



THE “WOW” OF TEACHING SPACE SCIENCE K-12

BY BEN ROY

How would you like to have *you* for a science teacher today? I have asked myself this question many times. The days that I would *not* want to have me for a teacher are the ones when I am teaching at the lowest levels of learning—information gathering, memorizing, and organizing.

People of all ages not only learn, but *remember*, concepts and facts more easily when lessons require thought, manipulation, and interactive conversation. Activity-based lessons can provide all three of these components.

The study of science can introduce students to the miracles of creation. Teachers must help students see the “glorious scenes painted by the great Master Artist upon the shifting canvas of the heavens, . . . become acquainted with the wonders of earth and sea, . . . [and] watch the unfolding mysteries of the changing seasons”¹ Teachers should not merely *tell* students about God’s

creatures; the animals themselves are to be their teachers.²

Actually *doing* science brings WOW into the process

(wonder, open-mindedness, wide-eyed-ness). For example, instead of only reading about different types of soil, students should see, feel, and smell samples of dirt, dig in it, weigh it, sift it, identify its colors, look at it through a magnifying lens, identify living things in it, test its pH, add water and observe the results, then talk, read, and write about what they discovered.

Here are some suggestions for increasing the “WOW” factor in your science classes:

- As you plan the school year, examine your Seventh-

Do not tell students what they are going to learn. Let them discover the lesson’s concepts for themselves.

day Adventist Curriculum Guide K-12 and the scope and sequence section of the teacher's edition of your textbook. Decide which concepts are the most important, and then design activity-based lessons for them. Get ideas for activities from the teacher's edition, publications such as *Science & Children* (for elementary teachers), *Science Scope* (for middle school/upper elementary teachers), and *The Science Teacher* (for secondary teachers); colleagues; professional conferences; and Websites.

- Plan each lesson carefully. Collect and store needed components in labeled, clear plastic boxes. Include a list of the box's contents, a copy of the lesson plan, and a note about any additional items required for the lesson. (Make a list of all the materials you need for the year, and share it with parents during registration or open house. Invite them to choose items they are willing to supply for the class.)

- Begin each class with a demonstration.
- Ask questions to stimulate thought. Do not tell students what they are going to learn. Let them discover the lesson's concepts for themselves. At the end of the lesson, you can summarize the concepts and ideas.

Try this national award-winning NASA space art lesson.

Instructions for one of my favorite "WOW" lessons is given below. It may be used when teaching about space or the Solar System. This lesson makes every student a successful space artist. One of the teachers to whom I taught this lesson shared it with her 5th graders, and one of her students won first place for the National NASA Space Art Contest.

Intergalactic Space, Grades K-3

Theme: Solar System or Space

Objective: Students will learn about space by designing and creating a poster of our Solar System.

Materials:

- One-fourth sheet of semi-glossy poster board per student, plus one for the teacher;
- Poster paint: blue, green, brown, white, red, and yellow;³
- Containers to hold dabs of poster paint, e.g., small paper plates;
- One can of glossy black spray paint per seven students;
- One can of glossy white spray paint;
- Different-size lids from jars and other containers, ranging from small to large;
- One pencil per student;
- Protective clothing for each student;

People of all ages not only learn, but *remember*, concepts and facts more easily when lessons require thought, manipulation, and interactive conversation.

- Ground cloth or tarpaulin.
- Optional: songs about space; pictures of objects in the Solar System; and information in five languages: English, Spanish, Portuguese, German, and French; see <http://solarviews.com> for details. Teachers and students may use materials from the site.⁴

Procedure:

Tell the students that they are going to be space artists today. (Try dressing up like a space traveler. Wearing a costume makes any new concept or activity more interesting and fun, and helps add "WOW" to your lesson.)

Before beginning this lesson, make a list of the planets in the Solar System in order of their distance from the Sun. Post it on the chalk board, or distribute it to the students. Discuss facts about the Solar System: planets (size, orbits, moons, unique characteristics, etc.), the asteroid belt, comets, and the Sun. Tell the students that they are going to create a collage depicting some of the planets in our Solar System. If you wish, you can play background music as they work.



The author, Ben Roy, dressed for an astronomy presentation.

Now you are ready to begin making the collage. (It is very important to demonstrate each part of this lesson, after which students follow your lead.)

1. Have the students don their protective clothing.
2. Have each student write his or her name on the non-glossy side of the poster board.
3. Using the semi-glossy side of the poster board, demonstrate to the students how to arrange the different-sized lids on the poster board, then lightly trace around each lid to create the outline of planets and the Sun. Tell the students that as they paint each circle, they should make sure that the paint goes a little outside the line. (This is important because they will later cover each circle with a lid, which must cover all of the paint.) They do not have to put the circles in any particular arrangement. Tell them to save the lids.

The study of science can introduce students to the miracles of creation.

4. Holding up your piece of poster board, tell the students that they will use their fingers for brushes today. To model how to do this, choose a circle on your poster board and dip your fingertip in the blue paint.

5. Ask the students: "Which planet is the second one from the Sun?" (Venus) Choose one circle to represent Venus. Fill the entire circle with blue.

Next, dip your finger in yellow paint and daub it over the blue in several places. Students will notice that a third color, green, has been created by mixing the blue and yellow paint.

(While you are demonstrating how to paint the planets



and Sun, you can continue to share/review information about the parts of the Solar System.)

6. Ask the students: "Which is the third planet from the Sun?" (Earth) Choose one circle to represent Earth. Astronauts say that planet Earth looks like a blue marble in space. Paint the entire circle blue.

Ask the students what would be brown on Earth that could be seen from space? (deserts and mountains) Dip a finger in the brown paint, and put a little here and there.

Ask what would be green on Earth that could be seen from space? (forests and jungles) Dip a finger in the green paint, and put a little here and there on top of the brown.

Ask what would be white on Earth that could be seen from space? (clouds, ice caps, glaciers, and snow) Dip a finger in the white paint, and put a lot of white here and there.

7. Dip the tip of your index finger in the red paint, and ask the students: "Which planet is called the red planet?" (Mars). Choose one of the traced circles to represent Mars. Paint the entire circle red. Dip your second finger into the white paint, explaining that Mars has polar ice caps. Put a little white at the top of the circle representing Mars.

8. Ask the students if they know the names of any of the "dwarf planets" (Pluto, Ceres, and Eris). Choose a small circle to represent Pluto. Dip a finger in brown paint and fill the entire circle with brown. Dip a finger in the white paint and mix some white into the brown paint.

9. Ask the students: "What is the name of our star?" (Sun) Choose a large circle to represent the Sun. Dip your finger in the yellow paint, and fill the entire circle with yellow. Then dip a finger in the red paint, and mix it into the yellow to create some orange areas.

10. When the students have finished their paintings, set them aside to dry. Then take them outside and put them on top of your drop cloth. Have the students cover each of their planets with lids matching the sizes of the circles.

11. Using the black paint, have the students watch as you spray in the black night sky between and around each lid.

12. As you lift the lids off of each painting, the students will "Ooh" and "Ah" in delight!

13. After the black paint dries, the students can add some stars by rubbing a small amount of white paint on a small stiff-bristled brush and daubing it gently where they want the stars, or by dipping a dull toothpick into the white paint and applying small dots wherever they like.

14. A comet can be added by inverting a can of white spray paint over the painting and quickly pressing the spray nozzle into the poster board. Remind the students that the tail of a comet always goes away from the Sun.

Intergalactic Space, Grades 4-12

Try dressing up as a space traveler as mentioned in the lesson plan for K-3. The older students still enjoy the fun of dress-up!

Theme: Solar System or Space

Objective: The students will learn about space by designing and arranging a solar system.

Materials:

- One-fourth sheet of semi-glossy poster board per student, plus one for the teacher;
- Six colors of glossy spray paint: blue, green, brown, white, red, and yellow, one can for every 14 students;
- One can of glossy black spray paint per seven students;
- Different-sized lids from jars and other containers, from small to large;
- Ground cloth or tarpaulin;
- Plastic shopping bags for texturing paint;
- Poster board torn into hand-size pieces;
- Optional: songs about space; pictures of objects in the Solar System and information in five languages: English, Spanish, Portuguese, German, and French.⁵

Procedure:

A week or so before the lesson, give students a short quiz to determine what they know about the Solar System. This will help you plan a discussion before and during this project. You can discuss facts about the Solar System: planets (classification, size, orbits, moons, unique characteristics, etc.), the asteroid belt, comets, the Sun, and the Milky Way.

Tell the students that they are going to create a collage depicting some of the planets in our Solar System. Tell them that because the Sun and some of



the planets are very large, the picture will not be drawn to scale. Younger students can draw circles around the jar lids on the poster paper as guidelines for where to spray the paint.

If you wish, you can play background music as they work.

Because this activity involves the use of spray paint, it must be done outside, and students should wear a smock or other protective clothing.

The teacher must demonstrate the entire lesson before the students begin their projects.

1. Place the semi-glossy side of the poster board facing up on top of the drop cloth.

2. Tell the students that they will start with the second planet from the Sun (Venus, Earth's twin). Spray a hand-sized circle of blue paint several centimeters from Mars. While the paint is still wet, spray some yellow paint here and there on top of the blue paint.

Immediately lay a plastic shopping bag on top of the wet paint, patting the plastic down lightly into the paint, then quickly peeling the bag off. This creates an interesting texture, mixing the blue and yellow paint to create a third color, green, on planet Venus.

3. Spray a large circle of blue paint on the poster as you talk about the Blue Planet in space, Earth. Spray some brown and green (deserts and mountains; forests and jungles) here and there over the blue. While the paint is wet, completely cover the entire circle with a layer of white paint (clouds, snow, glaciers, and polar icecaps). Carefully lay a plastic shopping bag on top of the layer of white, then slowly peel the bag off.

4. While giving information about Mars and asking questions about the Red Planet (Mars looks red because it is covered with dirt that contains a lot of iron oxide), spray a fist-size circle of red paint on the poster board. While the red paint is still wet, spray a small spot of white across the top of the red circle. This represents the northern polar ice cap. Brush a torn edge of poster board over the wet red area (avoiding the ice cap), to create a uniquely textured red planet.

5. To represent one of the dwarf planets, Pluto, spray a very small spot of brown paint in an open area on the poster board, followed by a light spray of white. Wipe a finger through the brown and white paint, creating a nice blend of color.

6. To represent our moon, lightly spray a small spot of black paint close to planet Earth.

7. Spray a very large yellow arc in one corner of the poster board to represent the Sun. While the paint is wet, lightly spray red paint over the yellow. Immediately lay a circular piece of torn poster board over the wet paint, then peel it off. You have just added a sunspot.

8. After the students have completed their posters, place them on a drop cloth or tarpaulin. Choose a matching-sized lid for each planet, and place the lids over each circle. A trash can lid or Frisbee may be used for the Sun.

Decide which concepts are the most important, and then design activity-based lessons for them.

9. Using a can of black paint, spray the black night sky color in between and around each lid. You can add a little blue to the black to make an interesting night sky.

10. You can add a hint of the Milky Way Galaxy by holding a can of white spray paint about 20-30 centimeters above the poster board, and quickly spraying across it.

11. If desired, a sprinkling of stars can be added. Holding the can of white spray paint upright, place the finger that you are using to depress the button so that it partially blocks the sprayer. Some of the paint will hit the pad of your finger and spatter tiny bits of paint onto the poster board. Or the students can use dull toothpicks to apply dots of white paint on the background.

12. A comet can be added by inverting a can of white spray paint over the painting and quickly pressing the spray nozzle into the poster board. The tail of a comet always goes away from the Sun.

13. As you lift the lids off of each painting, you and the students will "Ooh" and "Ah" in delight! These student paintings look just like commercially designed posters! ✍

I hear the teacher talk and I forget.

I see the teacher demonstrate and I remember.

I do and I understand.

Adapted Chinese Proverb



Ben Roy teaches science methods to education majors at the University of Tennessee at Chattanooga and is an adjunct professor at Southern Adventist University in Collegedale, Tennessee. He has taught in the Adventist school system for 25 years, and is a Teacher Resource Agent for the American Astronomical Society.

Mr. Roy is also the president of "The Science Zone Corporation," which puts on mobile science shows, teacher in-services, and weeks of prayer throughout North America and produces science kits and DVDs. Some of his 72 science lessons have appeared on 3ABN's Kids' Time program. He can be contacted by e-mail at benroy@gosciencezone.com or at his Website at <http://www.gosciencezone.com>.

REFERENCES

1. Ellen G. White, *Education* (Mountain View, Calif.: Pacific Press Publ. Assn., 1952), pp. 100, 101.
2. Adapted from *ibid.*, p. 117.
3. For a recipe for poster paint, see <http://www.bluebonnetvilage.com/recipes.htm>. To make poster paint more washable, add a small amount of liquid soap.
4. See <http://solarviews.com> for details. Teachers and students may use materials from the site.
5. *Ibid.*