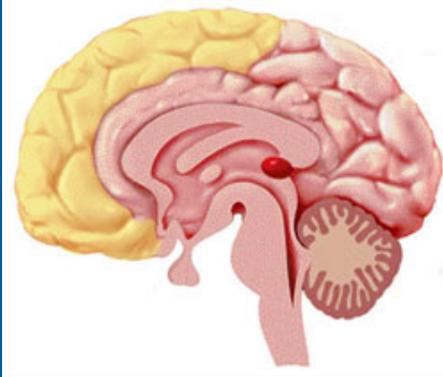
6. Provide options for executive functions

- Options that guide effective goal-setting
- Options that support planning and strategy development
- Options that facilitate managing information and resources
- Options that enhance capacity for monitoring progress



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Multiple Means of Expression and Action



Examples:

NSF's Science Writer

Carnegie's Strategy
Tutor

Scholastic's Expert
Space

 SCHOLASTIC

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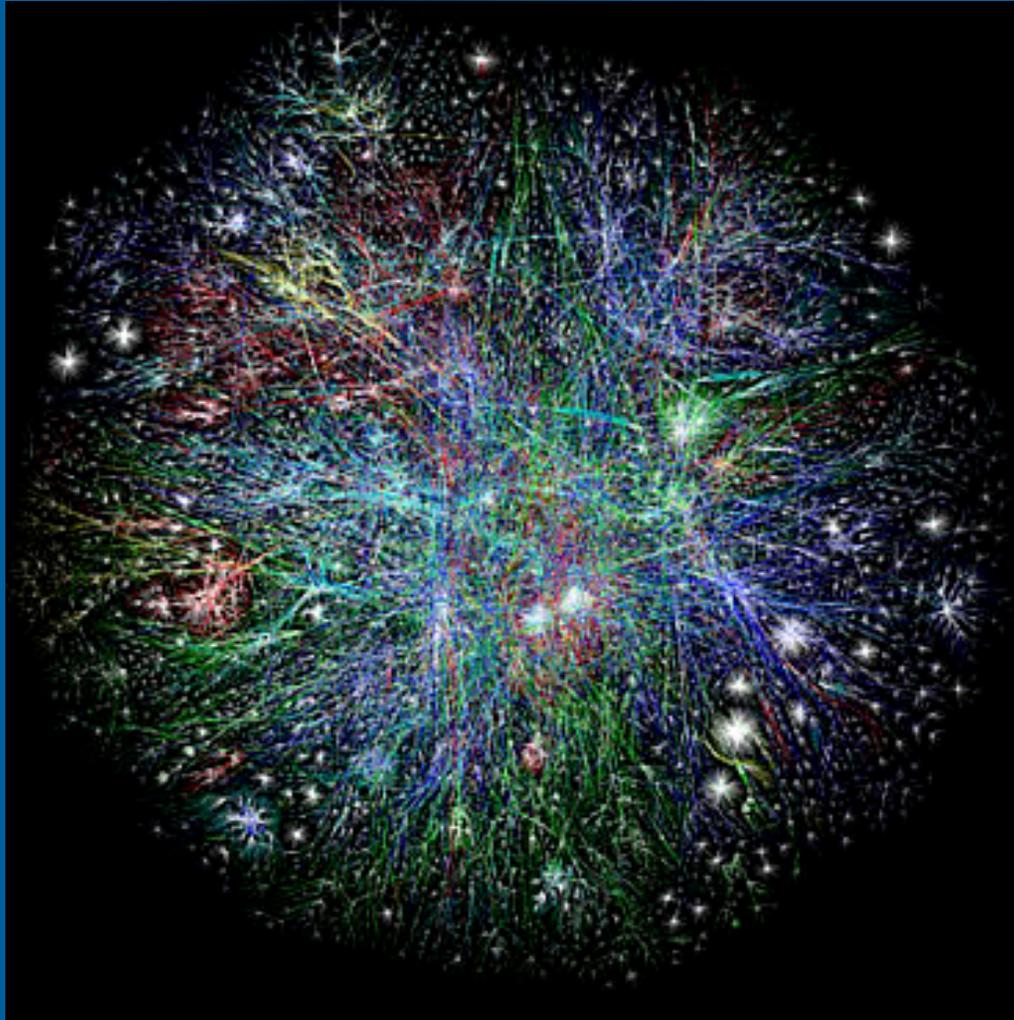
In this modern context:

It is print that has disabilities.



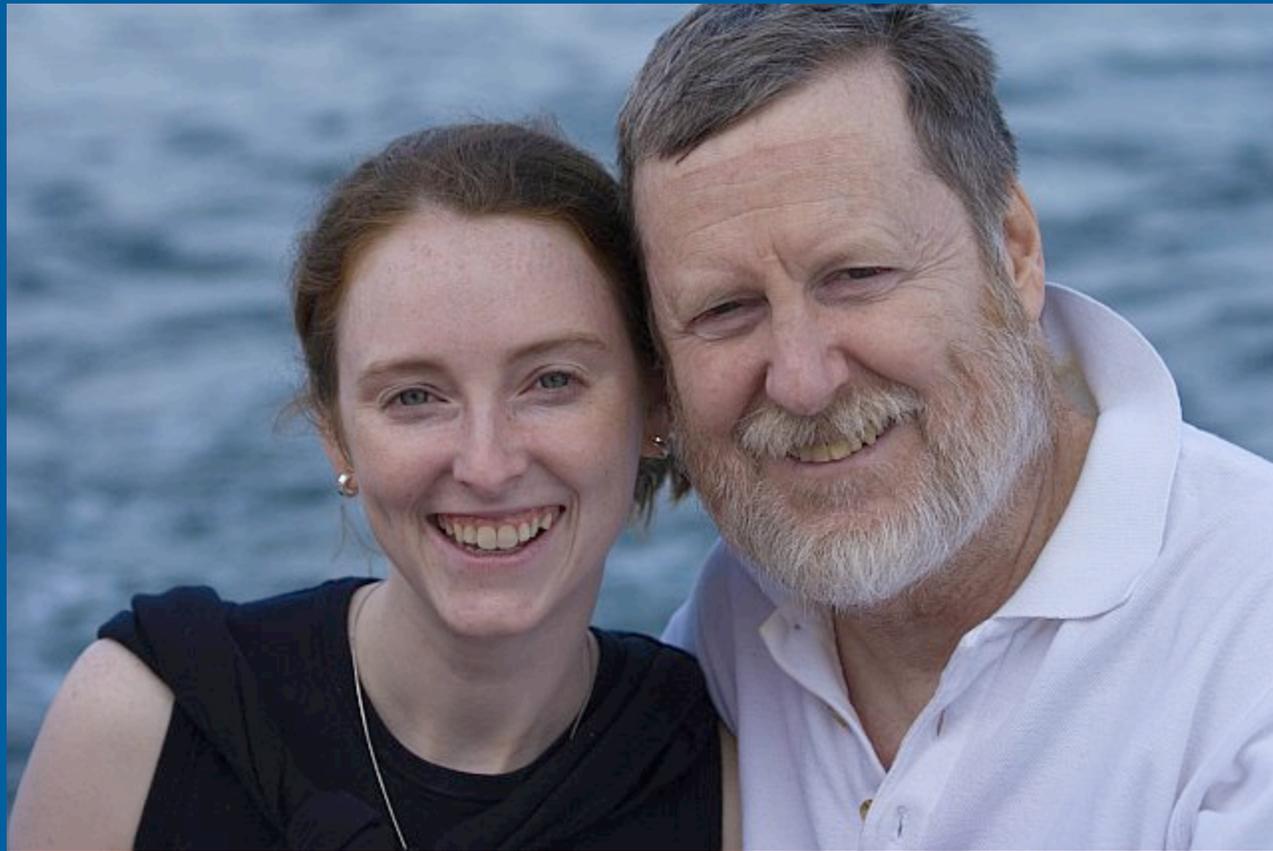
UDL

Textbooks: Disabled in what they can teach

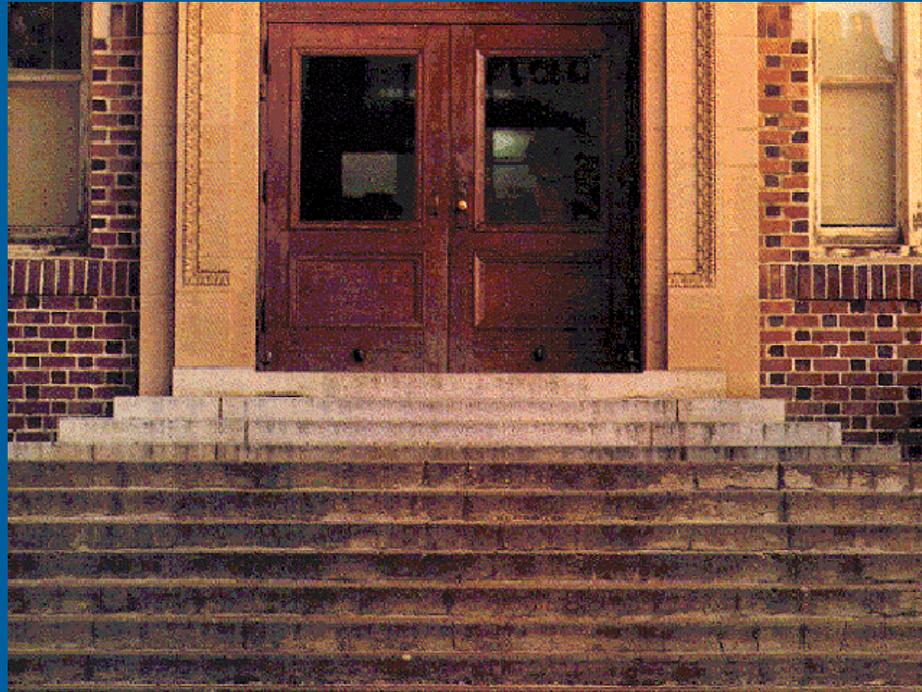


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Textbooks: Disabled in when they prepare students



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In the modern world it is not just who has print disabilities, it is also what has print disabilities.

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For Much More: www.cast.org

And better: National Center on Universal
Design for Learning

UDL in public policy

The Higher Education Opportunity Act of 2008

Section 103(24) **UNIVERSAL DESIGN FOR LEARNING.**--The term 'universal design for learning' means a scientifically valid framework for guiding educational practice that—

 (A) provides flexibility in the ways information is presented, in the ways students respond or demonstrate knowledge and skills, and in the ways students are engaged; and

UDL in public policy

The Higher Education Opportunity Act of 2008

“(B) reduces barriers in instruction, provides appropriate accommodations, supports, and challenges, and maintains high achievement expectations for all students, including students with disabilities and students who are limited English proficient.”.

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I. Representation

Use multiple means of representation

1. Provide options for perception

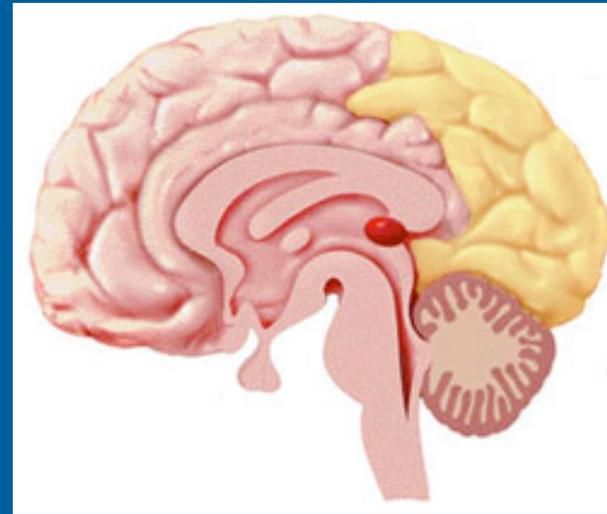
- Options that customize the display of information
- Options that provide alternatives for auditory information
- Options that provide alternatives for visual information

2. Provide options for language and symbols

- Options that define vocabulary and symbols
- Options that clarify syntax and structure
- Options for decoding text or mathematical notation
- Options that promote cross-linguistic understanding
- Options that illustrate key concepts non-linguistically

3. Provide options for comprehension

- Options that provide or activate background knowledge
- Options that highlight critical features, big ideas, and relationships
- Options that guide information processing
- Options that support memory and transfer





How do we get to Guidelines?

Universal Design for Learning Guidelines

I. Representation

Use multiple means of representation

1. Provide options for perception

- Options that customize the display of information
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- Options that provide alternatives for visual information

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II. Expression

Use multiple means of expression

4. Provide options for physical action

- Options in the mode of physical response
- Options in the means of navigation
- Options for accessing tools and assistive technologies

5. Provide options for expressive skills and fluency

- Options in the media for communication
- Options in the tools for composition and problem solving
- Options in the scaffolds for practice and performance

6. Provide options for executive functions

- Options that guide effective goal-setting
- Options that support planning and strategy development
- Options that facilitate managing information and resources
- Options that enhance capacity for monitoring progress

III. Engagement

Use multiple means of engagement

7. Provide options for recruiting interest

- Options that increase individual choice and autonomy
- Options that enhance relevance, value, and authenticity
- Options that reduce threats and distractions

8. Provide options for sustaining effort and persistence

- Options that heighten salience of goals and objectives
- Options that vary levels of challenge and support
- Options that foster collaboration and communication
- Options that increase mastery-oriented feedback

9. Provide options for self-regulation

- Options that guide personal goal-setting and expectations
- Options that scaffold coping skills and strategies
- Options that develop self-assessment and reflection