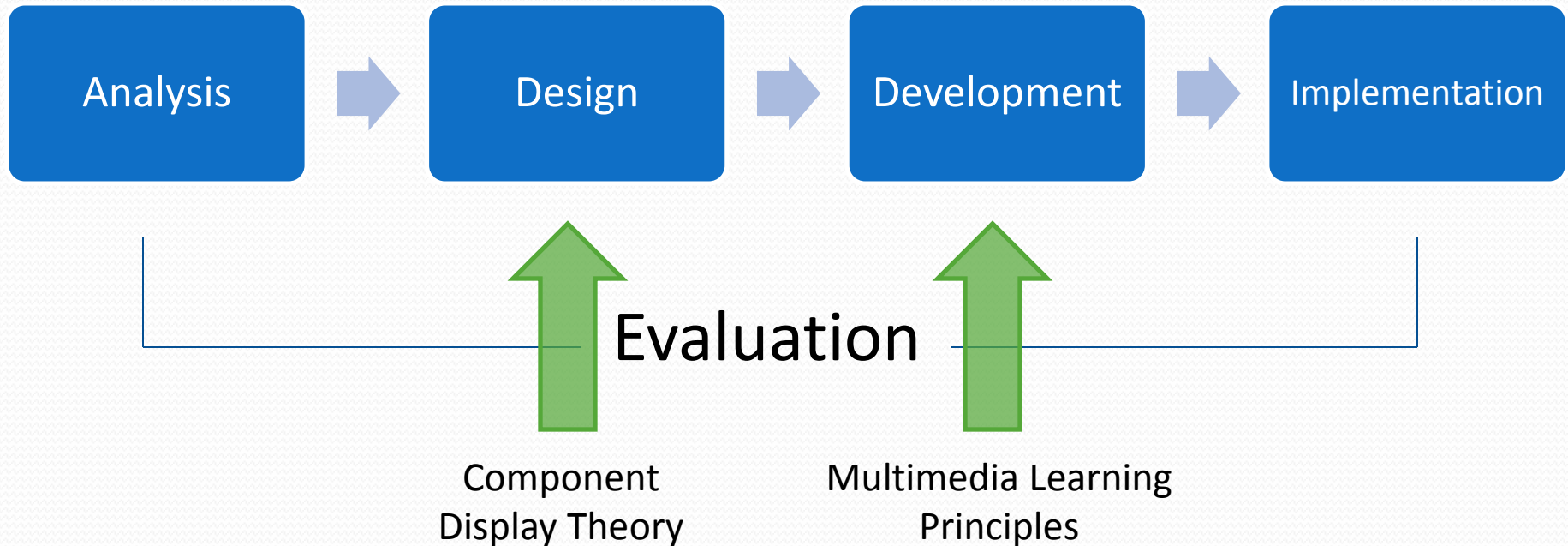


*Bringing Design Online: Applying Instructional
Design Principles to Digital Spaces*

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Why Instructional Design?

A D D I E



Component Display Theory (CDT)

- Created in 1978 based on research by Reigeluth & Merrill
- Largely based on work by Gagné in the '60s and '70s
- Helps instructors
 - Bring focus to lessons
 - Create meaningful learning activities
 - Create effective assessment

Merrill's Content-Performance Matrix

Find				
Use				
Remember				
	Facts	Concept	Procedure	Principle

Spend time working with the content–performance matrix *before* you develop your instruction.

Clark's Content-Performance Matrix

Apply		Classify new examples.	Solve problems and make inferences.	Perform the procedure.	Perform the task; solve the problem.
Remember	Remember the facts.	Remember the definition.	Remember the stages.	Remember the steps.	Remember the guidelines.
	Facts	Concepts	Process	Procedure	Principle

From: Clark, Ruth C. (2009). *Developing Technical Training: A Structured Approach for Developing Classroom and Computer-Based Instructional Materials* (3rd ed.). Hoboken, NJ : John Wiley & Sons, Inc.

Concepts

Apply

Classify new examples.

Remember

Remember the definition.

Concepts

A mental representation or prototype of objects or ideas that include multiple specific examples.



Concepts

When teaching concepts, include:

- Definition
- Examples and non-examples
- Similar, but different examples
- Analogies (be sure to use something familiar to your audience)

Procedure

Apply

Perform the procedure.

Remember

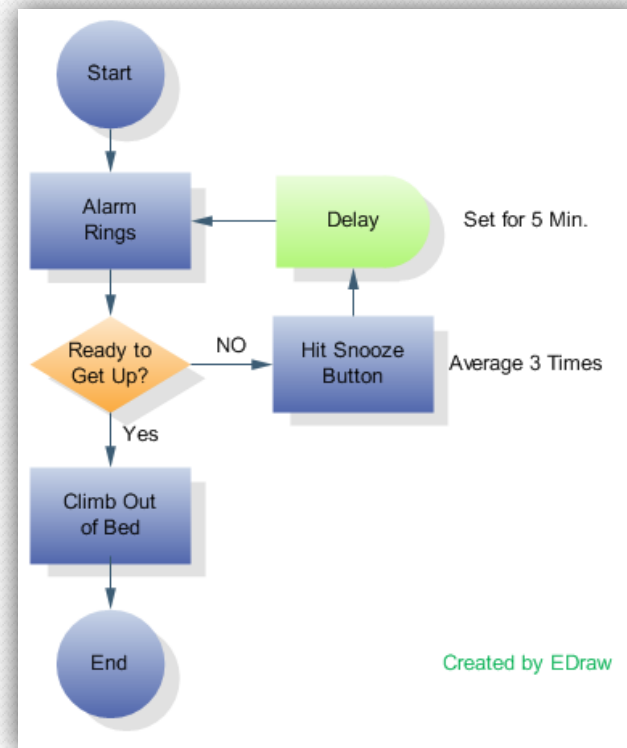
Remember the **steps**.

Procedure

A series of clearly defined steps that result in achievement of a routine job task.

How to wash your hands

1. Wet your hands with clean running water (warm or cold) and apply soap.
2. Rub your hands together to make a lather and scrub them well; be sure to scrub the backs of your hands, between your fingers, and under your nails.
3. Continue rubbing your hands for at least 20 seconds.
4. Rinse your hands well under running water.



Procedure

When teaching procedures:

- Avoid “remember” level objectives
- Include a clear statement of the steps with illustrations
- Include a follow-along demonstration
- Include “hands-on” practice with explanatory feedback

Process

Apply	Solve problems and make inferences.
Remember	Remember the stages .
Process	

Best defined when compared to procedures.

Procedures are directive; they tell someone **how to do something**.

Processes are descriptive; they tell someone **how something works**.

Process

Teaching processes is similar to procedures:

- Avoid “remember level” objectives
- Use flow diagrams to illustrate the *stages* of the process
- Use animation to allow learners to zoom or view major and minor stages.
- Use simulations if applicable.
- Provide practice through simulations

Principle

Apply	Perform the task; solve the problem.
Remember	Remember the guidelines.
Principle	

A task in which there are no clearly defined steps because the situation and context in which the task takes place is different each time.

Think about *near transfer* vs. *far transfer* training.

Principle: Near vs. Far Transfer

- Near transfer – steps are the same each time; teach the *procedure* that makes up the guidelines
- Far transfer – guidelines are adapted to the situation; teach the *principles* that make up the guidelines

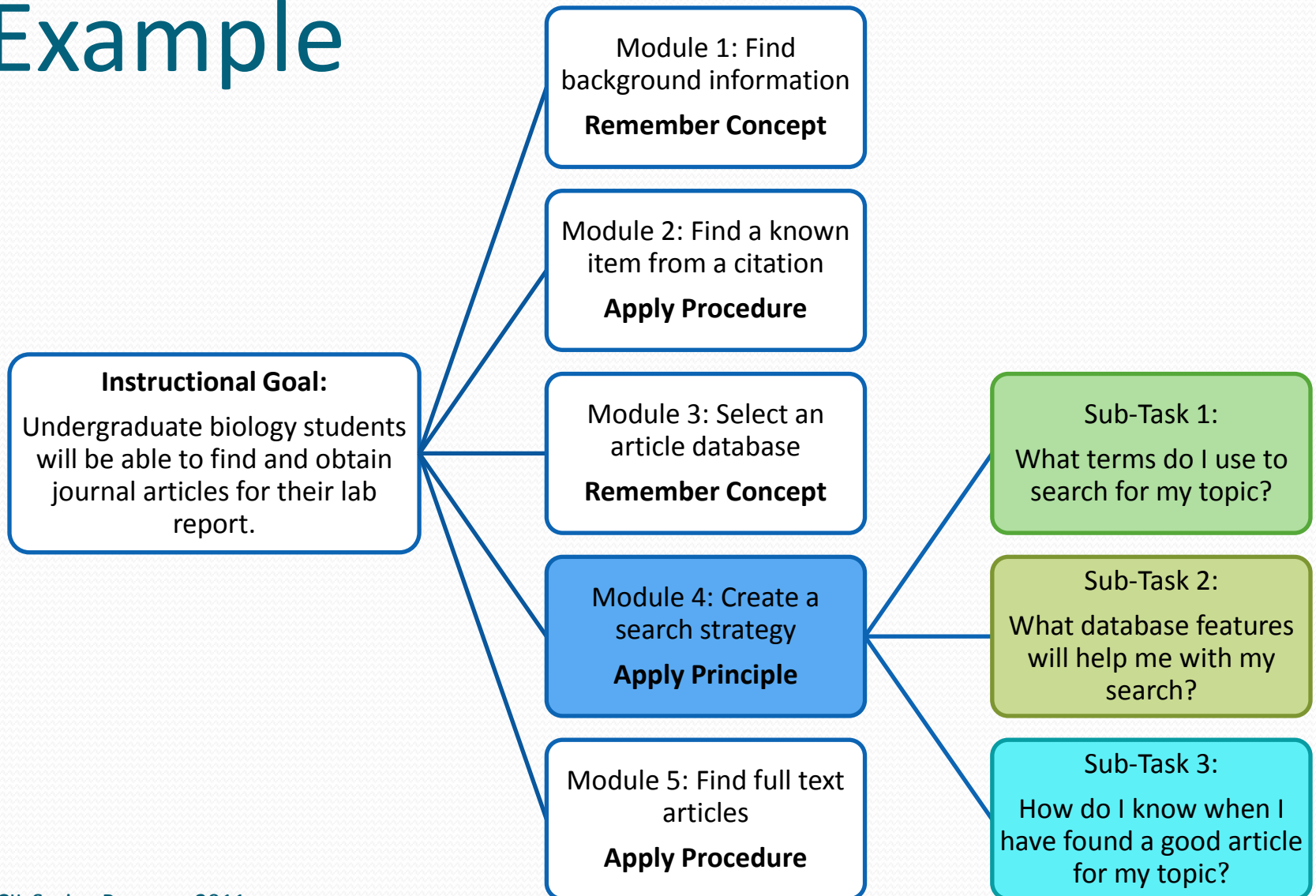
List three strategies you can use to search a database.

Given *topic x* and *database y*, find three articles using at least one of the strategies presented in class/in the tutorial (e.g. truncation, database limits, controlled vocabulary or related articles).

Principle

- When teaching principles, consider
 - Use lots of examples of how to apply the principle
 - Use non-examples
 - Use analogies
 - Particularly in e-learning, include a combination of worked and partially worked examples

Example



Example

Sub-Task	Learning Outcome	Content Type
What search terms do I use for my topic.	Given a broad topic, the LWBAT describe his/her process used to identify search terms.	Remember Process
What database features will help me with my search?	Given a topic and access to an article database, the LWBAT modify a search using key database features.	Apply Principle
How do I know when I have found a good article for my topic?	Given search terms and access to a database, the LWBAT identify at least three articles from the list of results that answer the research question.	Apply Principle

Practice

- First, classify each as “remember” or “apply.”
 - First, classify each as a *concept*, *process*, *procedure* or *principle*.
1. Given a citation, get the full-text article.
 2. Given a topic and access to a database, use at least three different search strategies to at least two articles.
 3. Given a topic and a list of results, identify relevant articles.
 4. Given an article citation, place an interlibrary loan request.
 5. Given access to different resources, identify which ones are databases and which are catalogs.

Creating practice & test questions

- Match behaviors specified in outcomes, e.g. remember or apply levels.
- Include feedback

Stem	Distracters	Feedback
The practice or test question.	If multiple choice or true/false, include the choices.	Information learners receive if they select a choice.

What's next?

- You've written your objectives
- You've classified them according to the CPM
- You've thought about how you will teach them based on the behaviors identified through the CPM
- You've created practice and test questions

Now, you're ready to develop.

Reflect

Think about a recent experience you had with learning online. (It could be formal, e.g. web cast, online course – or informal, e.g. software tutorial.)

Was it a positive or negative experience? Why?

What made it effective – or not?

Multimedia Learning Principles

- **Multimedia learning** – presentation where people learn from both words and pictures
- **Multimedia instruction** – presentations involving words and pictures that are intended to foster learning.

From: Mayer, Richard E. (2009). *Multimedia Learning* (2nd ed.). New York, NY: Cambridge University Press.

Definitions

- Working memory – temporarily holding and manipulating knowledge in active consciousness.
- Cognitive processing
 - Essential processing (selecting)
 - Extraneous processing
 - Generative processing (organizing + integrating)
- Channels
 - Visual/pictorial – used for processing pictures
 - Auditory/verbal – used for processing spoken words

Well-designed e-learning will:

- Reduce extraneous processing to allow room in the working memory to manage essential processing (selecting) and promote generative processing (organizing + integrating).
- Reduce cognitive load by recognizing how learners process information using their visual and audio channels.

1. Coherence Principle

- People learn better when extraneous words, pictures, and sounds are excluded rather than included.

Don't	Do
Have more words than necessary on the screen.	Be brief. Focus on a single, important point on the screen.
Add unnecessary music.	Use audio narration instead of words on the screen.

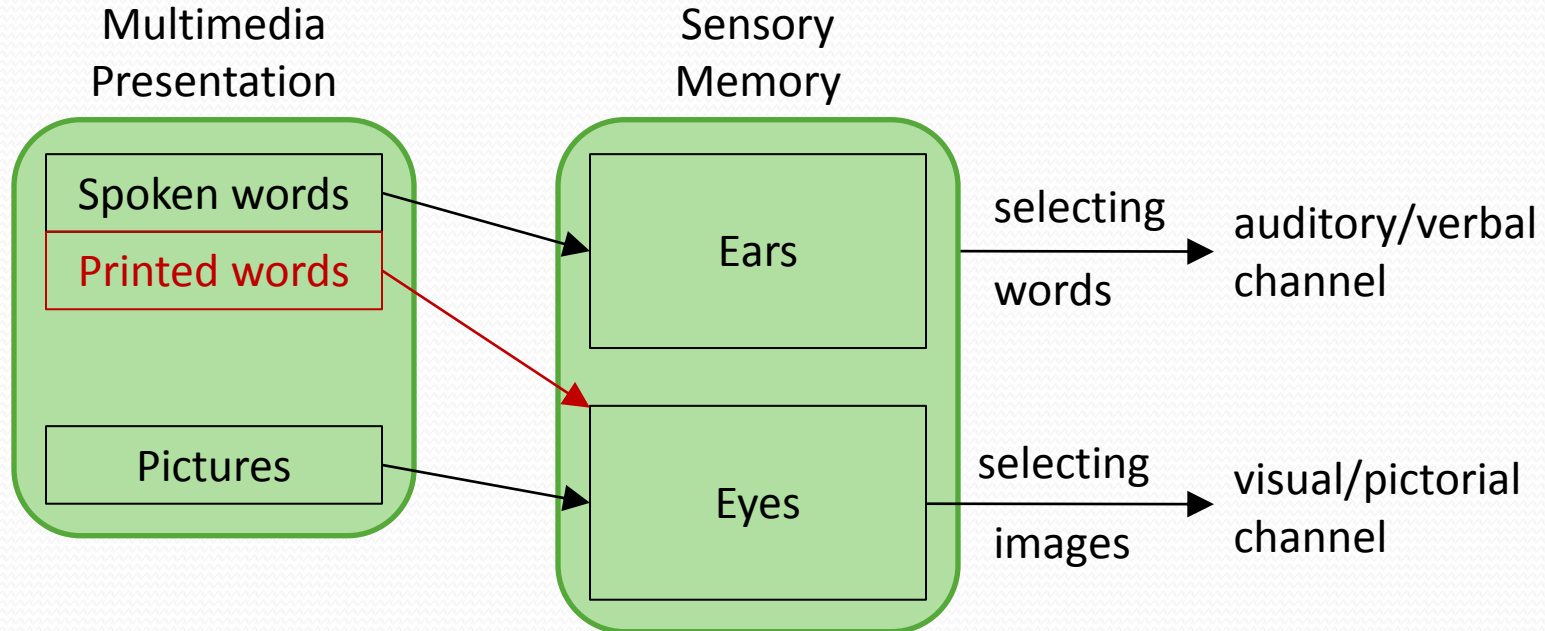
2. Signaling Principle

- People learn better when cues that highlight the organization of the *essential material* are added.

Verbal Signaling	Visual Signaling
Outline	Arrows
Headings	Distinctive colors
Vocal emphasis (if using narration)	Pointing (if using an onscreen agent)
Pointer words (first, second...)	Highlighting or graying out

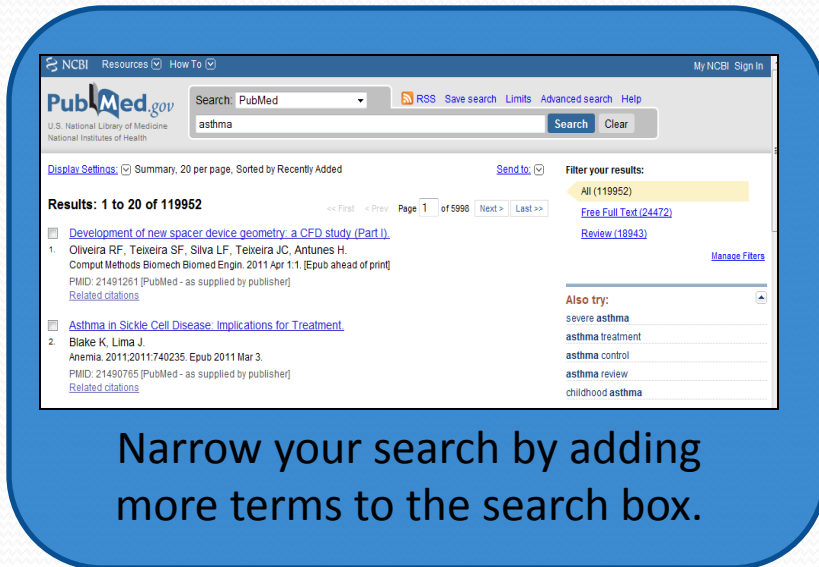
3. Redundancy Principle

- People learn better from **graphics and narration** than from graphics, narration and printed text.

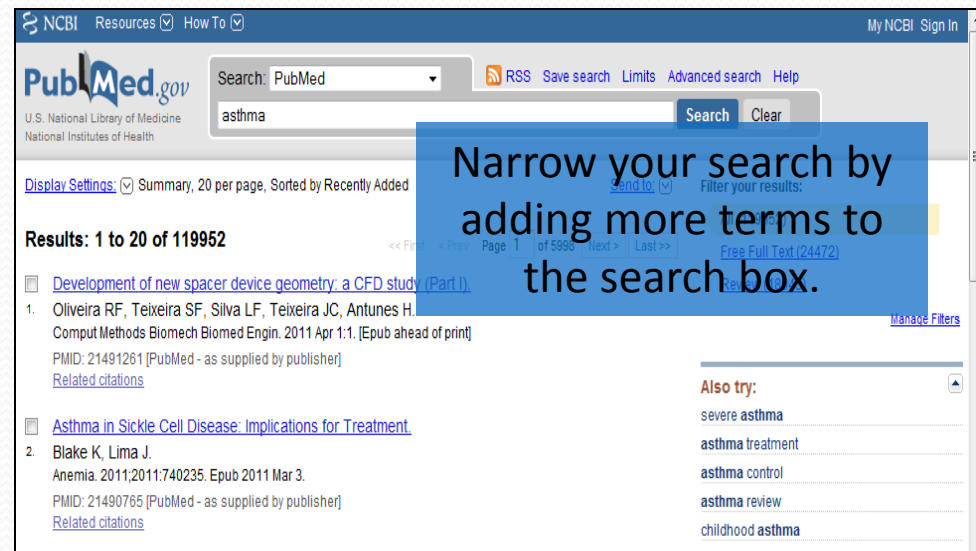


4. Spatial Contiguity Principle

- People learn better when corresponding words and pictures are presented near each other on the screen.



A screenshot of the PubMed website showing search results for the term "asthma". The search bar at the top contains "asthma". Below the search bar, the results are displayed, including a list of articles and a section titled "Also try:" with suggestions like "severe asthma", "asthma treatment", "asthma control", "asthma review", and "childhood asthma". A blue rounded rectangular callout box is overlaid on the bottom left of the screenshot, containing the text: "Narrow your search by adding more terms to the search box."



A screenshot of the PubMed website showing search results for the term "asthma". The search bar at the top contains "asthma". Below the search bar, the results are displayed, including a list of articles and a section titled "Also try:" with suggestions like "severe asthma", "asthma treatment", "asthma control", "asthma review", and "childhood asthma". A blue rounded rectangular callout box is overlaid on the right side of the screenshot, containing the text: "Narrow your search by adding more terms to the search box." The search bar area is highlighted in yellow, and the text "asthma" is visible in the search bar.

5. Temporal Contiguity Principle

- People learn better when corresponding words and pictures are presented simultaneously rather than successively.

NCBI Resources How To My NCBI Sign In

PubMed.gov
U.S. National Library of Medicine
National Institutes of Health

Search: PubMed
asthma

RSS Save search Limits Advanced search Help

Search Clear

Display Settings: Summary, 20 per page, Sorted by Recently Added

Results: 1 to 20 of 119952

1. [Development of new spacer device geometry: a CFD study \(Part I\)](#)
Oliveira RF, Teixeira SF, Silva LF, Teixeira JC, Antunes H.
Comput Methods Biomech Biomed Engin. 2011 Apr 1:1. [Epub ahead of print]
PMID: 21491261 [PubMed - as supplied by publisher]
[Related citations](#)

2. [Asthma in Sickle Cell Disease: Implications for Treatment](#)
Blake K, Lima J.
Anemia. 2011;2011:740235. Epub 2011 Mar 3.
PMID: 21490765 [PubMed - as supplied by publisher]
[Related citations](#)

Also try:
severe asthma
asthma treatment
asthma control
asthma review
childhood asthma

Narrow your search by adding more terms to the search box.

6. Segmenting Principle

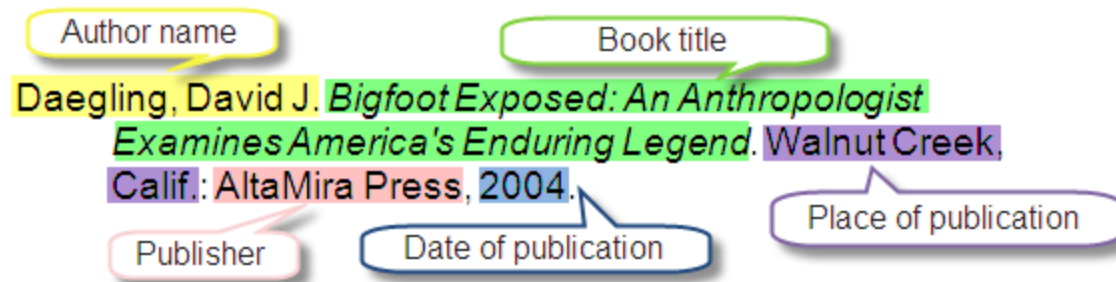
- People learn better when a tutorial is presented in user-paced segments rather than as a continuous unit.

Don't	Do
Try to fit more than one step in a process on the screen.	Focus on a single step, or important point on the screen.
Add automatic advance timing to screens.	Whenever possible, allow the tutorial to be self-paced.

7. Pre-training Principle

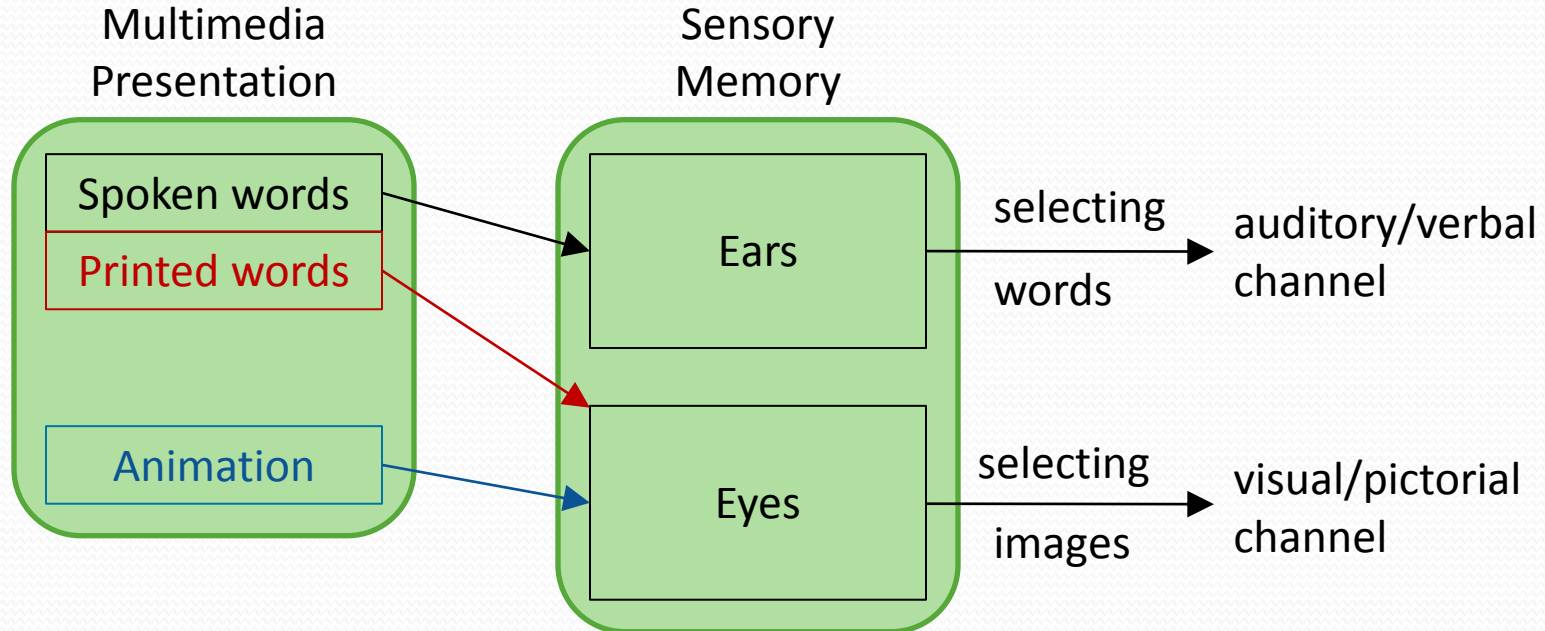
- People learn more deeply from a tutorial when they know the names and characteristics of the main concepts.

For example, you might do pre-training about the parts of a citation before teaching how to use APA.



8. Modality Principle

- People learn more deeply from pictures and spoken words than pictures than printed words.



9. Multimedia Principle

- People learn better from words and pictures than words alone.

UC-eLinks

Title: Paracetamol use for non-respiratory indications and subsequent asthma: a valuable way to eliminate confounding by respiratory infections
Source: International Journal of Epidemiology (2011)

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Oxford : Oxford University Press

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BML Bound Journals	W1 IN784 v.10
BML Bound Journals	W1 IN784 v.11
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10. Personalization Principle

- People learn better from tutorials when words are conversational style rather than formal style.

11. Voice Principle

- People learn more deeply when the words in a tutorial are spoken by a friendly human voice rather than a machine voice. (*Preliminary research*)



OR



[“So you want to be an \[Academic\] Librarian”](#)

12. Image Principle

- People do not necessarily learn more from a tutorial when the speaker's image is on the screen rather than not on the screen. (*Preliminary research*)

Example

Here is a tutorial I designed recently using Articulate Presenter, Engage, and Quizmaker:

<http://bit.ly/tutorial-example> (note: the recorded volume is low)

Which principles do I use well?

Which ones could be improved?

Comments? Suggestions? I'd love to hear them –

dturnbow@ucsd.edu