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Botanical Society of America
In this session on www.PlantingScience.org

- Describe how our model aims to support authentic investigations
- Show a few planned new resources and interactive tools
- Share your ideas about materials and resources you are looking for

Too ambitious for time, so please come chat after
Professional Development
120 Master Plant Science Team graduate student & post-docs

Web Platform Resources and Tools
- Embedded student tests
- Automatic notifications
- Video helps
- Teacher handbook
- Mentor guide
- Administrative tools

Online Learning Community
11,642 students working in 3,207 teams. Middle and high school teachers in 37 U.S. states and abroad. >700 scientists registered as online mentors.
14 society partners.

Plant Inquiry Modules
- Germination, Photosynthesis, Reproduction, Life cycles
- Genetics, Cells and Tissues
- Variation, Science Practices

Dissemination
- NABT, NSTA workshops,
- Science essay, Science Scope,
- society meetings

Research and Evaluation
- Workshop teacher profiles
- 14 Classrooms observed
- 1 dissertation: online inquiries
- Student attitude, process, and content

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Game Changers to “traditional” Education
What Does Today’s Learning Landscape Look Like?

Learning with technology

- Personalized Learning
- Professional Development
- Data and Assessment
- Digital Content, OER, and Software
- Blended and Hybrid Learning
- Online Courses
- Tools and Devices
- Teachers and Students
- Learning Management Platforms

Learning in action

- THE REAL WORLD
  - Argue
  - Critique
  - Analyze
- COLLECT DATA
- TEST SOLUTIONS
- Investigating
- Evaluating
- Developing Explanations and Solutions
- THEORIES AND MODELS
  - Formulate Hypotheses
  - Propose Solutions
- Imagine
- Reason
- Calculate
- Predict

The Digital Learning Imperative

A Framework for K12 Science Education

FIGURE 3-1 The three spheres of activity for scientists and engineers.
Where do students talk science?

Team Research Webpage
- Posting notebook and data
- Discussing
- Analyzing
- Explaining

Teachers and Scientists collaborating to guide students. Each bringing expertise and specialized knowledge. Teacher pedagogy training and understanding of student knowledge, conceptions, and skills: essential foundation for student inquiry.
>11,642 students working in 3,207 teams since 2005

Middle and high school teachers in 37 U.S. states and abroad

>700 scientists registered as mentors

14 society and organization partners
Scientists

- National/international recruitment via plant-related scientific societies
- >700 volunteer mentors
- Early, mid- and late-career scientists
- Cohort of graduate students and post-docs sponsored annually by BSA and ASPB (n=120 to date)
- New mentors receive Mentor Guide
- “Mentor Tip Sheets” with key tips for each investigation theme

Teachers

- National recruitment
- Web-surfing teachers seeking inquiry
- Approval from school board/principal
- Reform-minded teachers
- Innovators at their schools
- Summer professional development optional
School Level: Middle School/Jr High

Research Information

Research Question
which seeds grow in beach climates?

Research Predictions
Some seeds will grow better in salt water rather than regular water, like the ones that live in beach climates.

Experimental Design

Research Conclusions

Conversations - use this space to communicate about this project

Students, please do not include your last name in any comments.

Add a new Comment
Subject

Comment

www.PlantingScience.org
Resources for collaborative science learning

“I’ve never been a fan of Science, but these experiments really made Science come alive for me.”

- Student

“It has helped me to change the way I teach all grades in the classroom. I don’t give answers anymore, I lead discussions and let them research and guide them through their thought processes.”

- Teacher
Thanks to the teachers, scientists, and students.
Roadmap through a science project

PlantingScience for Students
PlantingScience offers students in middle school through college classes a personal experience to work like real scientists with their scientist mentors. Enhance your team skills. Get a better understanding of what science is really like. Get to know a scientist. Talk science in our online community.

Register Now
Science practices, Core Ideas, Cross cutting concepts

- Asking questions
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Constructing explanations
- Engaging in argument from evidence
- Obtaining, evaluation, and communicating information

Learning in action

A Framework for K12 Science Education
Think-pair-share

“Where do you think students struggle most?”

“Where is it most difficult for you as an instructor to facilitate student learning?”
Plant Investigation Toolkit

Plant Care

Math with Plants

Research in the Lab

Technology

Research in the Field

Investigating Safely
The Need for a Plant Investigation Toolkit

Science (il)literacy

Botanical (il)literacy

- Few higher-level thinking skills
- Poor science understanding
- Little interest in science careers
- Plant blindness
- Little meaningful exposure to plants
- Textbooks (standards) focus on animals
- Preference for animal examples

- Misconceptions about how science works
- Few opportunities for authentic inquiry, student-centered questions
- Mile wide / inch deep curricula, cookbook labs
- Little plant content for pre-service teachers
- Low confidence teaching plant biology
- Little interest in science careers
- Few higher-level thinking skills
- Poor science understanding
Teacher dashboard to track progress
Teacher and Mentor Class Page
“...supporting students’ learning calls for additional types of assessment:

- Formative assessments administered in the course of learning to provide information that teachers and students can use to guide future learning
- Assessments of 21st-century skills such as collaboration, problem solving, and innovation
- Personal and affective qualities related to intellectual curiosity, self regulation, and persistence.” (p.51)

“More of what educators really want to assess could be measured by mining the data produced when students interact with complex simulations and tasks presented in digital learning systems.” (p. 54)
Comment on, reuse, tag community resources
Speak Up 2011 National Report

Teachers’ Wish List for Tech-Enabled Professional Learning Communities

- Tools for collaboration with teachers at my school (43%)
- Tools for collaboration with teachers at other schools (42%)
- Online courses (42%)
- Easy access to student data that I can use to inform my teaching (39%)
- Centralized repository of teaching resources (38%)
Think-pair-share

“What would you like to see as resources for personalized, anytime collaborative learning?”

For students?
For teachers?
For scientists?
For parents?
For administrators?
“What would you like to see as resources for personalized, anytime collaborative learning?”

<table>
<thead>
<tr>
<th>Science practices NGSS / AP Bio</th>
<th>Learning Analytics</th>
<th>Open Education Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Online poster student session</td>
<td>• Dashboard</td>
<td>• Webinars</td>
</tr>
<tr>
<td>• Video introductions by mentors</td>
<td>• Results student pre-post tests</td>
<td>• Online community of practice private space</td>
</tr>
<tr>
<td></td>
<td>• Student portfolio</td>
<td>• Tutorials</td>
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