

# EQUIPPED to INNOVATE

## Developing Skilled Thinkers (Part 2)

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### SNORKEL VS. SCUBA VS. SUBMERSIBLE

“He who would search for pearls must dive below.” John Dryden

- ▶ Describe what you imagine each experience to include:
  - snorkeling
  
  - SCUBA diving
  
  - voyaging in a deep sea submersible
  
- ▶ Which experience might enable you: ...to describe what’s visible in the shallows? ...to contribute something to “Shark Week”? ...to discover a shipwreck?
  
- ▶ If an individual engaged in all three activities, how would his/her learning about the ocean be affected?

Our “stereo vision” enriches what we see by adding depth to the other dimensions. We can roughly gauge how far something is away from us, or how far away it is from another object, because of the brain’s ability to combine information from two visual inputs.

Depth enlarges our vision, moving what we see from flattened and separated to proximate and connected.

How do depth of diving and depth of vision relate to one another—i.e., what does depth, in both examples, provide?

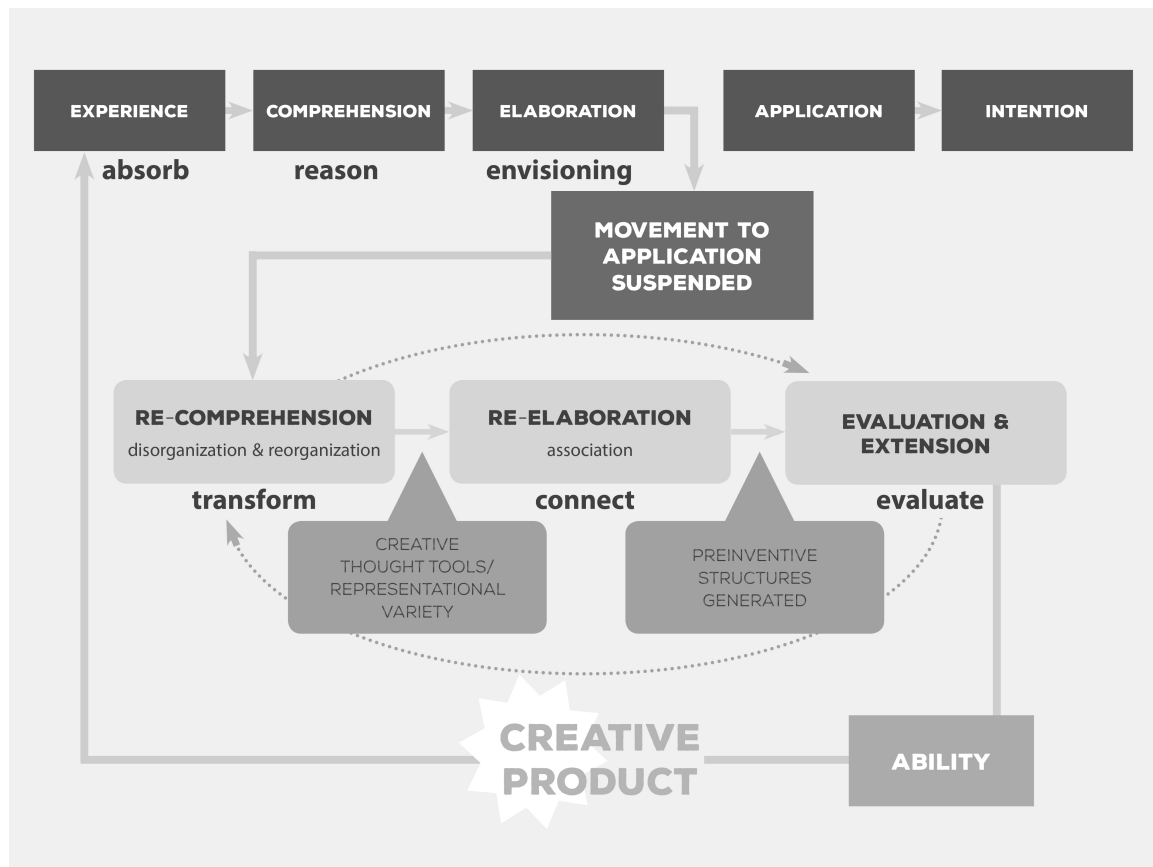
*Depth reveals connections.* What other examples from your experience illustrate this idea?

### **CREATIVITY: FOUNDATIONAL IDEAS**

- ▶ View creativity as thought, not product
- ▶ Creative thinking is thinking below the surface

### **EXPANDING CREATIVITY, DEEPENING LEARNING**

“The creative mind engages in re-elaboration, identifying new associations between the reorganized data and past experiences. As the individual conceptually blends the new association with the reorganized data, a ‘preinventive structure’ develops. This is an idea with possibilities. The individual evaluates and perhaps expands the preinventive structure. One that seems worthwhile sparks action. The individual applies previously developed creative skills to form an expression of the idea. The re-comprehension and re-elaboration of the original data sparks application of creative or artistic skills to produce results” (Washburn, 2010).



## **CREATIVITY, LEARNING, & "BRAINSETS"**

Researcher and Harvard professor Dr. Shelley Carson associates creative thinking with "brainsets," which she defines as "brain activation patterns [that] are the biological equivalents of 'mindsets'; just as your mindset determines your mental attitude and interpretation of events, your brainset influences how you think, approach problems, and perceive the world" (Carson, 2010).

Carson uses the acronym **CREATES** to make these brainsets more memorable: **C**onnect, **R**eason, **E**nvisioning, **A**bsorb, **T**ransform, **E**valuate, **S**tream.

However, examining these brainsets in a different order reveals potential connections to learning:

### ▶ **Absorb**

- characterized by decreased frontal lobe activity but increased activity in the temporal, occipital, and parietal lobes, and by increased alpha and theta wave activity, suggesting a relaxed and receptive mental state
- activity includes curiosity, noticing novelty, an openness to ideas sparked by the environment or emerging from the unconscious, attending to multiple perspectives, gathering information without judgment
- Activate this brainset by:
  - challenging students to cast a wide net when gathering information, striving for diversity in sources and source types; allow for initially wide, unfocused information gathering
  - encouraging **questioning**, especially questions that foster multiple perspective taking and prompt research beyond established facts
  - Answer First: Give the students an answer and challenge them to identify 3-5 questions that could only be linked with it (Grigg & Lewis).

The answer is: *the small intestine.*

What relationship do you see between the absorb "brainset" and experience?

### ▶ **Reason**

- characterized by active executive centers (especially in the left hemisphere) and association centers (also especially in the left hemisphere), and by an active orientation
- activity includes deliberate thought, sequential and deliberate processing, "What will or does work?" (rather than "How could this work?"), trial and error with one possible solution at a time

- Activate this brainset by:
  - engaging students in identifying and organizing critical ideas
  - challenging students to support their choices and organization with evidence: Why is this the best representation of how these ideas relate?
  - Reverse: move student thinking in an opposite direction via prompts, such as:
    - ◆ Name three things that are definitely not *cuddly*.
    - ◆ List five things a balanced equation would never say.
    - ◆ Identify seven sounds early American colonists could not have heard. (Grigg & Lewis)
  - Alphabet: Challenge students to identify a complete list of words, A to Z, that are associated with an object or concept (Grigg & Lewis).
    - ◆ Come up with a list of 26 words, each one beginning with a different letter of the alphabet, that you associate with Edgar Allan Poe’s “The Cask of Amontillado.”

What relationship do you see between the reason “brainset” and comprehension?

► **Envisioning**

- characterized by active control and association centers, especially the right prefrontal cortex and left superior parietal cortex
- activity includes control of awareness combined with an accessing of ideas from more “disinhibited levels of cognitive processing,” mental imagery—“thinking without words,” imagination
- Activate this brainset by:
  - encouraging mental imagery, thinking about multi-sensory elements to identify relationships between new and known concepts
  - asking students, “What else could this idea relate to? How?”
  - challenging students to identify more (i.e., deeper) associations between new and known concepts
  - Picture: Draw or display a picture or object that is unrelated to the topic and challenge the students to identify and explain connections (Grigg & Lewis).

Here is a photo of bamboo. Make connections between it and prime numbers.

Here is a clay jar. Make connections between it and Hester Prynne in *The Scarlet Letter*.

- Combine: Have the students list the defining attributes of two different things and combine the attributes to generate something new (Grigg & Lewis).

What are the defining characteristics of cell structure? What are the defining characteristics of a bicycle helmet? What could embody the defining characteristics of both of these things?

What relationship do you see between the envisioning “brainset” and elaboration?

▶ **Transform**

- characterized by active “Me,” emotional, and memory retrieval centers, especially the amygdala and its connections to the frontal lobes
- activity includes attending to thoughts and feelings related to the self, often a negative feeling state or dissatisfaction, internal reflection, a revisit of ideas in a search for deeper meaning
- Activate this brainset by:
  - engaging students in personal reflection about new information—As you consider these ideas, what do you feel?
  - challenging students to re-organize ideas from a different point of view
  - Interpretation: Present students with a situation, and then challenge them to think of different explanations for the situation’s development. Encourage them to include alternative emotional and motivational elements in their alternate interpretations (Grigg & Lewis).

*By the Great Horn Spoon:* Jack is determined to save his family, so he stows away on a boat bound for California and its 1849 Gold Rush. Out of loyalty, the family’s butler Praiseworthy follows him. How else could this situation develop?

▶ **Connect**

- characterized by less active left executive center and more active right executive center, active left temporal (language) and parietal (association) centers, active vision center, and active subcortical reward center circuits
- activity includes divergent thinking (many possibilities), connecting disparate objects or concepts, attending to novelty and complexity, fluency in idea generation, humor, remote connecting of words and concepts both semantically and homophonically

- Activate this brainset by:
  - challenging students to identify diverse, even seemingly silly, associations between new and known concepts—e.g., not just tree > branch, but also tree > Christmas, tree > shoe, tree > climbing, tree > house, tree > diagram, tree > sled-stopper, etc.
  - introducing alternate reference points or associations; encourage play with ideas
  - What If?: Ask “What if…” questions, such as “What if the Union and Confederacy fought to a tie and two separate countries still existed?” or “What if the order of seasons changed to fall, spring, winter, summer?” (Grigg & Lewis)

#### ▶ Evaluate

- characterized by active executive and judgment centers (prefrontal cortex, orbito-frontal and anterior cingulate cortex) with deactivated “Me” circuit
- activity includes focused attention and active judgment, analysis and evaluation, identification of pros and cons, application of what constitutes “good” to an idea or a work (not an individual)
- Activate this brainset by:
  - directing student focus to ideas holistically and analytically, limiting personal investment in them as much as possible
  - creating an environment of collaboration and consultation, encouraging students to seek out feedback on their ideas
  - Disadvantages: Engage students in identifying disadvantages of an object and in listing possible ways to eliminate those disadvantages (Grigg & Lewis).
    - May be literal: What are the disadvantages of clay as a medium for this concept?
    - May be more figurative: What are the disadvantages of having a sense of sight?

#### ▶ Stream

- characterized by active premotor, temporal association and reward centers, right executive center, and parietal lobes
- activity includes “flow”—spontaneous and skillful responses to challenges, creative combinations of responses, melding of self and action—intensity, lack of self-consciousness, activity directed outward, high engagement and intrinsic motivation, improvisation
- Activate this brainset by:
  - giving students time and space to act on their ideas
  - encouraging improvisation and extension via strategic feedback
  - What relationship do you see between the transform, connect, evaluate, and stream “brainsets” and the “creative curve”?

## **A TRIAL RUN**

Identify a topic you teach:

Choose (or develop) a creative thinking strategy:

“Teach to the point of opportunity.” Explain how your lesson or unit will flow, where the creative thinking strategy will be integrated, and what you expect the result of the creative thinking to be.

## **CONCLUSION**

- ▶ Created products result from creative thinking.
- ▶ Creative thinking engages deeper thinking.
- ▶ Like learning and critical thinking, learning and creative thinking positively influence one another.
- ▶ Many forms of creative thought have a corresponding process of learning.
- ▶ Creative thinking strategies can strengthen the effectiveness of instructional stages.
- ▶ The “creative curve” is worth considering when teaching ideas of foundational or critical importance.

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