Lively Science Teaching for Multigrade Classrooms

"Did it grow?"
"It worked, didn't it?"
"Let's see, let's see!"

Mrs. Lane's fourth-grade students tumbled into the room. They quickly moved to the science learning center to check the progress of their experiment.

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Delight registered on their faces as they observed the crystals forming on a string suspended in a sugar solution. The discovery of "something happening" followed the prediction two of them had made before the experiment began. A third student, while delighted to see the development of crystals, was skeptical, waiting until he had subjected all the facts to close scrutiny.

At the beginning of the experiment, Mrs. Lane asked the students to predict what would happen. Some did not believe that crystals could form on the string, and indicated this on a prepared response sheet. Now the results were coming in, and the students were eager to see what had happened.

Mrs. Lane had set the stage for learning. The excitement generated by the experiment was the result.

A class experiment is only one of many ways to draw students into the exciting world of discovery, of science. Sometimes the natural curiosity of students will lead to some fascinating discoveries. However, if such incidental learning is the basis of a classroom science program, it will be inadequate and disorganized. A combination of incidental and planned experiences allows for flexibility and provides an opportunity to incorporate the best of both.

Incidental learning may capitalize on seashells brought for sharing, an insect found in the classroom, or may center around a recent or anticipated natural phenomenon such as a solar eclipse, or the first frost. Frequently, the incidental experience may be meshed with the planned curriculum.

Teachers who are responsible for science instruction of several or all grades should develop a program that meets the needs of the students without exceeding the energy of the teacher. For the lower grades teachers should utilize the multigrade unit plans developed for grades 1-4. They provide the information necessary to teach these grades during a single instruction period incorporating the prepared curriculum available for each grade level.

Teachers of upper-grade students should outline the program for the year and plan in advance what learning experiences will be provided. Curriculum with common objectives should be combined to allow for a single presentation to the upper grades. With a little work, units of study can be developed that will provide a strong science program for even the smallest or most remote school. In planning a science program for the multigrade classroom, the teacher should keep in mind the following guidelines:

1. *Determine what science principles will be studied and how objectives will be achieved.* Matching the curriculum to the needs of each child is a continuous process. For students at the elementary level the guiding principle should be exploration of their surroundings. They are oriented toward simple goals and learn through trial and error. Elementary students would rather measure the depth of a mud puddle by wading through it than by sticking a ruler into it.

2. *Review your own background in the topic.* How much research and preparation are required to teach a given subject? Planning is in direct proportion to the training and familiarity of the teacher. Locating and trying out activities, experiments, and other methods of inquiry helps the teacher become familiar with the principles and steps required in the demonstration (as

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well as what might go wrong!).

3. *Demonstrate enthusiasm about science.* No matter how a science program is organized, its success depends on the teacher. The teacher's background, interest, enthusiasm, and willingness to learn are key factors to success. These provide the impetus for student learning and offer a model for children to follow.

4. *Become a learner with the students.* If the teacher shares the excitement and pleasure of learning with the students, science will have much more impact. Memories of a walk together to observe nature's preparation for winter will be remembered far longer than just reading about it in a book. Students who rub a balloon through their hair to see what happens will remember more about static electricity and electrons than those who copied the definition of electrons from the encyclopedia.

For elementary students the guiding principle of the science curriculum should be exploring and discovering their surroundings.

Every teacher is an actor! Whenever possible, use those skills to generate

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enthusiasm, curiosity, and lively participation in discovering the marvels of the world around us. Your science program will inspire enthusiasm in your students if you provide a stimulating physical environment. Since the interaction of students with the world around them is the foundation from which science grows, capitalize on this natural curiosity by providing a wide variety of materials to explore.

Some items to consider are materials for growing plants; a terrarium; an aquarium; small animals such as rabbits, hamsters, or mice; containers of varying sizes; tools; toys; collections of natural objects like shells, rocks, leaves; a box filled with items like pieces of wood and fabric, batteries, wire, light bulbs, buttons, spools, magnifiers, and other materials that can be used for sorting, matching, identifying, and assembling. Larger materials such as fabric boards, yardsticks, and pails should be readily accessible.

Demonstrate! Whenever possible, begin science study with a demonstration. This does not need to be elaborate, highly technical, or time consuming. Rather, plan for a brief, eye-catching, thought-provoking few moments that will get the attention of the students and draw them into the lesson. For example, when studying how heat causes chemical changes, pop some popcorn and discuss what has happened. Heat a carbonated beverage, then have students taste it. Ask them how the chemical change can be detected.

- *Plan for a wide variety of experiences.* Give the students firsthand experiences with materials and living organisms. Each student comes with preconceived concepts and needs to learn new ways of looking at, thinking about, and processing information. Watching a hamster build a nest, mixing water and oil, or examining seashells with a magnifying glass will broaden children's perceptions.

- *Consider the background and ability of each student.* Plan activities that can intrigue those with short attention spans as well as those who an spend hours simply watching an insect or a fish. Be flexible about time and assignments so that when a reluctant student becomes engrossed in an activity, he or she is not hurried on to other matters. Even slow students or those lacking in motivation brighten up when it's "Hands on" time. Cleaning the aquarium may be drudgery for the teacher, but it may be highlight of the week for a student!

- *Plan cross-age activities* that all students can share. This will give the students an opportunity to share and learn together. Let the mentally agile child assist the one who needs help in grasping information. Younger students can participate more fully in science if they have an older student to guide and help them.

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- *Invite students to ask questions.* Pose questions for them to wonder about. Discoveries they make for themselves will have more impact than information dispensed by the teacher. Telling students about the length of growing season required by various plants means little to them until they have actually planted corn and radishes and seen how long each takes to grow and mature.

- *Listen carefully to students' answers and comments.* Words have different meanings, depending on the background of the child. For example, to one student to be "able" means to be capable of doing something, while another child may think of Abel, the brother of Cain. Misconceptions may be corrected by careful questioning by the teacher, combined with further activities that reinforce correct responses.

- *Help students develop a scientific method of investigation* through instruction techniques and guided experiences. At first they may not recognize logical conclusions. However, through trial and error their discoveries will lead them to natural outcomes. For example, give a small child equal portions of clay, one in the shape of a ball, the other in a roll, and ask him which piece is bigger. He will most likely say the ball is larger. However, given time to manipulate and remold the clay, children will discover the correct answer and then draw some conclusions of their own.

- *Have fun with students* as you teach science. Concepts are important, but the excitement that can be generated about learning is just as important. Once safety rules are established, encourage explorations and experiments that will stimulate further discoveries. Enjoy this time with your students.

- *Know your community and its resources.* Even the smallest town has people with collections, hobbies, or interests that can be incorporated into a unit of study. Make an informal survey of the church and school community to discover what is available. A small backyard garden, waste disposal plant, or nearby gully, ditch, or stream can reveal amazing scientific facts to the students. Community members who know the names of the birds native to the area, who have a collection of artifacts representative of the locale, or who have a keen interest in astronomy may be able to enrich the study of science in your classroom.

- *Reveal the Creator to students* through the study of His works. Help them gain a greater appreciation and understanding of God through science. Few other subjects offer such a natural stage from which to present the power and love of the Creator. No contrived scenarios are necessary, for each lesson provides an opportunity to witness to the greatness of Him who made all things and has provided for their perpetuation in ways that even great scientists cannot understand.

Who can explain how a fuzzy caterpillar becomes a beautiful butterfly or how a snowflake, delicately formed and fragile, combines with countless others to bring a city to a standstill.

As students learn about the world around them and come to better understand themselves through the study of science, they will gain knowledge and insights to carry them through this life into the world to come. □

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