Chapter 4

Why Is It So Hard for Students to Understand Abstract Ideas?

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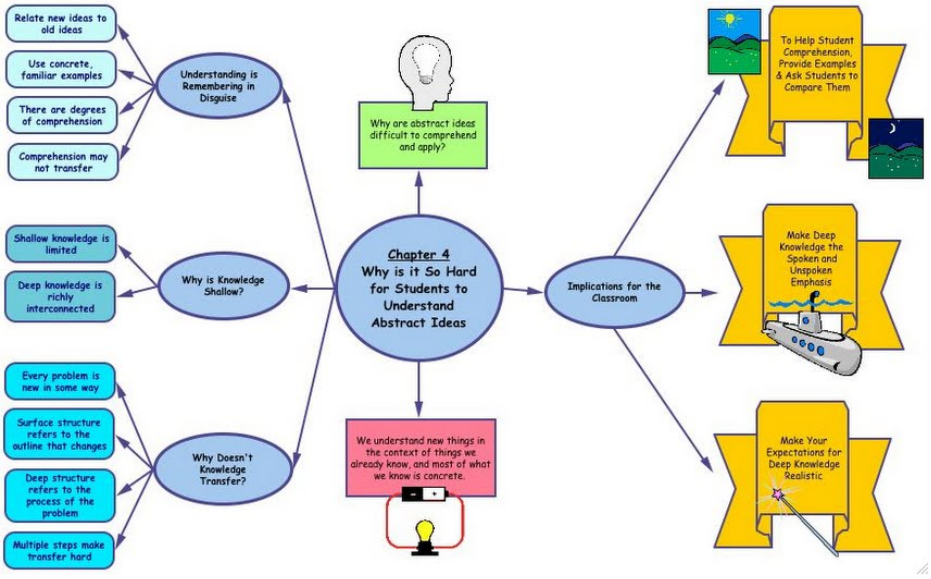
Authors Website



Introduction

Cognitive principle: We understand new things in the context of things we already know, and most of what we already know is concrete.

Abstraction is the goal of schooling

students must be able to apply what they have learned in new contexts outside the classroom.

The mind does not care for abstraction. It prefers the concrete.

It is difficult to understand abstract ideas, and difficult to apply them to new situations

Understanding Is Remembering In Disguise

It's often difficult for students to understand new ideas, especially when the new ideas are not related to what they already know

Analogies are extremely useful

analogy helps us to relate familiar meaning to unknown--OM's law

analogy=electrons moving along a wire are like water moving through a pipe (we are used to thinking about water in a pipe)

Great teachers are story tellers

(Willingham describes the importance of analogies in connection with the Common Core)

Examples help make abstraction concrete

Concrete examples must also be familiar

Understanding new ideas requires getting the *right* old ideas into working memory and rearranging them

making comparisons we hadn't before, or thinking about a feature we had previously ignored

Digging Deeper into Understanding

(Article about the Usefulness of Brief Instruction in Reading Comprehension by Willingham)

there are degrees of comprehension

knowledge may not transfer outside of the classroom

→ How does this connect to educational technology?

* Show Me lessons can be recorded and revisited to bring knowledge back into working memory...
* Create sequenced stories online for student reference in Flipbook!

Why Is Knowledge Shallow?

A spectrum between memorization and complete comprehension

Rote knowledge (memorization with no understanding) might lead to giving the right response, but it doesn't mean the student is thinking

Students may display sophisticated vocabulary, but it's clear that comprehension hasn't occured (example: "three kinds of blood vessels:

arteries, vanes, and caterpillars"

Shallow knowledge is more common than rote knowledge
- students have some understanding of the material but their understanding is limited
- students understand new ideas by relating them to old ideas, but if knowledge is shallow, the process stops here

Why do students end up with shallow knowledge?
- Students are not paying attention to the lesson
- Students do not understand abstractions easily or quickly

Deep Knowledge
- richly interconnected ideas
- complete comprehension of abstract ideas
- students with deep knowledge can predict how the machine would operate if one part were to be changed.

→ How does this connect to educational technology?
* XtraMath can be used to memorize math facts with rote memory...
* Create flash cards to organize rote materials in Quizlet

Why Doesn't Knowledge Transfer?

When psychologists talk about transfer they mean the new problem looks different from the old, but we have applicable knowledge to help us solve it

Background knowledge helps transfer what comes next

Our minds assume that the new things we read/hear will be related to what we've just read/heard
- makes understanding faster and smoother
- interpretations are created based on individual experiences/knowledge

Our cognitive system is always struggling to make sense of what we're reading or hearing.
- Surface structure is more obvious and influential
- not effective to simply tell students to look for the deep structure
- Students get distracted by the surface structure of the problem (whether it is area of a tabletop or lawn) and don't connect this to the deep meaning of the problem. (tumors and armies)
- When a problem has lots of components and lots of steps in its solution, transfer is hampered

→ How does this connect to educational technology?
* Concept mapping like Bubbl.us can be used to build connections between ideas.

* Make flow charts to establish links from old knowledge to new ideas.

Implications for the classroom:

To help students' comprehension, provide examples and ask questions
- Experience helps students see deep structure
  - Provide lots of examples
  - examples from a variety of contexts and/or diverse examples.
- Ask students to compare different examples
  - Students may need guidance, but may see what things have in common
  - Comparing diverse examples may help students by forcing them to think about deep structure
  - students look for patterns

Make deep knowledge the spoken and unspoken emphasis
- Don't ask only low level questions, emphasis your questioning to make them think about the deeper knowledge
- Make assignments, assessments, and project demand deep understanding
- Quiz and test deep knowledge--the implicit message is that the material on the test is valuable deep knowledge.
- Students draw a strong message from what's on the test
  - if it's on the test, they know it's important

Make your expectations for deep knowledge realistic
- Deep knowledge is the is the product of much practice
- Remember shallow knowledge is better than no knowledge at all
- You need to start with shallow knowledge to get to the deeper knowledge
- Deep understanding may take years

Summary

We understand new things in the context of things we already know, and most of what we already know is concrete.
It's hard to understand abstract ideas, even if we do, it may not transfer to new situations
It is important to build upon background knowledge
(Video on building background knowledge in reading by Willingham)
Difficulty of deep understanding shouldn't be underestimated
Practice in thinking about and using an abstract idea is critical to being able to apply it

Additional Links

Video with concept map and explanations of chapters 3 and 4
See our video outlining and explaining the main ideas set out by Willingham in these two chapters.

Some support for Willingham's ideas:

"The brain is a pattern-recognition machine, after all, and when focused properly, it can quickly deepen a person's grasp of a principle, new studies suggest. Better yet, perceptual knowledge builds automatically: There's no reason someone with a good eye for fashion or wordplay cannot develop an intuition for classifying rocks or mammals or algebraic equations, given a little interest or motivation."

Locke's Theory of Knowledge

What Locke said was that the mind is a blank slate, that it contains no ideas, until it experiences. Aristotle's concept of experience is through imagination. Imagination is the image producing mechanism in the body that produces images of what the senses detect in the world around us. The mind, in order to image those thinks it is contemplating or remembering, uses Imagination to produce those images.

Abstract, Concrete, General and Specific Terms

Examples of abstract terms include love, success, freedom, good, moral, democracy, and any -ism (chauvinism, Communism, feminism, racism, sexism). These terms are fairly common and familiar, and because we recognize them we may imagine that we understand them—but we really can't, because the meanings won't stay still.