



# Constructing Understanding

How does learning happen, and how can instructors facilitate learning?





# Kids ♥ Love





# *WHAT IS THE PROPER AGE TO GET MARRIED?*





# *WHAT IS THE PROPER AGE TO GET MARRIED?*

**“Eighty-four! Because at that age, you don’t have to work anymore, and you can spend all your time loving each other in your bedroom.”**

**-Judy, 8**





# *WHAT DO MOST PEOPLE DO ON A DATE?*





# WHAT DO MOST PEOPLE DO ON A DATE?

**“On the first date, they just tell each other lies, and that usually gets them interested enough to go for a second date.”**

**-Mike, 10**





*WHY DOES LOVE  
HAPPEN BETWEEN  
TWO PARTICULAR  
PEOPLE?*



# *WHY DOES LOVE HAPPEN BETWEEN TWO PARTICULAR PEOPLE?*

**“No one is sure why it happens, but I heard it has something to do with how you smell. That’s why perfume and deodorant are so popular.”**

**-Jan, 9**





# *What is the ROLE OF GOOD LOOKS IN LOVE?*



# *What is the ROLE OF GOOD LOOKS IN LOVE?*

**“If you want to be loved by somebody who isn’t already in your family, it doesn’t hurt to be beautiful.”**

**-Jeanne, 8**



# *What is the ROLE OF GOOD LOOKS IN LOVE?*

**“Beauty is skin deep. But how rich you are  
can last a long time.”**

**-Christine, 9**







# Guiding Question:

How does learning happen, and how can instructors facilitate learning?



# Blank Slates View of Learning

- Learning is the process of being filled with information.
- Teaching is the transmission of knowledge from instructor to student



# Clever Minds View of Learning



- Learning is a process of learner's adding to, connecting with, and changing their ideas and explanations.
- Teaching is guiding learners to build their own understanding.

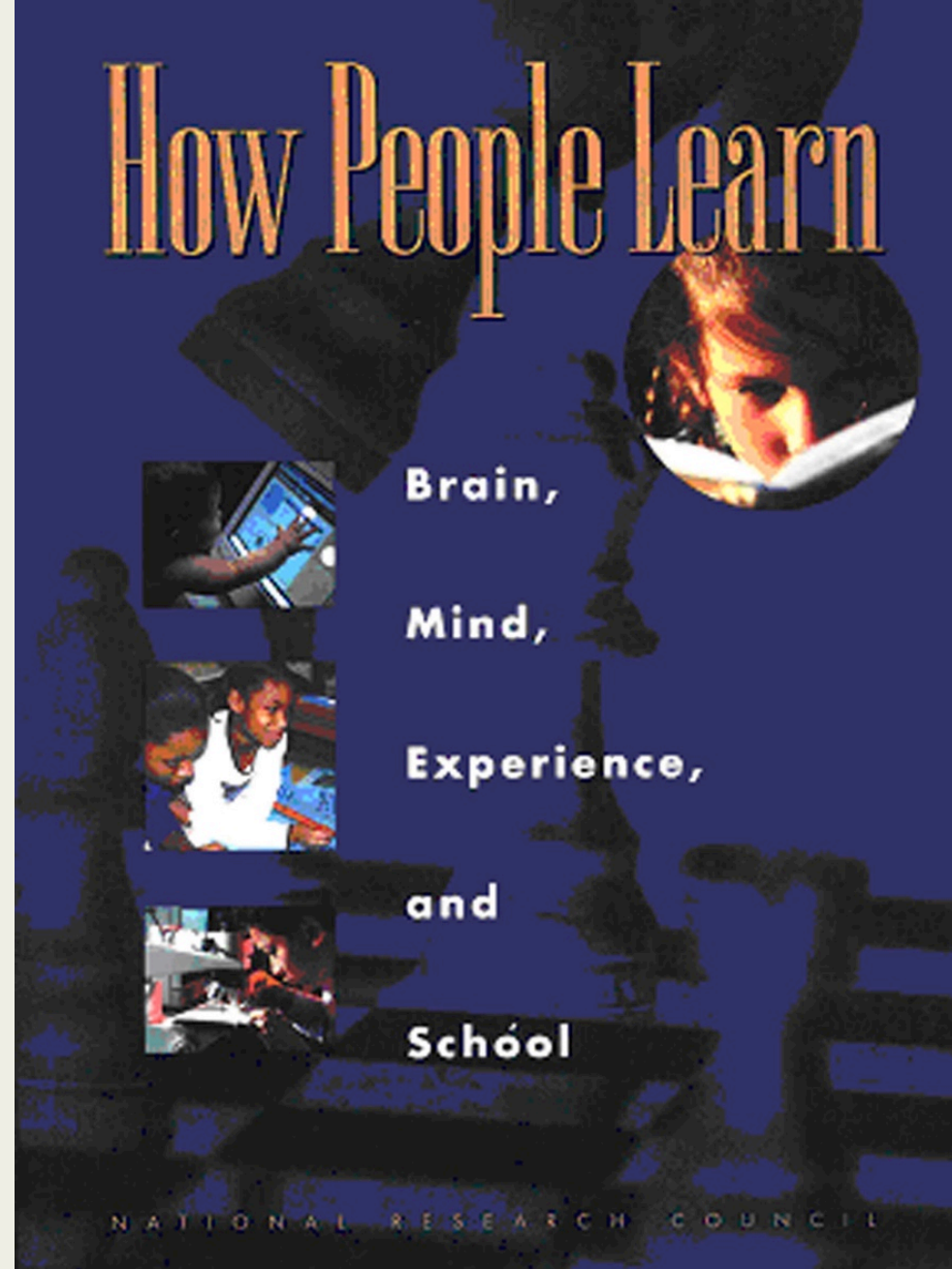


How We Learn:

**We construct our own understanding of the world through our experiences and interactions with others.**



*A seminal work  
published by the  
National Research  
Council*





# Discussing Information Based on Research Findings

- Take turns reading each piece of information aloud in your small group
- Discuss how teaching might be structured to take this information into account



# What Research Tells Us About How People Learn

1. All learners bring to learning situations their own, often quite elaborate, ideas.
2. Learning is an active process of engaging and manipulating objects, experiences, and conversations.
3. Learners “construct” their own understanding of the world based on their experiences, motivations, and cultural and social interactions with peers and others.





# Some Terms for Student Prior Knowledge and Ideas

- Misconceptions
- Naïve ideas
- Preconceptions
- Alternative conceptions



# Alternative Conception: The Sun orbits around the Earth.

- A clever (and inaccurate) explanation for direct observations shared by brilliant minds of the past and children of today.



















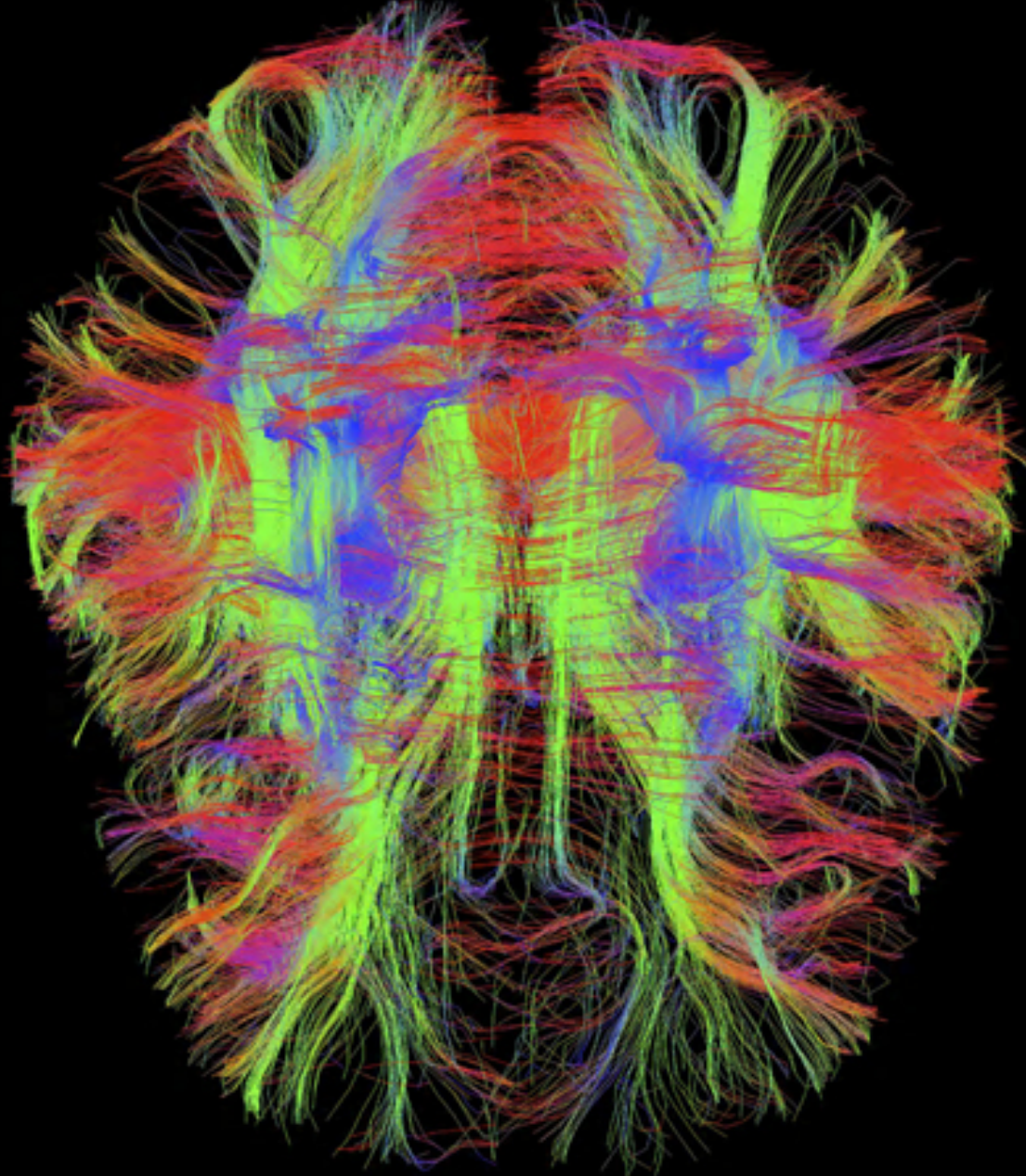












“*Learning is  
about  
making  
connections*”

-Patricia K. Cross

# Expert Theory

**“...usable knowledge’ is not the same as a mere list of disconnected facts. Experts’ knowledge is connected and organized around important concepts”**

*(How People Learn, Bransford, 2009)*





# Conceptual Framework for a Bird





# Moon Phases

Make your own concept map that represents your ideas about the Moon and why it changes its appearance over the course of a month.



# Debriefing Moon Balls

- Look back at your concept map
- Work with a partner to adjust concept map to better reflect current understandings
- Discuss, in particular, evidence you gathered against something you wrote down earlier



# Strategies used to support learning:



- What strategies helped to find out learner's ideas about the topic?
- What strategies helped address alternative conceptions about the topic?
- What strategies helped you come to a deeper understanding about the content?
- What strategies have you experienced or seen in other educational situations that educators have used to help learners make better sense of the world?



**Raise your  
hand if  
these  
assisted in  
your  
learning...**

- ❖ Accessing your prior knowledge & experiences
- ❖ Hands-on, manipulation of the model
- ❖ Listening to & talking with peers
- ❖ Thinking on your own
- ❖ Listening to & talking with the instructor in the whole group
- ❖ Discussing and testing out ideas that agree or disagree with your own understanding
- ❖ Asking new questions
- ❖ Explaining your ideas to peers or instructor





# Research-supported Ideas About Teaching:

- Complex ideas develop over time.
- Learners need multiple learning experiences that encourage them to
  - question their assumptions
  - struggle with new ideas
  - apply their new understandings in different contexts.



# Shallow and Slippery Learning: Short episodes with telling, regurgitation and memorization







**Deep & Sticky  
Learning:**  
Longer episodes with  
students struggling with  
ideas



Surprise is triggered when our schemas  
[conceptual frameworks] fail...and this prepares  
us to try to understand *why* the failure occurred.

- *Made to Stick*, Chip Heath & Dan Heath





# A Private Universe

A video from Minds of Our Own series



Whether or not a student has the  
opportunity to share “their private  
universe,”

**it still exists.**



# Research on students discussing inaccurate ideas-a

**“Our results indicate that peer discussion enhances understanding, **even when none of the students in a discussion group originally knows the correct answer.**”**

Why Peer Discussion Improves Student Performance on In-Class Concept Questions, Smith et al., 2009





# Research on students discussing inaccurate ideas-b

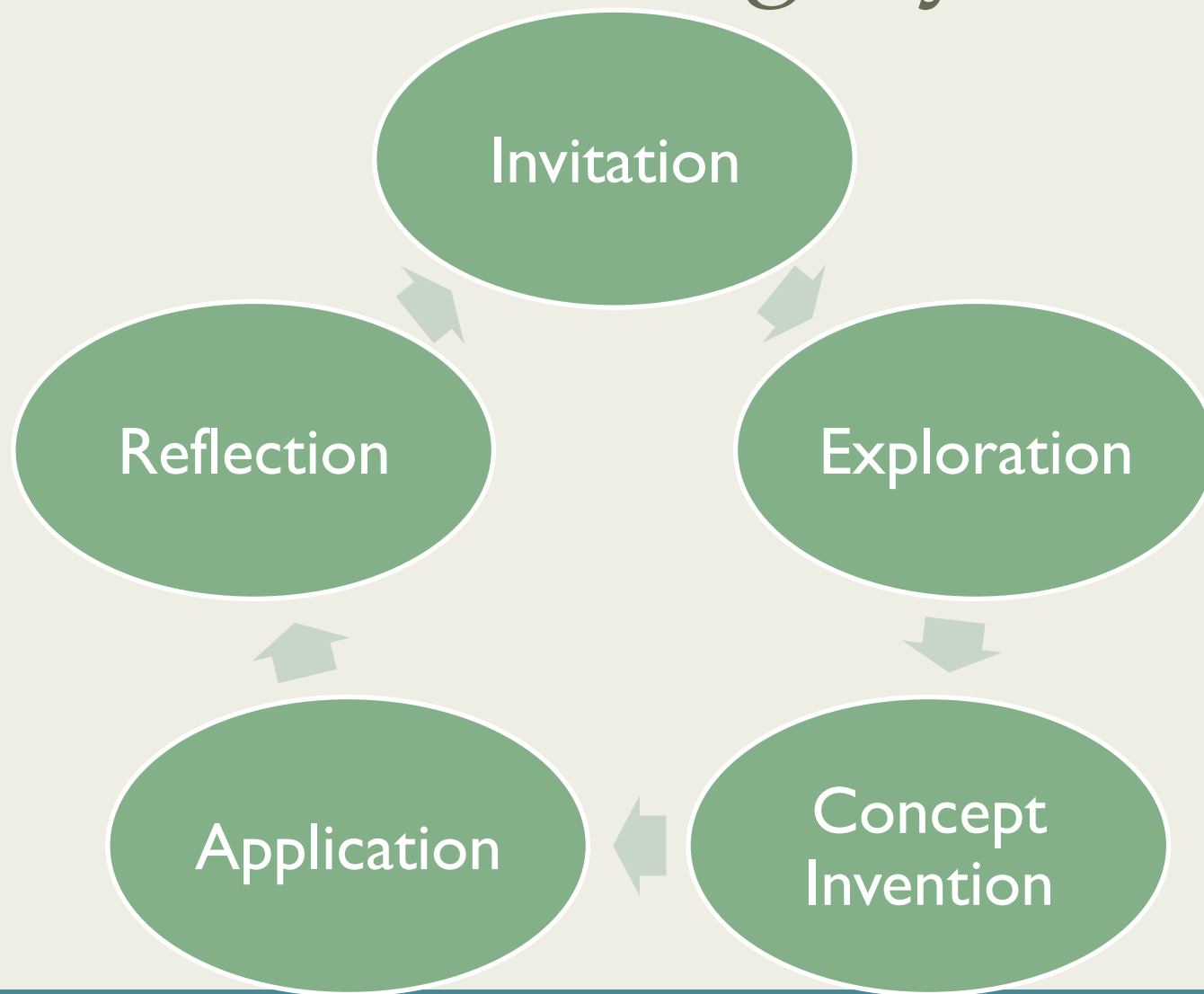
“Discussion is productive when people do not know the answers because you explore all the options and eliminate the ones you know can’t be correct.”

Quote from student who was part of the Smith et al., 2009 research study





# The Learning Cycle



# Reflection Diagram:

Through research, we know this is *not* how people learn:



Make your own diagram/drawing showing how research informs us that people really *do* learn:

# Reflection Prompts

- How have your ideas about how learners construct understanding changed?
- What do you think made your ideas change?
- How might you use this in your science instruction?





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