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What Undergraduates in Biology Don't Know About Plant Structure and Growth

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What Undergraduates in Biology Don't Know About Plant Structure and Growth

Abstract

We were interested to know what undergraduates in biology understand about plant structure and growth, and in particular what misconceptions they hold. To date, there has been no comprehensive analysis of what college undergraduates know about this topic, so we designed a study to address this deficiency. Students at two liberal arts colleges, two mid-sized universities (both public and private) and one research university were interviewed one-on-one. They were asked a series of open-ended questions addressing how plants grow taller, grow in diameter, move water and organics, produce leaves, etc. All students had at least one semester of either introductory college biology or introductory plant biology, and most had two. In our preliminary analysis of responses, we see the following trends. The most frequent misconception is that herbaceous tissues are supported entirely by cell walls; the role of water pressure is not comprehended. For some topics, students lack knowledge so completely that they do not even have misconceptions to hold. The mechanism of phloem transport, bark formation and fertilization are in this category. About a third of the interviewees did not know how plants increase in diameter, how leaves form, or how lateral roots form. We have collected data on the specific coursework completed by each student and will also report on correlations between knowledge levels, misconceptions and academic training. Our results should be of use to instructors of both introductory biology and introductory plant biology, as instructors can be more effective if they plan specific learning activities to address misconceptions or topics where student retention of knowledge is poor.

Disciplines

Biology

Comments

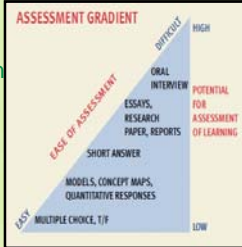
Presented at the American Society of Plant Biologists Annual Meeting in Providence, Rhode Island, 2013.

What undergraduates in biology don't know about plant structure and growth

Kathleen Archer, Maryann Herman,
Grace Miller, Laura Olsen,
Jodie Ramsay

Goals and Objectives

- Overall Goal: Generation of a concept inventory in plant structure and growth
 - Need for objective measures to evaluate student comprehension
- 1st Objective: Collect and analyze student misconceptions



Methods & Approaches

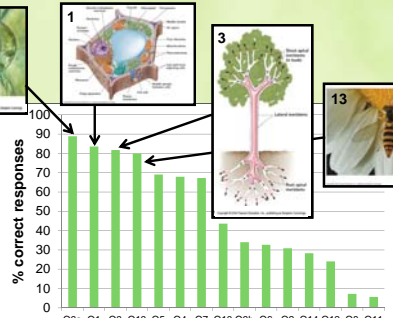
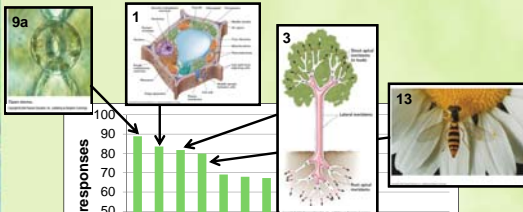
- 15 questions
- 68 interviews at institutions of various sizes
 - St. John Fisher College (NY)
 - Trinity College (CT)
 - Indiana Wesleyan University (IN)
 - Northern State University (SD)
 - University of Michigan (MI)



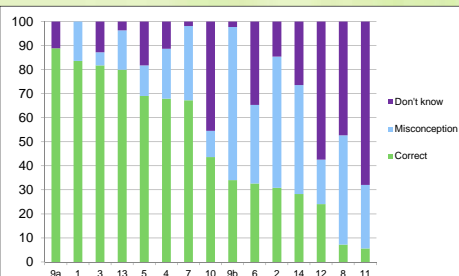
Methods & Approaches

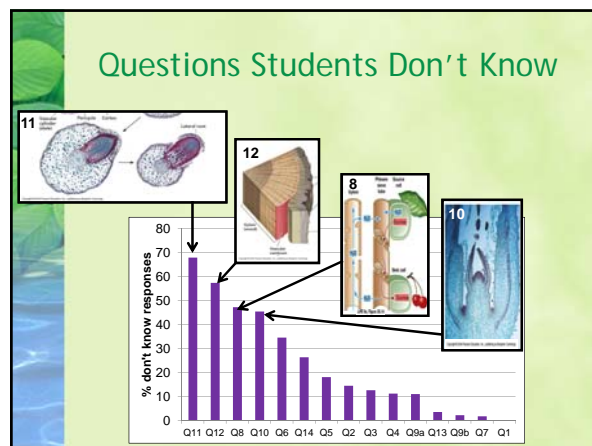
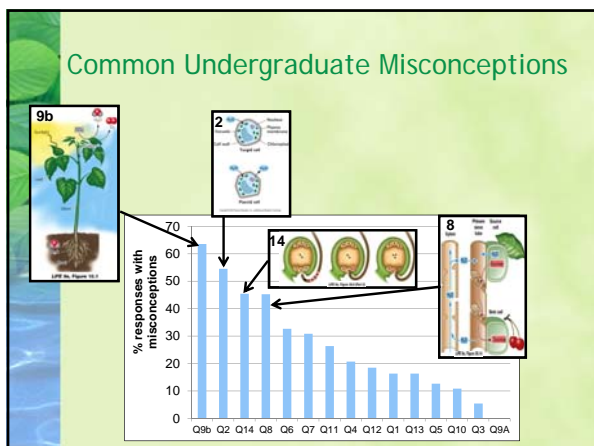
- Student demographics:
 - Introductory biology (n = 11)
 - Introductory biology + botany (n = 32)
 - At least 1 upper division botany (n = 12)
- Coding of transcribed interviews
 - Correct
 - Misconception
 - Don't know
- Coding inconsistencies were discussed and group consensus achieved

Questions with >80% Correct Responses

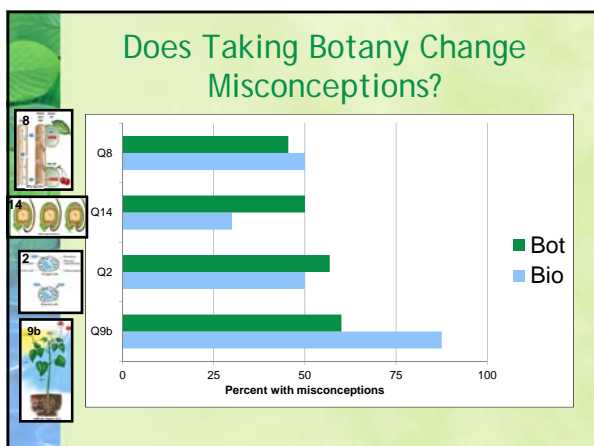
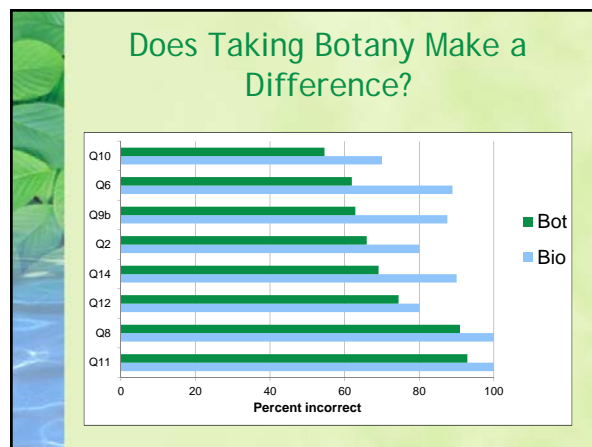



Distribution of responses





- ### Overall Trends in Student Responses
- Students had the greatest correct answers for simple questions
 - Highest percentage of misconceptions dealt with gas exchange and cell support
 - Students lack a general understanding of plant development (lateral roots, bark, leaves)



- ### Future Directions
- Complete coding of remaining ~15 interviews
 - Further analysis of demographic data – Poster 12007
 - Has core botany content changed? – Current emphasis in plant biology classes?
 - Development of concept inventory

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