

Scientific Problem solving

takes students through the step by step process of solving a problem by correct application of scientific problem solving techniques. A simple experiment is conducted that shows the complete process explained here. The demonstration is setup to allow it to be duplicated in the classroom, then compared to the results on the video. The program's natural stopping points allow the teacher to conduct the experiment while following along. In addition, suggestions are made for further studying the effects of salt water. The suggestions may be easily adapted to class demonstration or experimentation. Laboratory safety procedures are presented and used during the program.. The video concludes with presenting some unlikely careers that depend on science skills.

Vocabulary: (In order as they appear in the video)

Steps for solving a problem scientifically.

Step 1:

Define the problem: Form a question of what you want to find out.

Step 2:

Research the problem: Gather information from a variety of sources about the problem being investigated.

Step 3:

Form a hypothesis. Make an educated guess of how the problem will turn out compared to the variables used. Use the knowledge gained from step 2 to help form the hypothesis. For example the more salt used, the lower the boiling point of water.

Step 4:

Test the hypothesis. Design an experiment that will answer the problem statement. (Suggestions for designing an experiment are below)

Step 5:

Record and analyze data: The writing down of information observed in the experiment. This is a means of communicating the relationship between the independent and dependent variables.

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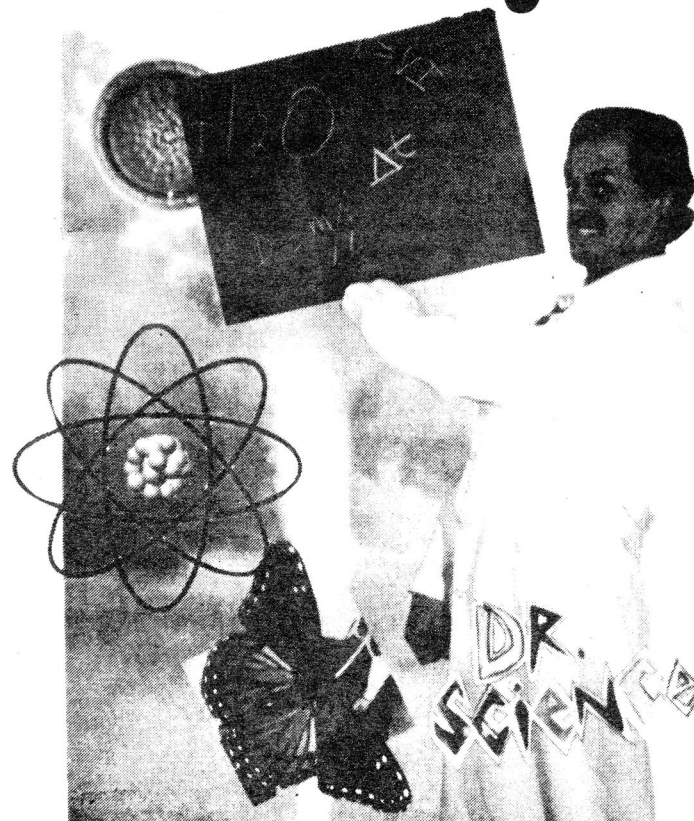
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Teacher's Guide

VOL. 1

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Step 6:

Stating a conclusion: Should include a description of the purpose, major findings, and an explanation for the findings.

Meniscus: The curve of a liquid in a container.

Materials: Supplies needed to conduct an experiment.

Procedure: Steps taken in performing an experiment.

Variable: Each factor that changes in an experiment.

Independent variable: The purposefully changed factor in an experiment.

Dependent variable: The factor that is changed by the experiment.

Control: The factor or factors that do not change in an experiment.

Data: Recorded observations and measurements. They include time intervals, changes in measurements, and changes in quality and quantity.

Trials: Repeating the experimental process to reduce the efforts or chance for errors.

Theory: An explanation backed by repeated tests and experiments.

Law: When a theory has been tested and validated repeatedly and is accepted by the scientific community it becomes a law. If at a later time experiments show it is not true it will no longer be accepted.

S.I. International scientific method of measurement. The metric system.

Preview or review questions:

- What is science? (Science explains the what, why, and how of every day life.)
- What is the Scientific Problem solving method? (A systematic approach to solving problems).
- What elements make up salt? (Na, sodium and Cl, chloride).
- What safety equipment should be used in a lab when working with heat, projectiles, or chemicals? (Goggles).
- When heating a substance in a test tube, why should the opening be facing away from you and others? (So the contents don't boil or spurt out toward anyone).
- When combining acids and water, how should they be poured? (Acids should always be poured into the water, so the water will splash and not the acid).
- What part of the meniscus should be read? (The bottom curve).
- Compare a dependent variable to an independent variable. (The independent variable is the result of the action of the dependent variable.)
- In the film what is the independent variable? (The different amounts of salt). The dependent variable? (The different boiling points of the water).
- What is the reason for testing only one variable at a time? (To insure that the results are caused by only one factor).
- What is the first thing to be done when measuring mass on the triple beam balance? (make sure the pointer is at "0").
- What system of measurement is used by scientist throughout the world? (S.I. The metric system).