

Instructor's Manual

The course is comprised of six lessons on the scientific process. It is designed to be self-directed. Each lesson is approximately 60 minutes in length or two class periods. The administration of the pre/posttests and open-ended checklist should take thirty minutes; actual student completion time may vary. Students should follow the sequence of lessons as they build on previous lessons. It is suggested that students receiving less than a 75% on the self-check quiz should return to the video and multimedia presentation for further study before continuing.

Throughout this course, teachers will need to facilitate the learning by observing students, monitoring the students' quiz scores and by grading assignments to make sure students are progressing at an appropriate rate. It is recommended that students who score less than a three on assignments should receive some intervention from the teacher by conferencing with them to correct any misconceptions.

Lesson Activities

Each lesson has five components.

1. The pre-activity video defines the vocabulary.
2. The multimedia presentation provides the course content.
3. Students should take the self-check quiz after completing the video and presentation.
4. Student participation includes a virtual lab. After completing the lab, students should complete the lab assignment.
5. The follow up activity is a homework sheet.

Assessment Activities

The assessments include a pre/post test and an open-ended checklist. Pre/posttests are comprised of short answer and completion questions. The open-ended checklist is performance

based. The students are asked to define the science vocabulary used in the scientific process. They must explain the purpose of each step in the scientific process. Answer sheets are included for the pre/post test and open-ended checklist. A rubric is supplied to score the homework and science lab assignments.

Problem Statement Lesson Objectives

- 1.0 Given materials for a scientific investigation, students will formulate a problem statement as a testable question.
- 1.1 Given examples, students will discriminate between testable and non-testable questions with a 75% accuracy or better.
- 1.2 Students will explain the importance of a problem statement in a scientific investigation with a rubric score of three or better.

Hypothesis Lesson Objectives

- 2.0 Given materials for a scientific investigation, students will formulate a hypothesis with a cause and effect relationship.
- 2.1 Given instructional materials on hypotheses, students will define the word hypothesis and explain its importance with a rubric score of three or better.

Variables Lesson Objectives

- 3.0 Students will identify independent and dependent variables with a 75% accuracy or better.
- 3.1 Given a hypothesis, students will discriminate between the independent and the dependent variables with a 75% accuracy or better.
- 3.2 Given a scientific scenario, students will write variables that denote a fair test.

Procedures Lesson Objectives

- 4.0 Given a suitable science investigation, students will generate precise procedures that are repeatable.
- 4.1 Students will explain why procedures need to be replicable with a rubric score of three or better.

Data collection Lesson Objectives

- 5.0 Given data from a science investigation, students will construct a properly labeled data table to record the data.
- 5.1 Given data from a science investigation, students generate a graph with the appropriate title and labels which correctly represents the data.
- 5.2 Given data from a science investigation, students will generate three inferences about the data.

Conclusion Lesson Objectives

- 6.0 Given appropriate data from a science investigation, students will summarize the results and receive a rubric score of three or better.
- 6.1 Given materials from a science investigation, students will explain the relationship between the IV and DV and receive a rubric score of three or better.
- 6.2 Given materials from a scientific investigation, students will draw conclusions about the results which include a reference to the hypothesis and the scientific worth.

After completing lesson six the teacher should administer the open-ended checklist and the post-test. Each assessment should take approximately 30 minutes.