A RESEARCH-BASED ACTIVITY

A Powerful Learning Experience

STEM
PRINCIPAL LEADERSHIP TRAINING
A Four-part Series for K-12 Building Leaders
Goal: Build a Shared understanding of quality STEM education

- At the end of this section, we want you to know:
  - the components of a Powerful Learning Experience
  - a piece of research: *The Biological Basis for Thinking and Learning* by Dr. Larry Lowery
Observing An Orange

Using your notebook, title a page: *Observing an Orange*

Tools available:

- Tape measures
- Containers of water
- Hand Lenses
- Scale

Make and Record Observations

- Size, shape, color, patterns, texture, weight, smell...
Possible Observations:

✓ Measurements:
  - **Circumference** (peeled and unpeeled)?
    - Diameter / radius
  - **Mass** (peeled and unpeeled)?
    - Weight of the peel vs. the orange
  - **Parts – segments**

✓ Observations:
  - **Color, patterns, texture, size**
    - Illustrations with labeled parts
    - Words to describe the orange
  - **Smell, feel, taste**

✓ Cause and Effect:
  - **Float / Sink**
  - **Roll / No roll**
Images Of Oranges
The Written Word...

orange
Reading The Research:

- Dr. Larry Lowery: *The Biological Basis of Thinking and Learning*, The Regents of the University of California
First Hand Learning
“The five senses are the brain’s only way to obtain data about the “outside” world” (pg. 5)

The more senses involved in the experience, the more solid the memory of the information (Summary of last paragraph of Making Connections on pg. 6)

“Expert teachers never forget that it is only by using the senses that students come to learn about the world around them” (pg. 7)
Second Hand Learning
“Pictorial representations are considered to be one step removed from reality because they substitute for the reality” (pg. 18)

“Fewer of our five senses are utilized in the study of representations” (pg. 18)

“The use of representations in teaching has great value” pg. 18 (Examples on pg. 18-19)
Third Hand Learning
“For symbols to carry meaning, the brain must be able to interpret the symbol in terms of prior knowledge. If there is no match between the brain’s storage and the symbol, then the symbol cannot be interpreted.” (pg. 19)

“The great value to reading books, whether narrative, technical, or expository, is that the words (symbols) are used to take a reader’s prior knowledge and rearrange it in fresh ways.” (pg. 19)
“What is learned from books is, essentially, rearrangements of stored knowledge. The rearrangements establish new insights, fresh ideas, and conceptual frames” (pg. 19)
Powerful Learning Experiences

Most Powerful

First Hand (The Real Thing)
Hands on Experience to Engage the Senses

Second Hand (Representational)
Video/Pictures/Models/Simulations/Lecture

Third Hand (Symbolic)
Books

Orange
What Standards and Skills did we address?

- Circle the practices and skills you think we addressed.
- Then have a table conversation and see where you have agreement and where you do not.
Making Sense...

- Turn to your table group.
- What was powerful about the learning experience you just completed?
- As a result of this experience and the summary of the research, what are three things you need to think about?
- Turn to your science notebook and capture your thoughts.
Turn, Talk, and Tweet (T3) ...

What surprised you today?

What excited you?

What’s your hashtag?