

# Developing a Distance Education Lab Course in Plant Biology

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# PB 200 - Plant Life

- Long-running general education course
- Mixed-majors
- Lecture and lab are inseparable
  
- Asynchronous DE offering developed to reach
  - Government employees
  - K-12 teachers
  - Students at institutions without general botany
  - NCSU students

# Guiding Principles

- Must meet same learning outcomes as on-campus course
- Student interaction and feedback are important
- Lab must be as hands-on as possible
- Lab safety is paramount
- Develop multimedia tools to help visualize content

# Course Development

- NCSU DELTA – IDEA Grant – 2010
- Year-long process in consultation with instructional designers and multimedia specialists
- Revisit specific outcomes for each lecture and lab topic
- Quality Matters Rubric
- Content delivered in Moodle

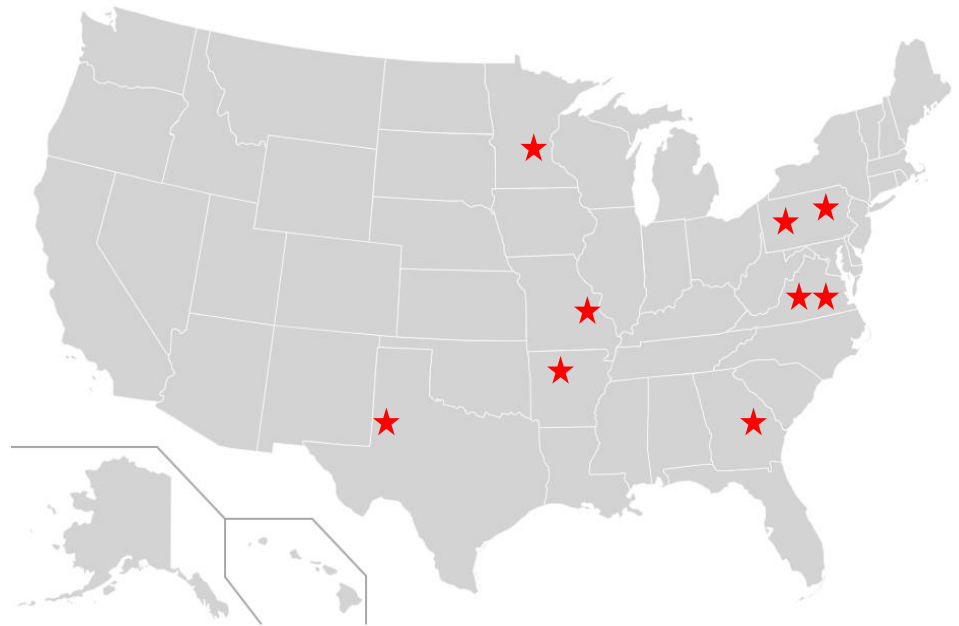


**Innovation in Distributed Education Applications**



# Course Enrollment

- First offered – fall 2011
- 85 total students in four semesters
- 12 Non-degree-seeking
  - Federal employees
  - Other institutions
  - Teachers
- 7 states
- 1 foreign country (Dubai)



# Course Moodle Site

college of agriculture & life sciences

You are logged in as Chad Jordan (Log out)

PB 200 (601) Fall, 2011 Plant Life

moodle.wolfware > PB 200 (601) Fall, 2011

Switch role to... Turn editing on

## PB 200: Plant Life

This 4-credit course is an introduction to the structure, processes, and reproduction of higher plants, including the diversity of the plant kingdom and principles of inheritance, ecology, and evolution.

**INSTRUCTORS**

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**ANNOUNCEMENTS & QUESTIONS**

- Announcements / Latest News
- General Course Questions
- NCSU Dept. of Plant Biology

**IMPORTANT COURSE DOCUMENTS**

- PB 200 Course Syllabus
- PB 200 Lecture Schedule
- PB 200 Lab Schedule
- Welcome Letter from Drs. Jordan & Mickle
- Vocabulary: Digital Flashcards
- Stern Textbook: Student Resources- Quizzes, Flashcards and Images

**QUICK LINKS TO TOPICS**

Click on a topic to quickly navigate down the page.

- Getting Started
- Why Plants?
- Areas of Study
- Plant Macromolecules
- Cell Theory
- Seeds and Early Growth
- Roots
- Stems
- Leaves
- Secondary Growth
- Photosynthesis: Light-dependent reactions
- Photosynthesis: Carbon-fixing reactions
- Cellular Respiration and Fermentation
- Transport Processes and Response to Environment
- Plant Hormones
- Plant Biotechnology
- Preserving Plant Biodiversity and Plant Propagation
- Fungi
- Algae and the Transition to Land
- Alternation of Generations and Bryophytes
- Fern and Fern Allies
- Gymnosperms
- Angiosperms
- Plant Evolutionary Processes
- Plant Ecology I
- Plant Ecology II
- What Have We Learned?

**Latest news**

Add a new topic...

- 02:44 PM, Dec 6  
James Mickle  
Plant Ecology Quiz open until midnight more...
- 11:52 AM, Oct 30  
James Mickle  
Algae/Fungi Quiz is now posted more...
- 03:27 PM, Oct 27  
Chad Jordan  
Exam 2 Grades, Lab Grades, and General Updates more...
- 03:52 PM, Oct 7  
Chad Jordan  
Weekly Quiz on Carbon-Fixing Reactions and Cellular Respiration more...
- 10:49 AM, Sep 13  
Chad Jordan  
Plant Macromolecules Lab is Due Today more...  
Older topics ...

**Activities**

- Assignments
- Books
- Choices
- Forums
- Glossaries
- Quizzes
- Resources

**Calendar**

college of agriculture & life sciences

PB 200 (601) Fall, 2011 Plant Life

moodle.wolfware > PB 200 (601) Fall, 2011 > Books > Alternation of Generations and Bryophytes

Update this Book Turn editing on

## Alternation of Generations and Bryophytes

Table of Contents

- Introduction
- Assignments
- Lecture
- Vocabulary
- Summary

### Introduction

During this module, we will study:

- Alternation of generations as the life cycle model for all plants
- Unifying characteristics of plants called bryophytes
- Liverworts and hornworts
- Mosses: structure and life cycle
- Moss uses and unique features

**Module Goals**

- Describe alternation of generations.
- Describe the diversity and novel features of seed-free, non-vascular plants.
- Apply alternation of generations to the moss life cycle.

**Objectives**

- Distinguish between characteristics of the gametophyte and sporophyte generations of plants.
- Identify major plant taxa having dominant gametophytes and those that have dominant sporophytes.
- List and describe at least 4 major features of all bryophytes.
- Sight-identify hornworts and liverworts, and mosses, and determine how many copies of DNA are in the dominant phase of their life cycle.

Extensive use of quick links and “Books” feature to organize lecture content.

# Lectures

**Ethylene**

- \* Only gaseous growth regulator
  - \* Can diffuse through atmosphere to other plants
- \* Damaged tissue
- \* Senescence
- \* Fruit ripening and drop
  - \* Diffuse to other stored fruits
  - \* Speed ripening/spoilage
- \* Growth response to touch/motion

29:52 / 48:50

Lecture capture software used for PowerPoint-based presentations.

Mediasite with course pack notes.

**NC STATE UNIVERSITY**

Slide 2069 of 4170

PowerPoint-based presentation

Paused 29:00:54:51

**PB 200 - Leaf Introduction and Morphology**  
 Dr. Chad Jordan  
 Plant Life

9/2/2011 2:00 PM EDT Length: 00:54:51

venation: What are veins in a leaf? Are they similar to your veins? Sketch

Pinnate  
 Pinna - feather

Palmar

Parallel

obvious midrib

Arrangement of leaf on the stem: Possibilities:

Opposite  
 Dogwood, Maple, Ash

Alternate  
 Oak, Hickory, Tulip

Whorled  
 Catalpa

# Hands-on Labs

- Eight – adapted from on-campus course, but not identical
- Labs can be protracted for several weeks with regular monitoring
  - Plant Ecology
  - Growth and Development
- Primary focus on safety and practicality while addressing same course outcomes



# Lab Kits

- Shipped or picked up
- List of materials required at home
- Students submit hard-copy write-ups and photographs
- Students sign safety statement



- Cost comparable to on-campus cost / student

# Virtual Viewer

The screenshot displays a virtual viewer interface for Zea mays stem specimens. It features four main viewing windows arranged in a 2x2 grid, each showing a different magnification level: 40x, 100x, 200x, and 400x. Each window includes a 'Slide' and 'Notes' tab, a main image area, a smaller inset image, a 'Micrometer' scale, a rotation slider (ranging from -90 to 90 degrees), and a 'Drag to pan the stage.' instruction. The search panel on the right contains a 'Search' section with dropdown menus for 'Leaf' and 'Zea Mays', a 'Results' section showing 'Zea Mays Leaf' with a small thumbnail, and buttons for 'Add Selected View(s)' and 'View Manager'.

>40 slide specimens

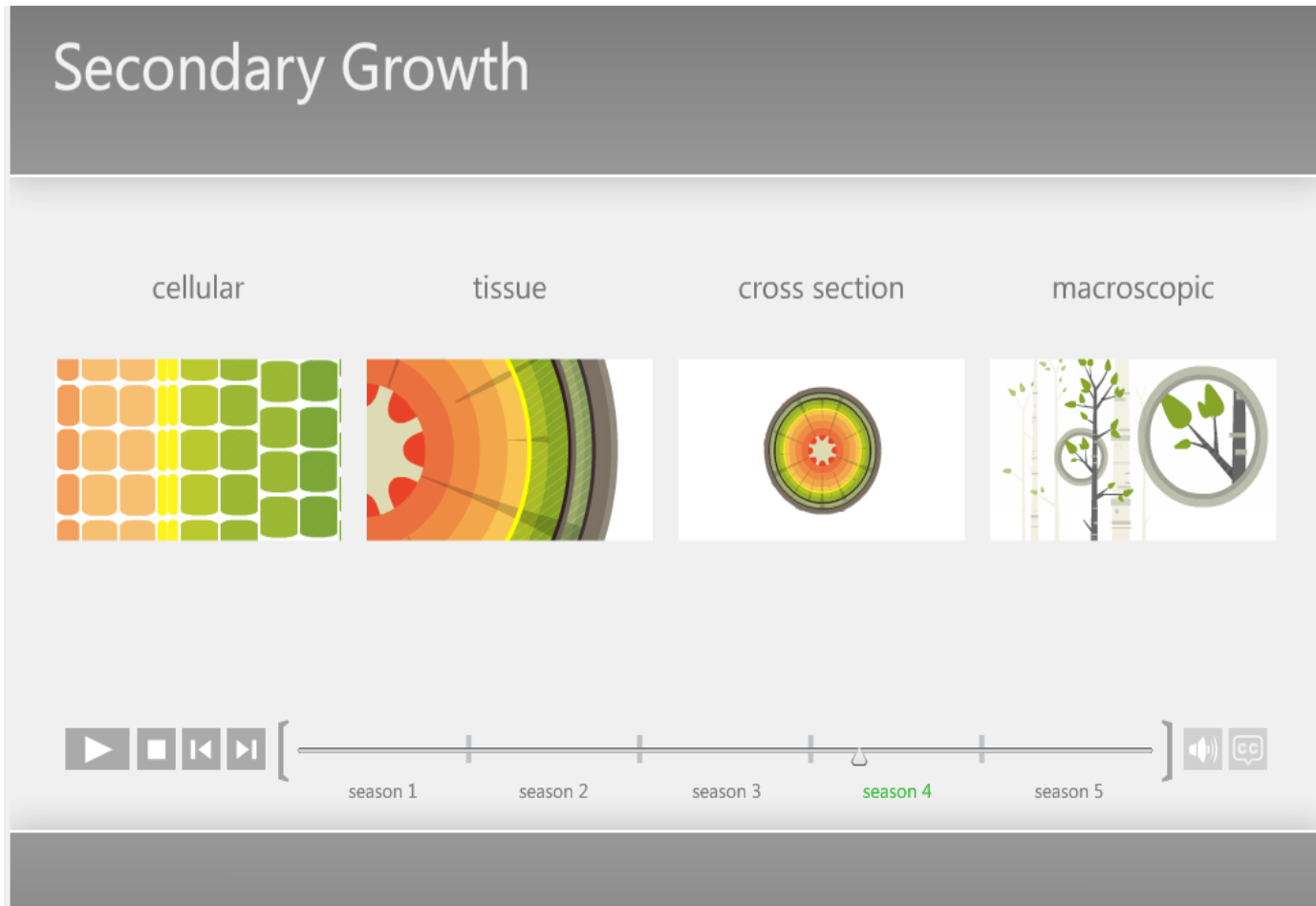
# Plant Diversity Videos

The screenshot shows a video player interface with a dark background. At the top, there is a navigation bar with the text "NC STATE UNIVERSITY" and links for "CAMPUS DIRECTORY", "LIBRARIES", "MYPACK PORTAL", "CAMPUS MAP", and "SEARCH NCSU.EDU". Below this, the video title "PB 200: Plant Specimens *Bird's Nest Fern*" is displayed. The main video area shows a close-up of a Bird's Nest Fern with large, bright green, waxy leaves. The video player controls at the bottom show a play button, a progress bar at 0:19, a total duration of 1:05, and icons for volume, subtitles, and full screen. To the right of the video is a "Playlist" section with a scrollable list of video thumbnails and titles:

- Bird's Nest Fern (1:05)
- Boston Fern (0:49)
- Butterwort (1:27)
- Casaba (1:05)
- Dwarf Button Fern (0:46)
- Floating Fern (0:44)
- Kangaroo Fern (1:32)
- Long Leaf Pine seedling (1:25)

Also, herbarium tour video.

# Secondary Growth Animation



Also now used in on-campus courses.

# Student Perceptions & Feedback

- Students prefer Mediasite lectures over PowerPoint lecture capture
- Accessory multimedia well received
- Labs are popular, require careful planning

“The lab component to this course was wonderful. All of the lab materials that I needed were included in the kit and each of the lab instructions were clear and well explained. Any materials that I had to provide for the labs were ones that are everyday household materials I already had.”

“Overall, this course was very well planned out and I enjoyed learning the material.”

# Module Topic Summary Feedback



## PB 200 Module Topic Summary Form

As this module comes to a close, reflect on the topics studied and provide your feedback on the following questions. After entering your name and selecting the appropriate module, answer at least three of the five questions below. By doing so, you can award yourself up to 0.4 bonus points. You must provide thoughtful, detailed responses in order to receive bonus credit. Complete and submit this form by 11:55 PM on the last day of the module.

**\* Required**

**Last Name \***

Last Name or Surname

**First Name \***

Given first name

### What have YOU done to improve your learning skills in this class?

Choose ALL that apply.

- Completed the readings for the week.
- Reviewed all of the lecture material
- Studied the vocabulary.
- Asked the instructor for help if I did not understand.
- Posted a question in the General Course Questions.
- Other:

### Rate yourself on the following (0 or .1). \*

Remember, you must answer at least three of the above questions in order to award yourself bonus points.

	0	.1
I read the assigned readings for the week.	<input type="radio"/>	<input type="radio"/>
I was well rested and alert when studying the content and doing my assignments.	<input type="radio"/>	<input type="radio"/>
I participated in a group discussion and/or gave feedback to the instructor.	<input type="radio"/>	<input type="radio"/>
I asked questions and sought answers when they were needed.	<input type="radio"/>	<input type="radio"/>

**Submit**

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# Using Google Forms

# Some Lessons Learned

- Hands-on labs = a lot of development and refinement time
- Lab kit assembly is time-intensive each semester
- Students need guidance in a course with so many components
  - Short introductory video for each lab setup
- Approach not suitable for a *majors* lab course, where students develop tactile skills used in later courses

# Acknowledgements

## Instructional Designers

Cathi Phillips

Cleo Magnuson

## Multimedia Designers

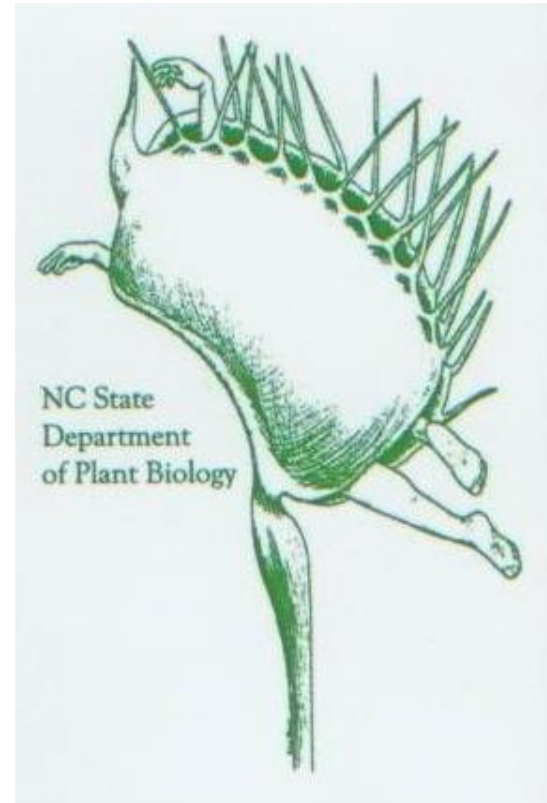
Mike Cuales

David Tredwell

Ben Huckaby

## Teaching Assistant

Jared Locklear



Innovation in Distributed Education Applications



DISTANCE EDUCATION & LEARNING TECHNOLOGY APPLICATIONS



# References

- Bradley, L.K., Stutz, J.C., and Towill, L.R. 2009. Plant Biology: From the Classroom to the Internet. *Journal of Natural Resources and Life Sciences Education*. 38 (1): 82-86.
- Mickle, J. E. and P. M. Aune. 2008. Development of a Laboratory Course in Non-majors General Biology for Distance Education. *Journal of College Science Teaching*. 37 (5): 35-39.