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Help! Help Your Substitute Teach Science

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The science teacher often finds that to miss a day of school most frequently means to have lost a day of instruction. School administrators are experiencing serious difficulty in finding substitutes for teachers of the new B.S.C.S,, C,B,-A., CHEMS and P.S.S.C, programs: Active science teachers are aware of new developments and concepts and orient their teaching procedures to incorporate these into their curriculum regardless of whether or not they are teaching the new courses. Experienced substitute science teachers for traditional courses may sometimes be obtained but the probability that these teachers can contribute greatly to the science experience of the student is doubtful.

McCALLEY

STARR

EASON

Because it is difficult to find substitute teachers trained in science and capable of handling the newer materials, we generally expect no more than the maintenance of good discipline.

In this article we propose to illustrate a possible way by which science teachers can meet this problem in a more satisfactory way than is frequently the case. We suggest that the teacher have prepared in advance several period-length special plans especially for the substitute teacher. Each plan could deal with a single concept which might be associated with more than one unit of study. These could be keyed to the appropriate course units, thus allowing the substitute to select one of the group which best fits the major topic of class study. If the teacher were gone more than one day, the substitute would then have several days of specific instructions to follow.

The plan could be based on an article from **Science and Math Weekly, Science World** or some similar source which could be available to each student. Some teachers might find a variety of articles from different sources concerning a single topic. This would provide a variation of information bases on which to draw for class discussion.

Development of the plan would involve not only assignment of resource materials, but suggestions to the substitute regarding background for understanding special areas of discussion, leading questions which might best develop a discussion, and questions for a short quiz to be given in the closing minutes of the period.

We believe the following suggestions for plans illustrate ways this

may be done in the areas of biology, chemistry and physics.

GUIDELINES FOR DEVELOPING SUBSTITUTE TEACHER PLANS

I. To the Substitute Science Teacher
II. General Outline
  A. Time allotments and organization.
  B. Source of materials
III. Teacher's Guide
  A. Discussion guides
  B. Background information
  C. Quiz questions

BIOLOGY

To the Substitute Teacher:

One or all of the following plans are to be used in event of my absence from teaching duties. Each plan is keyed to specific units studied in this course. By checking my general plan schedule, you can decide which plan is most appropriate for the day you substitute for me. If more than one day will be missed, the three may be used regardless of the units being studied.

LESSON—Animal Fighting

Source material

Science and Math Weekly; March 13, 1964, Volume 3, Issue 23.

Organization of the class period (60 minutes)

1. Allow 10 minutes to take roll and get class informed and started on the assignment.

2. Allow 15-20 minutes for study of the article. The time will depend on the ability of the class.

3. Allow about 20 minutes for discussion of the article and related ideas.

4. The last 10 minutes should be used for the quiz. Be sure that each student has his name on his paper and then collect all papers.

TEACHER'S GUIDE

LESSON—Animal Fighting

The following are questions and comments which should prove valuable in developing a worthwhile discussion. Briefly describe the problem set forth in this article.

1. Ask for student opinions regarding the meaning of "Survival of the Fittest." (This is a popular term derived from Darwin's discussion of his theory of Natural Selection in which he states that those organisms best adapted to their environment have the best opportunity to live, mate and pass on their traits to their offspring.)

2. Have the students discuss the idea of territory: what is a territory—why and how may it be established? (See "Territorial Fighting." A territory is an area within the environment of a species which has been "sectioned off" by an individual member (male) of that species.)

3. What is the apparent basis for animal fighting? (Students' answers will quite likely be very specific in terms of the article. Among those things which may be suggested will be hormones and external stimuli. Attempt to establish a relation between external stimuli and instinct. An instinct may be defined as an inherited response pattern. This pattern may unfold in the animal as a result of some external or internal stimulus or perhaps by both kinds of stimuli working together.)

4. Make use of the questions which are included in the article. (Several male bees are produced, therefore insuring a greater opportunity for fertilization of the single queen in the colony. By devouring the male after fertilization, the female spider makes it necessary for a different male to fertilize a different female spider. This insures greater variation of hereditary traits in the species and provides more adaptability.)

5. Call on the memory of students about animal fighting they have observed in the past. What, generally, was the reason and what was the outcome? (Most will think of dog fights and cat fights. Some will recall birds fighting, squirrels chasing each other in real combat. Perhaps tropical fish will be used to illustrate fighting. Try to make the student recall specific details of the situation which may be useful in better understanding why the fighting occurred. Example: Frequently a bird strays into the territory of another of the same species. He will usually receive a flying attack and be chased out of the territory. The fight then ends. Often both birds tolerate each other from a closer distance with the territory bound-

ary between them than they would if both were inside the boundaries.)

Questions for the Quiz

1. Give one new concept about animal fighting which the article discussed.
2. How may an animal establish a territory?
3. Why may the territory be established? Of what advanage to survival is it?
4. What stimulates animal fighting?
5. How might we see examples of this activity in the human species? (This is a question not covered in their reading. It is to allow them to think beyond the specific case.)

CHEMISTRY

I. To the Substitute Teacher:

This unit has been prepared to help you teach a few necessary principles of chemistry during the absence of the regular teacher. Read the general outline of the procedure and the teacher's guide. The approach used in the outline should make your job enjoyable and give you a sense of accomplishment at the end of the day.

II. General Outline

A. Verify the roll as recorded by the student minitor—3 minutes.

B. Address the class by reading aloud the short introduction found in Part III, Teacher's Guide.

C. Supply each student with a copy of **Science and Math Weekly,** Volume 3, Issue 5.

D. Assign a 20 minute reading period for the article "Chemical Terminology" found on pages 54-55.

E. Study this article at the same time.

F. Conduct class discussion and lead students to develop the methods for naming the compounds using the questions in Part III, Teacher's Guide. Write these methods on the blackboard as they are derived. Give the students time to copy the material into their notebooks. Inform the students that they will be tested later on their abiliy to name substances.

G. Collect the copies of reading material.

III. Teacher's Guide

A. Introduction

"My name is ..... Your assignment which is due today will be reviewed when your regular teacher returns. We will investigate the naming of compounds today using the article, "Chemical Terminology" pp. 54-55 of **Science and Math Weekly,** Volume 3, Issue 5. You will be given 20 minutes to complete the article."

B. Discussion Questions

1. What does the name of a compound mean to a chemist?
2. How have the various nations contributed to the naming of compounds and elements?
3. When can a chemist use the word **substance** correctly?
4 How are binary compounds named?

IV. Questions for the Quiz

1. How are binary acids named?
2. What controls the selection of the proper prefix and suffix used when naming oxygen-containing acids?
3. Is there a system for naming salts of oxygen-containing acids? Explain.
4. How are inorganic hydrates named?
5. What designates the manner in which anhydrides are named?
6. In what special way are hydrogen containing salts named?

PHYSICS

I. To The Substitute Physics Teacher

In the Physical Science Study Committee's physics course there are four basic units. I have selected topics and articles from each of the four units. These can be used effectively in any part of the unit in event of my absence. If more than one day is involved, different articles in the same unit are also included in the bibliography.

II. General Outline

A. Time Allotments and Organization

1. Allow about ten minutes to take roll, hand out materials and get the class started on the assignment.
2. Twenty minutes of reading time should be sufficient to complete the article.
3. The discussion period should be flexible, but allow time for a short quiz.
4. Reserve the last ten minutes of the period for a short quiz.

B. Source of Material

Unit I **Science and Math Weekly,** Sept. 11,, 1963, Volume 4, Issue 1, page 6, "Mea-

surement Pinch".

Teacher's Guide - Unit I Measurement

1. Emphasize that physics is a branch of science where measurement is very important.

2. Discuss how the senses are very limited in measuring mass, length, etc. Have several students guess the weight of a book or what the temperature of some warm and cold water is, etc.

3. Point out how accuracy increased during World War II where some parts were made on west coast and some in midwest and shipped to east coast for assembly.

4. Discuss accuracy in the Space Age 1964 (millionths of an inch, etc.).

5. Point out some of the prefixes in measurement and how they have become smaller.

millisecond 10-3 sec.
microsecond 10-6 sec.
nanosecond 10-9 sec.
picosecond 10-12 sec.

6. Discuss the "Treaty of the Meter". In 1875, USA and 16 other nations signed an international agreement to maintain standards of measurement. Today 36 nations adhere to the treaty.

7. Discuss briefly the history of measurement (see "The Amazing Story of Measurement")

Quiz Questions - Unit I Measurement

1. What is the science of measurement called?

2. What are the four fundamental measuring quantities?

3. Discuss the great problem that World War II began to create as far as measuring was concerned.

4. Who sets and maintains the standards in the USA?

5. Why are international standards necessary?

Bibliography - Unit I Measurement

1. "Precision A Measure of Progress", General Motors booklet.

2. "The Amazing Story of Measurement", Lufkin Rule Company.

3. "The Measurement Pinch", Beverly Smith, (Saturday Evening Post reprint).

4. "Limits of Measurement", Science and Math Weekly, Sept. 18, 1963; Volume 4, Issue 2.