Teaching the Way People Learn

Module 6: Teaching for extension and application of knowledge

This handout accompanies the video for Module 6. Use the handout to review information from the video and to record discussion.

---------- **Section 1** ----------

- Teaching selected learning objectives to mastery assumes that students retain information in long-term memory.
- Once students have acquired knowledge, an important next step must occur to foster deep understanding and true learning.
- The next step is expanding instruction to promote the application of knowledge in real-world problem-solving tasks.
- The hallmark of 21st-century learning is the ability to demonstrate creative and innovative thinking.
- This module focuses on the growing body of research in creativity and how findings can inform instructional practices so that learning experiences foster divergent thinking and problem-solving.

Stop and Jot 1: What are your reactions to and thoughts about Robinson's talk?

---------- **Section 2** ----------

- "The principal goal of education in the schools should be creating men and women who are capable of doing new things, not simply repeating what other generations have done. Men and women who are creative, inventive and discoverers." --Jean Piaget.
- "We cannot always build the future for our youth, but we can build the youth for our future." --Franklin D. Roosevelt
- A common misconception in our culture is that creativity, innovative thinking, and problem-solving skills are traits bestowed on only gifted individuals.
- The misconception is apparent when comparing the curricula and instruction of gifted students versus remedial classes.
- Conventional instruction relies on convergent thinking, which encourages students to find the single, right solution to a problem.
- In contrast, an activity that promotes divergent thinking leads students to generate multiple and varied solutions.
- Bloom's taxonomy portrays the continuum of the two types of thinking.
- Divergent thinking scores are typically much better predictors of creative ability than IQ.
- Creativity is not innate - it can be practiced and learned.

Stop and Jot 2: What is divergent thinking? How might incorporating tasks that require divergent thinking enhance creative problem-solving?

---------- **Section 3** ----------

- Research on brain plasticity during the past two decades demonstrates that significant changes occur in the brain as the result of repeated sensory experience.
- A well-documented example of brain plasticity is a study of London taxi cab drivers. The researchers found that taxi drivers showed a significant increase in the size of the hippocampus, a brain structure associated with memory.
- Changes in brain structure have also been found in individuals who take part in activities such as playing musical instruments.
- Oher research has suggested that teaching children creative tasks results in changes not only in cognitive functions but also in brain structure.
- Our brains appear to work differently when we are engaged in tasks that require divergent thinking.
- Subjects who scored in the highly creative range on the Torrance Test of Creative Thinking showed significantly greater activity in brain areas thought to be involved in emotion, working memory, and novelty response.
- Moments of insight are associated with breaking free of conventional assumptions and common associations between pieces of information in order to discover novel solutions to problems.
- During improvisation, functional brain scans indicate a widespread *deactivation* of prefrontal cortex areas typically associated with self-regulation, self-monitoring, focused attention, and inhibition.
- Groups brainstormed more solutions and more original solutions for multi-part tasks. Whereas, individuals were more successful for single-part tasks. These results highlight the need for recognizing the type of problem before a teacher asks students to work in groups.

Stop and Jot 3: According to research, how does the brain respond to explicit instruction in creativity? What are some implications of this research for teachers?

---------- **Section 4** ----------

- Most scientists agree that creative thinking does not occur without having first mastered a body of content knowledge.
- Knowledge and thinking skills should be interwoven within the school curriculum and all content areas.
- One of the sharpest debates regarding teaching content versus process is in the area of mathematics.
- Some argue that to remain competitive in a global economy, our students will need to display global competence (i.e., the ability to integrate information through creative and innovative problem-solving).
- In order to develop the creative mind, experts contend that creativity can and should be explicitly taught in our schools so that children will implicitly employ it not only in school but also in life.
- Research has shown that teachers' theories and concepts of how students should perform in class can either dampen or enhance creativity in the classroom.

Stop and Jot 4: Why might an instructional shift that promotes divergent and creative thinking be "uncomfortable" for some educators?

---------- **Section 5** ----------

Try these activities associated with the extension and application of knowledge.

- Conducting investigations and surveys
- Engaging in problem-based learning by designing a task that requires thinking across disciplines
- Generating multiple solutions to a problem
- Designing experiments to test hypotheses in project-based learning models
- Analyzing perspective of historical figures or literary characters
- Building projects that tap into multiple domains of artistic tasks
- Asking novel questions that have multiple responses
- Connecting unusual elements of a question to produce an innovative answer
- Creating metaphors and analogies to explain a concept
- Discussing open-ended questions to probe for assumptions, clarifications, and consequences
- Allowing regular time for reflection of students in learning goals
- Restating a problem in multiple ways
- Diagramming a solution in visual representations
- Creating stories and narratives to explain concepts
- Collaborating in group learning activities within the classroom and within the broader learning environment

Go and Grow

Without referring back to the video or handout, what are **three** valuable points you take away from this module?

What are **two** things you would like to do "tomorrow" with the information you learned?

Assignment: What is **one** question you have and would like to research? For the next time you meet, prepare a brief summary of your findings to share with others who may have the same question.