Lesson Plan in Middle School Science: Population Density

Al Sams: Research in Ecology 2003

This unit is designed to explore the idea that the population density of a specific animal species within a given ecosystem will affect the health of that species population.

Objectives: The students will:
- Use the scientific method to conduct an experiment
- Use varied methods to gather background information.
- Correctly use lab equipment.
- Prepare tables and graphs.
- Organize, conclude, and present data.
- Discover if population density alone affects the health of a species and apply/connect that data to other species.

Sunshine State Standards: Expectations

The student:
- Understands the differences between growth and maintenance.
- Knows that behavior is a response to the environment.
- Understands how the components of an ecosystem interact.
- Understands that changes in the environment may influence the size, number, or diversity of organisms in an area.
- Knows that accurate record keeping, openness, and replication are essential to maintaining an investigator's credibility with other scientists and society.
- Uses accurate records, openness, and replication of experiments to ensure credibility.
- Understands the importance of the control in an experiment.
- Knows how to identify the independent and dependent variables in an experiment.
- Uses appropriate experimental design, with consideration for rules, time, and materials required to solve a problem.
- Knows that appropriate care, safe practices, and ethical treatment are necessary when animals are involved in scientific research.
- Uses a computer to collect, analyze, and report scientific findings.

Time Frame: 15 to 18 days over 11 weeks.
Divide class into 5 groups of 5-6 students each.
Problem Statement: Does the population density of a specific species within a given ecosystem affect the health of that species in that ecosystem?
Materials: 5-5 gal fish tanks and filter equipment
- 100 fish (goldfish)
- 10 snails 2 per tank
- Fish food
- 5 fish dip nets
- Aquatic plants
- Graph paper
- Poster board
- Gravel
- Balances
**Ho:** Population density will have no effect on the health of a species within a given ecosystem.

**HA:** Population density will have an effect on the health of a species within a given ecosystem

**Instructions:**
- Group 1 ñ 3 fish
- Group 2 ñ 6 fish
- Group 3 ñ 12 fish
- Group 4 ñ 24 fish
- Group 5 ñ 48 fish

Entire class needs to make a list of controls and which group will be considered the control group.
Entire class needs to decide on amount of food per day.
Entire class needs to decide on how to measure the health of the fish.
Each person needs to make their own hypothesis. (HA)

**Day 1** ñ Discussions on populations and pressures on species within ecosystems.
  Define Terms
  Begin research on population density, pressures within ecosystems, goldfish, aquarium set up and maintenance, using Internet and library resources.
  Homework ñ continue research.

**Day 2** ñ Class discussion/decision on controls.
  Answer questions from day 1.
  Fill tanks with water and set up pump and filter.
  Continue research.

**Day 3** ñ Meet with individual group.
  Record initial data on fish and add to tank.
  Add snails.
  Observe fish in the tank and make initial observation of the health of the fish.
  Make individual hypothesis and record (HA)

**Every Day** ñ 5 minutes ñ feed fish. Remove and record any dead fish.

**1 day each week for 10 weeks.**
  Evaluation of fish.
  Discussion of what has/is happening.

**End of experiment**

**Day 1** ñ make plans for students to take fish home.
  Organize data and prepare graphs and charts.
  Prepare oral presentation.

**Day 2** ñ Group oral presentations ñ copies of each groups data to every person in class.

**Day 3** ñ Evaluate data from all groups together.
  Assess hypothesis.
  Make conclusions.
  Prepare individual lab reports to be turned in.

**Day 4** ñ Clean tanks and take fish home.
  Have students do evaluation on their individual group members.
**Assessment**
- Teacher observation of groups during project 20%
- Group oral presentation 20%
- Individual written project report 50%
- Student evaluation of other group members 10%

**Follow up:**
- Student evaluation of the project.
- Discuss connections/applications to other species and real world ecosystems.