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## Posters

**Title**
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**Publication Date**
2003-10-10

# Learning Plant Adaptation in Middle School

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## Introduction:

### Previous Research

- Research is *sparse* pertaining to students conceptions of plants and natural selection.
- Students are typically not as motivated to study plants as they are to study animals.
- *Constructing coherent explanations* that synthesize factual information into a coherent explanatory framework *is difficult*.
- Students reasoning about the environment is *anthropocentric*.
- Much of what students learn in school science is *rote memorization* and not strategic inquiry.

### Student Conceptions

- **Natural Selection**
  - Student think of natural selection as a process that occurs only in animals, *not plants*.
  - Evolution is viewed as naturalistic, teleological, or Lamarckian.
  - Students think *evolution* is something that happened *in the past*.
  - Students are *confused by* individual and population level *adaptations.*
- **Plants**
  - Students think plants exist for the benefit of humans and other mammals. (This is an example of anthropocentric reasoning)

## Methods:

18 sixth grade students from one science class in a suburban school.

- Students' conceptions regarding plant structures and plant evolution were measured with a pre-post short answer questionnaire, and a post activity essay.
- Students' completed about 16 hours of instruction on leaf structure and function, and exploring environmental variations in temperature, humidity, and light intensity to explain how plants adapt to their environments.
- Measurements were coded and analyzed for information revealing students' understanding of plant structures, the relationship between structure and environment, and a general understanding of the process of natural selection.

## Results and Discussion:

### Performance on Short Answer Test
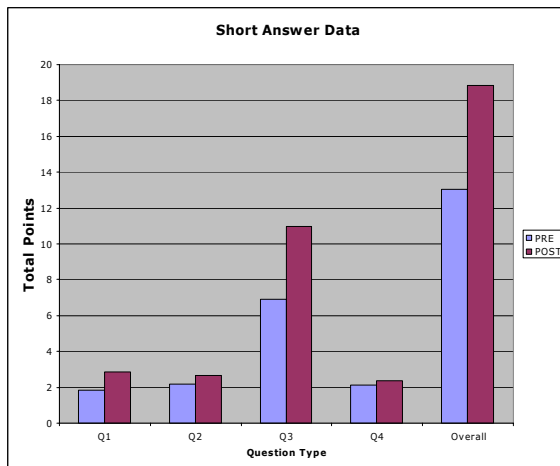


**Short Answer Data**

•Mean total increase from Pre to Post test = 28%

**Student Example of short answer pre to post:**

"In each area the plant leaves adapt to the environmental variables. In area 1, the leaves adapted by making their leaf shape concave and small. The small leaf is an advantage because it doesn't receive and attract as much sunlight as a big leaf."

•**Key Findings:**

•Students learned basic functional effects of leaf structural characteristics - size, shape, texture, and color (Q3).

•Students showed little or no improvement in answering questions about how plant adaptations evolve (Q1, Q2, and Q4; and essay).

### Final Essay

•**Task:** explain how plants evolve to adapt to their environment.

•**Scoring:**

•**5 -** Full systematic explanation. Correct natural selection explanation.

•**4 -** Some characteristics explained. Correct natural selection explanation.

•**3 -** Some characteristics explained. Incorrect natural selection explanation.

•**2 -** One characteristic explained. Incorrect natural selection explanation.

•**1 -** No correct information.

•**Performance:** Mean = 2.11; Std Dev = 1.02

**Example of student statement from essay:**

"Based on the type of environment they are found in they can adapt or grow adapted to their surrounding. The way they do this is they can change the shape of their leaves."

•**Implications for CENS Education Work:**

•Confirms expectation that learning to explain requires conceptual integration.

•Lower level concepts (i.e., leaf structure) appear easily learned.

•Longer and more in-depth exploration of CENS data should improve conceptual integration.