FLUENCY, ORIGINALITY, FLEXIBILITY & ELABORATION

Thinking strategies to enhance skills of analysis, creativity, and problem solving.

Grade: 5/Sci

A NEW KIND OF LIGHT BULB

Brief Description of the Lesson: Students practice fluency by brainstorming various sources of light and practice flexibility, originality and elaboration by using the creative thinking steps in Robert Eberle's SCAMPER process to invent a new kind of light bulb.

SOL/POS Objective: *(List number and specific objective.)*
Science 5.3
The student will investigate and understand basic characteristics of visible light and how it behaves. Key concepts include:

a) the visible spectrum and light waves
b) refraction of light through water and prisms
c) reflection of light from reflective surfaces (mirrors)
d) opaque, transparent, and translucent objects
e) historical contributions in understanding light

Instructional Strategy:
Generating and Testing Hypotheses- Students apply creative thinking skills to generate ideas for a new invention.

Materials: pencils, SCAMPER handout, drawing paper, examples of different kinds of light bulbs, *SCAMPER-Games for Imagination Development* by Robert F. Eberle

Enduring Understanding:

- The creative thinking processes of fluency, flexibility, originality and elaboration are used by scientists and inventors
- Scientists make new discoveries by recalling what they already know about a subject and manipulating the facts in imaginative ways.
- Creative problem solving requires stepping outside the boundaries of traditional or conventional thinking and looking at something in an entirely new way.

Introduction/Essential Questions: (*What influences your reaction to an issue or a problem?)*

- How do inventors get their ideas?
- What are the thinking skills related to creative thinking? (fluency, flexibility, originality and elaboration)
- Why is it important to "think outside the box" when doing creative problem solving?

Teach and Explore Strategy: *(Steps in teaching the process and exploring applications)*
Prior to teaching this lesson, be sure to have taught or reviewed the introductory thinking process lesson on fluency, flexibility, originality and elaboration. Help focus students' thinking by reminding them of the metacognitive component of this lesson.

- Tell students they are going to practice being fluent thinkers. Say that **fluent**

thinking (coming up with lots of ideas) is a way to warm up your brain's creative thinking power.

- Have students make a list of as many things as they can think of that provide light. Remind them to be sure to include both natural and man-made sources. Give them a five minute time limit.
- At the end of five minutes ask students, "How many have more than 15 things listed? More than 20? Have students compare their list with a partner. Ask, did you have any ideas that were not on your partner's list? The ones you did not have alike were your original ideas. **Originality** is another important creative thinking process.
- Ask how many had light bulb on their list. Explain that they will be doing creative thinking in this lesson to invent a new kind of light bulb.
- Teach students the SCAMPER process to practice **originality, flexibility and elaboration.** Ask, "What does the word *scamper* mean? Today we are going to let our imaginations run free as we think about changing a light bulb to make it better (more useful, cheaper, more efficient, faster, easier, more fun or exciting) In the history of the light bulb lots of scientists and inventors have come up with new varieties or light bulbs. (Show some of the examples.)
- Ask what other improvements or changes to a light bulb have you seen or know about?
- Say: The process of SCAMPER is an acronym that stands for seven words that describe ways to manipulate or "play with" an idea. Show the first letter **S**- This stands for the word ***Substitute (It means to have a person or thing act or serve in the place of another.)*** Show the students a light bulb. Ask: What are some things that could be substituted for a light bulb? What if you need to have light but there weren't any light bulbs? Allow think time and ask for responses. Follow the same procedure for the rest of letters.
- **C-** stands for ***Combine(It means to bring together or unite)*** Ask: What are some things you could combine with a light bulb to improve it or make it more interesting?
- **A**- stands for ***Adapt (It means to adjust or change for the purpose of matching a condition or special purpose)*** What if it was a light bulb for people who loved baseball? What might it look like? What if it was going to be used in a child's room?
- **M-** stands for three words ***Magnify (to enlarge, make great in size or quantity) Minify (to make smaller, lighter, slower, less frequent)*** **or** ***Modify (change one or more parts)*** What if a light bulb was as big as a refrigerator? What could it be used for? What if it was as small as a grain of rice? What use might it have? What if you had to recycle 5,000 old light bulbs? What use could they have? What if you changed the glass on the bulb to some other material such as a mirror or foil? What use might it have?
- **P-** stands for ***Put to other uses (It means use it in a way that it wasn't originally designed for)*** What could you do with an old light bulb? What other purpose could a light bulb have besides give light?

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- **E –** stands for ***Eliminate (It means to remove, omit, get rid of a quality or part)*** What if you eliminated the glass from a light bulb? Or the insides of the light bulb (filament, etc.)
- **R** – stands for ***Reverse or Rearrange (It means to turn it around, change the layout, reorder or turn the parts opposite, move parts around)*** What if you made the narrow part of the light bulb on the top and the wide part at the bottom? What if you put the insides on the outside?
- After going through all the SCAMPER steps, tell students that they are to use some of these steps to create a new light bulb that no one has ever seen before. Their new light bulb must be an improvement or a new version of old light bulbs.
- Give students time to work on the SCAMPER handout. The final product is a picture of their invention with important parts labeled. Students will also identify the SCAMPER step(s) they use, state the reason for their new and improved light bulb, and name their invention.

Assessment Evidence: (Discussion, teacher observation, completed product, student reflection…)

- Student ideas contributed in the SCAMPER discussion
- Student product (new kind of light bulb) Assess level of originality and elaboration shown in the design

Metacognition:

- What kinds of thinking did you use when you SCAMPERED your object?
- How was the thinking you did in this lesson like what inventors and scientists do in their work?
- How does thinking "outside the box" help your solve problems or make improvements to something?

Extensions:

- Students can create ads to persuade people to buy their new product.
- Students can SCAMPER another object such as a backpack, umbrella or an electrical appliance such as a hairdryer.

Name_____Date_____

SCAMPER a _____

S(substitute)_____
_____
_____

C(combine)_____
_____
_____

A(adapt)_____
_____
_____

M(magnify, minify, modify)_____
_____
_____

P(put to other uses)_____
_____
_____

E(eliminate)_____
_____
_____

R(reverse, rearrange) _____
_____