PlantingScience
Teacher's Handbook

The **purpose of this document** is to help you, the teacher,
get the most benefit from mentored inquiry experiences for your students and
plan how you will orchestrate the team investigations and dialog with online scientist mentors.

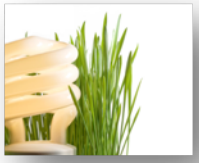
Table of Contents

I. Welcome!

First of all, **thank you** for agreeing to partner with scientists and educators in PlantingScience. Our message is important: Plants are important to life on Earth. Science is important to meeting societal challenges. Preparing science-literate citizens and future scientists is a community responsibility.

Plants are the planet's heartbeat. Without plants, life on Earth could not exist. Plants along with many microbes take the sun's raw energy and transform it into food. With every species that disappears from the planet, not only do we lose its genetic potential and its role in the ecosystem. But we may also be losing a potential cure for cancer or other beneficial product and losing the chance to better understand diversity of life. Students today have few opportunities in schools or their own backyards to explore plants and develop an understanding of plants and their scientific study.

And so our interest in building the PlantingScience community goes well beyond restoring plants to the curriculum. We believe that plants and plant science are significant forces in building students' investment in science, the environment, and their futures. By collaborating with scientist mentors, students in research teams can participate as members of the science community from their middle school through college classrooms. Students, teachers, and scientists experience science together.



This section describes the PlantingScience framework and how to make the most of it.

What will PlantingScience do for my students?	PlantingScience Principles
PlantingScience *is a way to inject "real science" into the classroom.*	**#1.** Science Talk is a central activity of sclence inquiry classrooms.
... *satisfies many curriculum requirements.*	**#2.** Science Talk is a central practice of scientists.
... *encourages students' everyday reasoning and fosters scientific thinking.*	**#3.** Student Science Talk allows teachers and scientist mentors to attend to students' ideas.
... *honors students' ideas as a starting point for conceptual understanding.*	**#4.** Science Talk is a form of reflection, assessment and community building.
... *provides authentic modeling for how scientists think.*	**#5.** Observation as key to curiosity and foundation for questions.
... *connects to plant biology content experts — real scientists interacting with your students online.*	**#6.** Questions launch and perpetuate Science Talk and the Inquiry cycle.
... *immerses students in "doing science" — just as scientists do.*	**#7.** Argumentation needed to construct understanding.
... *engages students in developing scientific concepts about biology, environmental science, and plants.*	**#8.** Mentorship can inspire curiosity, confidence, and engagement.

Learning across the inquiry cycle

Inquiry plays out in science classrooms in diverse ways. Most commonly used inquiry models (e.g., BSCS 5Es) explicitly include the suite of activities outlined by the National Research Council in 1996 and 2000. The inquiry literature consistently reports on the importance of integrating science process and content, scaffolding students as they develop inquiry skills to ask their own questions, and shifting teacher role to facilitator. Students need rich experiences with phenomena, time to observe, and to build a foundation of factual and experiential knowledge to ask meaningful questions and develop coherent concepts. Although limited classroom time can present challenges to opportunities for students to engage fully in complete inquiry cycles, new perspectives emphasize integrated science proficiencies that students can gain through inquiry.

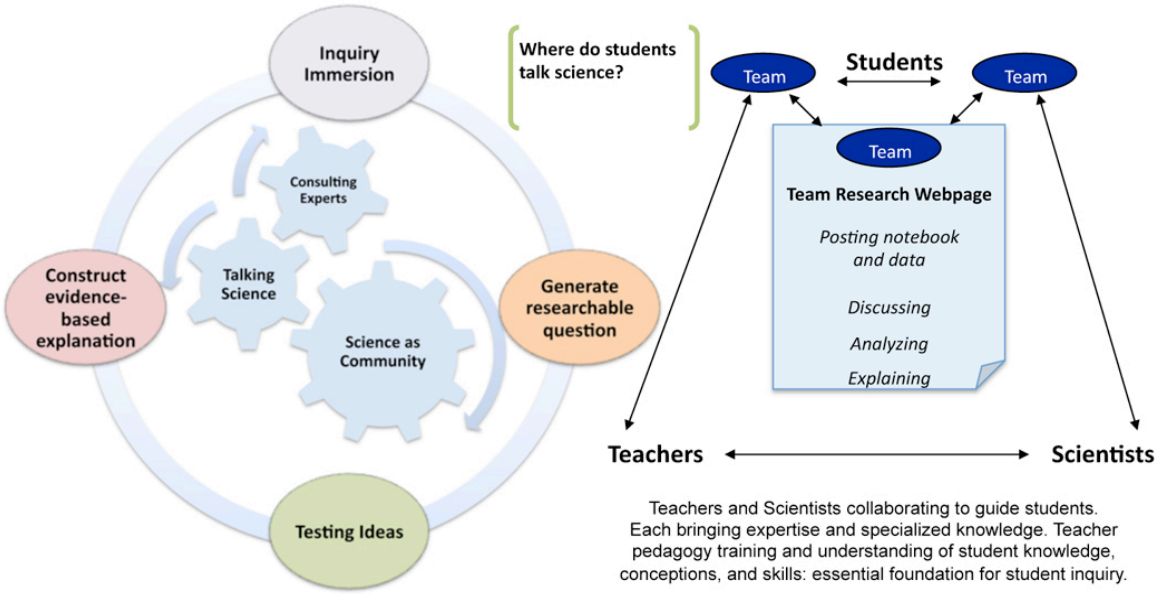
> ***"Inquiry is a multifaceted activity*** *that involves making observations; posing questions; examining books and other sources of information to see what is already known; planning investigations; reviewing what is already known in light of the experimental evidence; using tools to gather, analyze, and interpret data; proposing answers, explanations, and predictions; and communicating the results."* (NRC, 1996)

4 Intertwined Strands of Science Learning Proficiency

- Understanding Scientific Explanations
- Generating Scientific Evidence
- Reflecting on Scientific Knowledge
- Participating Productively in Science

(Michaels et al., 2007)

PlantingScience is designed to offer students an inquiry cycle experience, with self-reflection and online feedback during extended plant investigations. Communication is the constantly churning cog as scientist mentors connect with teachers and student teams to support science inquiry.



Where do teachers talk online?

Team Research Webpage
- *Encouraging team*
- *Reinforcing student expectations*

Teacher-and-Mentor Discussion Forum
- *Sharing about teams, schedules*
- *Talking about inquiry, guiding students*

Teacher-to-Teacher Discussion Forum
- *Exchanging views*
- *Sharing tips, concerns*

Plant Investigations and Curricular Connections

The flow of an Investigation

PlantingScience modules vary in length, but 2 weeks minimum of online communication is essential for students to benefit from mentor interactions. Each module includes a suggested planner in the Teacher's Guide and a Scientist Tip Sheet, to give mentors an idea of possible student inquiry directions and conversation threads. The planner below illustrates flow of an inquiry with time for (1) introductory phases, (2) investigations sequenced to build on a foundation, e.g. from guided to student-directed open inquiry, or successive student-directed experiences, and (3) final reflections in class and online. This idealized planner emphasizes ways to use student-scientist dialogs to enhance class activities.

General Activity Planner					
	Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Preparation Week	**Setting the stage / Getting online**				
		Discuss e-etiquette. Practice comments to scientists, peers.	Students register online.	Get to know mentors by reading bios on Meet the Scientists.	First blog introduction to scientists.
Foundation Week	**Immersing / Engaging**				
	Hooks and experiences leading to questions for class discussion. Post first journal.	Online reflection about immersion. Brainstorm questions with mentors.	Reflect and respond. Refine to biologically meaningful questions.	Science talk about data collection and designing investigations.	Post observations, qualitative & quantitative data.
Going Deeper Week	**Exploring / Extending**				
	Reflect on new questions that arise.	Online science talk on what data say and how to present them.	Reflect and respond.	Science talk on reconciling team data and patterns in class.	Reflect and respond.
(+)	Possible additions for open inquiry, iterative cycles of investigation, or required observations throughout plant life cycles.				
Wrap Up Week	**Sense making**				
	Science talk focus on using data as evidence.	In class Jigsaw or Roundtable discussion.	Online reflection about feedback. In class revisions.	Science talk on interpretation, source of error, new questions.	Online final reflections.

Individual teacher's schedule and activities will differ, but we recommend the following.

Recommendations as you tailor plans for your students	
Provide time & opportunities for your students to: • Explore plants, background information, and variables in the system before generating research questions • Relay to mentors how background information and experiences informed the students' ideas and questions • Talk with mentors about possible questions and plans before getting underway and at other key inquiry phases	**Let your scientist mentors know:** • What lessons you will be implementing • What your expectations for the students are • If students are guided towards/away from particular questions or particular resources • What conversations would help your teams

Selecting a PlantingScience investigation

PlantingScience is designed to engage students in exploring major themes of biology in the context of doing plant science and talking about it with teachers, peers, and scientists. All curricular modules integrate with classroom learning to meet national standards for science as inquiry and nature of science. The modules span an array of life science areas accessible to diverse learners from middle school through college. We encourage teachers to choose an option that fits their curricular scope and sequence and student population.

Authentic inquiry in which students generate their own questions is the ultimate aim. However, this requires the students have a solid foundation. Modules include descriptions of profitable lines of student investigation and suggestions for preparing students to help teachers tailor an open-ended or more guided structure to fit their needs. The genetics modules begin from a guided approach because population-level data for traits are necessary for the genetics concepts to be revealed. The suggested activities can address interrelated big ideas; choose to introduce all or focus on a few core concepts.

Module	Grade Level	Life Science National Standards*	Core suggested investigation activity, inquiry questions, and accessibility notes
Wonder of Seeds	6-12	**5-8:** Structure and function of living systems; Reproduction and heredity; Regulation and Behavior; Populations and ecosystems; Diversity and adaptations of organisms. **9-12:** The cell; Interdependence of organisms; Matter, energy, and organization in living systems; Behavior of organisms.	Germinating seeds. Observing development, growth, interactions with environment. **Juicy Questions:** Does a seed need soil? What is the environment of a seed or seedling? What does it mean to grow? Where does food come from? How does a plant gain mass? 2+ weeks. Widely accessible to learners at diverse levels. Follows well after **The Corn Competition**.
Corn Competition	6-12	As above	Grow the largest corn plants. Explain choices and reasoning. **Juicy Questions:** How do you know what caused the growth? 3 weeks. Fun, "safe" way to learn the value of a control sample.
Power of Sunlight	9-12	**9-12:** The cell; Interdependence of organisms; Matter, energy, and organization in living systems; Behavior of organisms.	Photosynthesis — Using leaf disks as proxies for leaves to observe relationship of inputs and outputs. Respiration — Measuring CO_2 level, O_2 consumption, or carbohydrate. **Juicy Questions:** Can you drown a seed? What do plants need to grow? What happens to food? What happens inside leaves during day and night? Do all parts of a plant do photosynthesis? 2+ weeks. Requires skills in manipulating equipment, measuring. Well-suited to AP Biology classes.
Foundations of Genetics: Traits, Variation, and Environment in Rapid Cycling *Brassica*	9-12	**9-12:** The cell; Molecular basis of heredity; Biological evolution; Interdependence of organisms; Behavior of organisms.	Grow an F2 population in high and low nutrient environments. Observe and record attributes of growth, development, and reproduction throughout the life cycle. Examine population for Mendelian (stem color) and quantitative (hair number) traits. **Juicy Questions:** What makes one individual different from another in a population? How does environment influence

			variation? How is variation inherited? Guided, whole-class inquiry. 6-7+ weeks. Phenotypic variation accessible to basic biology; extensions suited for genetics. **Recommended** for teachers with some prior experience growing Wisconsin Fast Plants or Arabidopsis.
Pollen and Pollination	6-12	**5-8:** Structure and function in living systems; Reproduction and heredity; Regulation and Behavior; Diversity and adaptations of organisms. **9-12:** The cell; Interdependence of organisms; Matter, energy, and organization in living systems; Behavior of organisms.	Pollen — Collecting and examining pollen slides. Setting out atmospheric pollen traps in the local environment. Pollinators — Observing potential pollinator visits to plants. **Juicy Questions:** Where does pollen come from? Where does it go? Is all pollen the same? It is all viable? Who are potential pollinators? What plants do they visit? Open-Guided inquiry. 2+ weeks. Requires pollen &/or pollinators present in the area during inquiry and access to garden or other outdoor area.
Genetics and Environment in Inbred Lines of *Arabidopsis thaliana*	9-12	**9-12:** The cell; Molecular basis of heredity; Biological evolution; Interdependence of organisms; Behavior of organisms.	Grow recombinant inbred lines (RILS) of model plant in constant environment. Examine Mendelian and quantitative traits. **Juicy Questions:** What is a model species? How do we control environmental and genetic factors so we can track the transmission of traits from parents to offspring? Guided, whole-class inquiry. 3-10 weeks. Appropriate for genetics elective class.
The Celery Challenge	9-12	**5-8:** Structure and function of living systems; Regulation and Behavior. **9-12:** The cell; Behavior of organisms.	Compete to cause and explain maximum bending in celery stalks. Osmosis, diffusion, transpiration. **Juicy Questions:** How does water move in a plant? How many different kinds of cells are there? What are their functions? Open inquiry. 2+ weeks. Appropriate for diverse classes.
C-Fern® in the Open	9-12	**5-8:** Structure and function in living systems; Reproduction and heredity; Regulation and Behavior; Diversity and adaptations of organisms. **9-12:** The cell; Molecular basis of heredity; Biological evolution; Behavior of organisms.	Observe C-Fern® spores, create growing system, make wet mounts of spores, observe germination, gametophyte development, sperm movement, fertilization, and sporophyte. **Juicy Questions:** What is a spore? Are there different gametophytes? What conditions are necessary for fertilization? What is the relationship of the gametophyte and sporophyte? 5+ week guided inquiry to observe alternation of generations in real time; options for open inquiry at points in life cycle.

Standards available online:

***NSES content, teaching, and assessment standards**: http://www.nap.edu/openbook.php?record_id=4962

The American Society of Plant Biologists 12 Plant Principles: http://www.aspb.org/education/foundation/principles.cfm

AAAS Benchmarks for Scientific Literacy: http://www.project2061.org/publications/bsl/online/bolintro.htm

Talking Science and Doing Science in Community

Teacher's Role in PlantingScience

Teachers and scientists serve as co-mentors of the students. The scientists rely on you to guide them in understanding the students' background and the class expectations. By creating a classroom culture conducive to collaboration, you set the stage for productive scientist-student-teacher partnerships in the practice of science.

Teacher's Role as Co-Mentor of Student Teams	What You Can Do to Help Students Embrace Talking and Doing Science in Community
• Understanding that questions and questioning are central to productive science talk • Eliciting and seriously considering students' ideas and reasoning • Recognizing that students' ideas and reasoning are the foundations for their own conceptual understandings • Recognizing that a right-answer orientation discourages students' engagement • Serving as an engaged link between class activities and student-scientist online interactions • Collaborating with mentors to guide students toward scientifically meaningful investigations	• Give students the space to put their ideas out onto the floor • Take up students' ideas by asking questions about them and the reasoning behind the ideas • Ask students questions that help students reflect, clarify, and go a bit deeper into their thinking • Challenge students' often blind acceptance of a "science fact" • Juxtapose the ideas on the floor so that students have to reconcile inconsistencies • Establish both successes and failures in the science lab as valuable learning opportunities • Encourage students to see themselves as a member of a science community

Make Thinking Visible with Science Talk Online and in Class

Science talk makes students' ideas and thinking visible to the student him or herself, to their peers, to you as a teacher, and to the online mentor. In the moment and over the course of the conversation, students self-assess, get feedback, and are coaxed to dig deeper for meaning rather than a rote knowing. These same values of communicating representations of ideas also hold true for scientists. As part of a laboratory, department, and scientific discipline, scientists contribute to larger groups and communities to develop models for how things work in the natural and physical world.

Research into what scientists do in their daily work shows that the intellectual work of science happens not in the lab activity, but in the talk that surrounds the ideas and reasoning around the big ideas. Scientists share their findings formally through peer-reviewed publications and professional meetings, where written documents and PowerPoint presentations prevail. But much of the idea building takes place over coffee, through email, on the phone, and in lab group brainstorming meetings about data and informal discussions of recent papers in the field.

Talk is central to nearly all these forms of communication, yet classroom science often focuses more on lab activities and less on discussion. Classroom talk can be a powerful tool for the dynamic process of building and refining conceptual understandings.

PlantingScience uses a team research webpage (and lab notebook/research journal) to capture the evolving nature of student ideas. An aim is create repeated cycles of think-reflect-feedback with thinking going on in class and team discussions, reflection taking place online and on paper, and feedback coming in from scientists, peers, and teacher. We encourage teachers to use these spaces to capture student understandings at multiple points across the investigations.

PlantingScience also relies on science talk in the classroom – both as a whole class and within teams – before and after online dialogs. The art of teaching and mentoring for productive science talk is to **attend to students' thinking**. In what students say and do, the students' life experiences become part of the conversation. Even though they may sometimes be contrary to "what science says," using those experiences and reasoning about them can be a productive way to dig into central concepts.

Questions to ask your students:

- What does that mean?
- How do you know?
- What if…? (present a counter-example)
- Does that mean…? (when conflicting ideas or pieces of evidence are presented)
- Bring the students' ideas back to the class or team members: "What do you think of that?" followed by "What makes you agree/disagree?"

Together the online work and classroom conversations can help students think, reflect, and improve understanding. The more students hear the ideas and reasoning of their peers and online mentors, the better they will become at reasoning and recognizing robust evidence and valid arguments. Using evidence to test claims and reasoning through counter-examples to examine alternatives are a significant part of scientific practice. Evaluating evidence is important for all students, not just those who become scientists, as these skills will help them to make informed decisions, personally and citizens.

Using Juicy Questions to Spawn Science Talk

"Juicy questions" are deceptively simple questions that might, on the surface, seem much too easy for your students. For example, "Is air matter?" turns out to be a juicy question. By asking students questions that probe beneath the surface of a pat definition, students are forced to make sense of concepts and even at times connect them.

Planting and unpacking juicy questions can be a productive way to help both you and your students. It helps students assess their own understanding – authentic understanding – of how the natural and physical world work. Through artful facilitation by the teacher, the conversation also helps them to connect their observations of these worlds using intuitive sense-making strategies and evidence. Through these conversations, a teacher gains insight into students' current understanding, helps students rely on innate reasoning skills and validates their

A juicy question is powerful if:

- … it makes you go, "Ah, now THAT's an interesting question."
- … you don't already know the "right" answer.
- … you don't know what will happen once you start investigating it.
- … you've played around with it in your mind and can't find a good explanation.

life experiences, while building skills of scientific thinking.

Setting Up Productive Online Interactions

Students in today's digital age grew up with computers at schools and social networking. It is a relatively small step for them to join an online learning community. However, we suggest **reviewing e-etiquette** with students and **discussing what communicating with scientists and peers might look like**.

- We recommend that students ***blog as often as possible*** – even daily, but at least 2-3 times per week. Entries can be made directly in the "Comment" box or by pasting from a Word document (if students write offline first). More formal pieces of work, such as **lab notebooks, datasheets, images** of set ups, can be **uploaded** separately as Word or Excel documents.

Advantages of Frequent Blogging

- The more students blog, the more they reflect.
- The more they reflect, the more internal feedback they get.
- More blogging can give teacher and mentor a better picture of students' evolving understanding.

- *Why so often?* Working online engages students in using technology to connect with scientists, which might be why you signed up for PlantingScience. ***The online work can be a method for getting students to reflect on their understanding. Both mentorship and self-reflection can lead to more productive reasoning.***

- Encourage students to think of their blog as a parking space for their current and emerging ideas. The "Comment" box is intended as a less formal space for students to "think out loud". Encourage students to share online about the background information, class activities, and personal experiences that influenced their ideas, questions, and research plans. This is critical to provide context for the mentors. Otherwise, ideas appear to emerge out of thin air.

Using blogs to tap scientists' knowledge and experiences:

- PlantingScience is built on the premise that teachers don't have to be experts in plant science. We encourage students to take a broad approach in what to talk to scientists about. While trouble-shooting a research plan may be the students' main concern at the moment, scientists can also offer insight into how the topic might relate to current research and biotechnology efforts, career paths, anecdotes on historical discoveries and their own scientific careers, and so forth.

Using scientists' comments as fodder for examining how scientists think:

- Scientists will often respond by providing information. But they will also be asking students for more information. In doing so, scientists are "data-seeking" - looking for more data to understand the system and help the student build an explanation about it. This **"data-seeking" behavior is an "instinct" that is part of scientific thinking**.

- While a scientist may respond with what seems like a pat answer, let students know that it's okay to **ask for an explanation or clarification**. Or to push the question to a different level.

- By the same token, it's important for you to **help scientists communicate** better with your students. If you have suggestions, contact the scientist by email, use the discussion forum, or send us an email. Your suggestions will aid your students, as well as the mentors.

Using student-to-student comments as peer mentoring:

- Both scientist and peer mentoring interactions are possible on the PlantingScience platform. If you feel your students are prepared for peer mentoring, you may orchestrate student-to-student dialogs in addition to the scientist mentor matches made by the project staff. **Prepare students with examples of helpful, thoughtful peer remarks**. Expect some level of off-topic commenting, and be prepared to monitor and moderate if needed.

- We recommend starting with cross-comments among teams in your class for students to practice giving and responding to constructive feedback with peers. For productive exchanges with students from across the country, we recommend collaborating with a teacher whose students are working on a similar topic and informing the mentors. Project staff will gladly assist in setting this up.

Assessing Mentored Inquiry Projects

Inquiry-based teaching looks at assessment through two lenses: everyday feedback (formative) and what was learned by the end of a lesson (summative). Students may be unfamiliar with the essential features of scientific work and unsure of expectations. Providing rubrics or other clear descriptions of how online and in-class work will be assessed can ease student concerns.

Connecting Everyday Feedback in Class and Online Scientific Discourse

Everyday feedback has been shown to improve student-learning outcomes. Regular feedback can take place in the context of the whole class, cooperative student teams, and with individual students. The purpose of everyday feedback is to hear student thinking on a topic, understand a student's framework or model for that construct, and help student's move along in their thinking. During this process, student misconceptions (sometimes referred to as alternative frameworks) are revealed. Knowing a student's framework gives teacher's a wonderful opportunity to guide students to more productive ways of thinking (without giving away the "right answer").

Reviewing and discussing the online discourse with your students provides a means to gauge what your students are gaining from and contributing to the community interactions. To support high-level conversations (whether peer-to-peer or student-scientist), provide your students with descriptions or examples of what would meet or exceed your

Teacher Tip: Students Could Earn Points for:

- Offering new information in the dialog.
- Responding to 2 or more posts by:
  (a) elaborating on the information,
  (b) requesting more information, or
  (c) offering an alternative view.

expectations for their discourse. Incentives can increase student participation.

Assessing Research Journals and Research Projects

Consider using a check-bric to communicate your expectations to the students and help then assess their own work and evaluate peers. (Sometimes called a "check-bric" instead of the more typical rubric that teachers just fill out.) A checklist could be used by both students and their teachers to assess the research journals and experimental designs. It could also include an additional evaluation component for the teacher to fill out in terms of quality: accuracy, thoroughness, and organization.

Sample Check-Bric for Assessing Student Research Journals and Projects

Student	Teacher	Expectations	Exceeds	Meets Expected	Approaches Expected	Few Attempts
		Journal entries are made 3 times per week				
		Background research information present with references				
		Journal entries by all team members are well organized				
		Scientific questions are well written				
		Methods are outlined and clearly described				
		Raw data are present				
		Quantitative data include units of measure				
		Qualitative data are rich are in description				
		Graphical representations of data are present				
		Representational type is appropriate for data collected				
		Axes and units are appropriately labeled on graphs and tables				
		Results of the investigation are summarized				
		Conclusions are made that answer the scientific questions				
		Conclusions are supported with the evidence (data) that were collected				

A Few Teaching and Learning Resources

Bransford et al. 1999. How people learn: brain, mind, experience and school. Washington D.C., National Academies Press.

Bybee, R. W. 2002. BSCS 5E instructional model. Colorado Springs, CO, Biological Sciences Curriculum Study.

Michaels et al. 2007. Ready, Set, Science: Putting research to work in K-8 science classrooms. Washington, D.C., National Academies Press.

National Research Council (NRC). 1996. National science education standards. Washington D.C., National Academies Press.

NRC. 2000. *Inquiry and the national science education standards: a guide for teaching ad learning.* Washington D.C., National Academies Press.

II. Logistics: What happens in an online session?

This section includes steps to complete when you are invited to participate in PlantingScience.

Recommendations, Requirements, and Expectations

Step 1: Register Online

If you are new to the program, the first step is to register online. Once you have registered we will provide you with a login and password to the website. You will have access to a personalized Teacher Page, and can view and participate in forums visible only to registered teachers and mentors. Carefully review the resources we provide, including expectations and requirements, and ask questions of us or of other participating teachers to determine if this online mentored inquiry program is right for you and your students.

> Before you participate in a session, we require signed permission from your school board authority or principal. You only need to submit this form once, unless you move to a different school. (Only required for schools participating in the USA.)

Step 2: Apply for an Upcoming Session

We will contact all registered teachers before each session inviting you to apply for the upcoming session. You may apply at any time during the year. Application forms are available on your personalized Teacher Page when you are logged in. We make decisions and notify teachers approximately one month before the beginning of each session.

Keys to success:

- **Easy, regular computer access is critical.** Contact your technology department early to secure computers.
- **Meaningful mentorship depends on interaction.** Collaborative support of students requires communication among teachers, mentors, staff.

Recommendations for session activity:

- **For your first experience, engage only one class online.** Teachers tell us it is easier to become familiar with online logistics and coordination with fewer students. Once comfortable, include more.
- **Engage your students in one online inquiry per session.**
  —If you are doing multiple inquiries, do others without online mentors.
  —You are welcome to participate in both fall and spring sessions.

What is necessary to participate in an online session?

- ☑ Signed student consent forms to participate online
- ☑ Reliable access for students to internet-connected computers
- ☑ Student access to Microsoft Office or similar product for notebook and spreadsheet
- ☑ Communication with project team regarding student numbers and class implementation

What we ask of teachers guiding students:

- ☑ Set aside a minimum of 2 weeks for the online student-mentor interactions
- ☑ Plan for 1 week of set-up activities, e.g., student registration, online pre-tests, and preparing students for experience
- ☑ Commit to communicating with PlantingScience staff and mentors
- ☑ Provide feedback after the session

What we ask of students in research teams:

- ☑ Participate as member of a research team of 3-5 students to conduct investigations
- ☑ Participate as member of the science community to talk about the research
- ☑ Complete entire inquiry cycle if possible
- ☑ Post online: research information, notebook, data, interpretations
- ☑ Reflect on own work and fellow students' work
- ☑ Correspond 2-3 times per week with mentor

PlantingScience Consent Forms

Signed consent is required. The National Science Foundation, which partially funds the program, requires teachers obtain written approval from their school. Materials are available on the website for review by school authorities and parents; hard copies are available on request. Only approved, registered students, teachers, and scientists may post online. Parents and the public may view the student projects online.
Security and privacy policy: http://plantingscience.org/index.php?module=content&func=view&pid=69

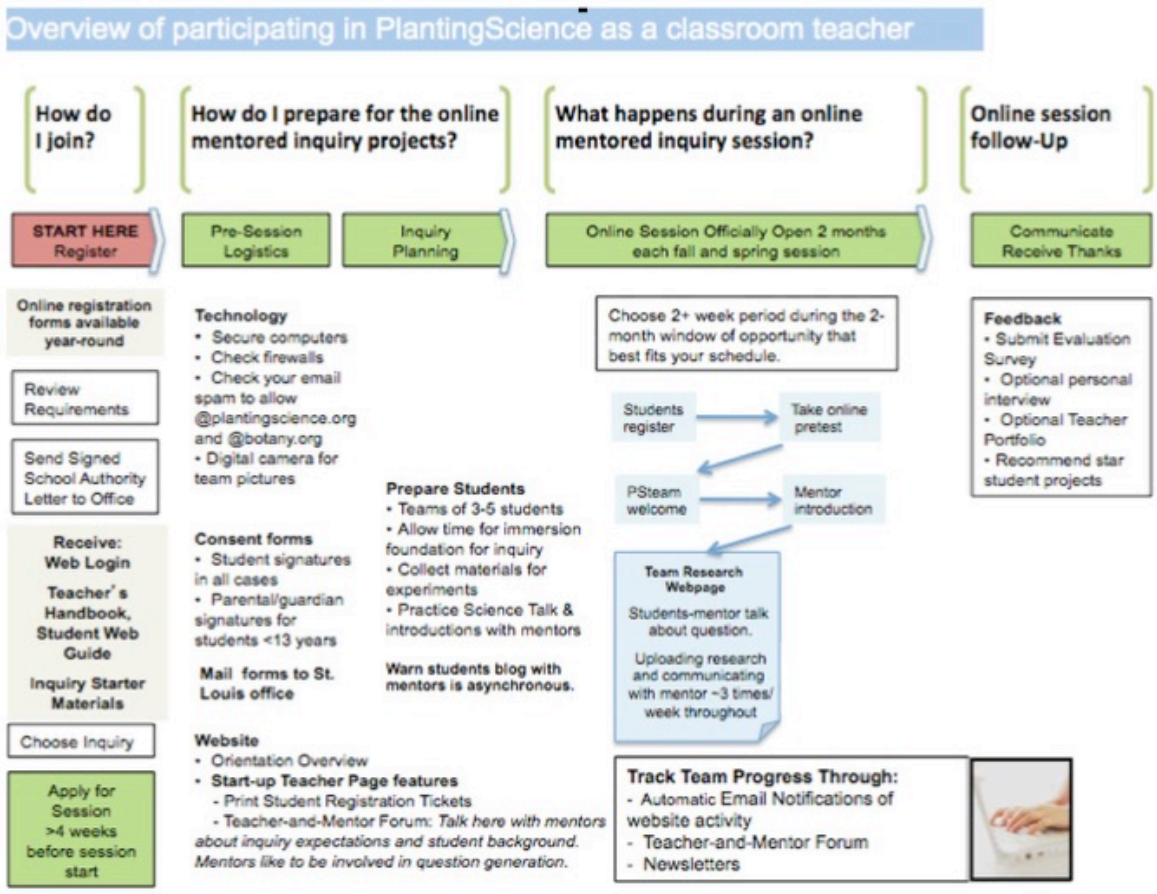
Students must sign consent forms to post online to help ensure a safe online environment and meet the Children's Online Privacy Protection Act. **Student signatures are required** before students may post online. **Parents/guardians must also sign if students are 12 years and younger**.

School Authority Form: http://plantingscience.org/file.php?file=SiteAssets/Teacher_Documents/SchoolAuthority.pdf

Student Consent Form: http://plantingscience.org/file.php?file=SiteAssets/Teacher_Documents/PS_K12_Consent_s15.pdf

Overview Timeline: From Application to Feedback

The figure below illustrates activities before, during, and after a session. Please feel free to contact us with questions about the process or expectations.



Coordinating with Project Team and Scientist Mentors

Shortly after you register, we will provide you with website login and inquiry resources. Email is the primary means we will communicate with you before, during, and after a session.

Preparing For Success Before the Session Begins:

Applying to Participate:

1. Use the username and password provided to **login** at www.plantingscience.org. Click the **Teacher tab** and take a self-guided orientation on your personalized **Teacher Page**.
2. Complete the **Session Application Form** located on your **Teacher Page** or linked in your invitation e-mail. You will need to estimate the numbers of students and teams you will oversee for the session.

Once Accepted:

3. Pledge to **communicate with the volunteer mentors** and the PlantingScience administrative team throughout the session, including posting class details in the Teacher-Mentor Discussion Forum.
4. See the **Student Web Guide** for steps to register students and access the Team Research Web Pages.
5. Review the **Inquiry Guide**, and gather resources for student investigations.

Using Tools on the Teacher Page:

Your personalized Teacher Page contains a variety of tools. First login with the password provided and click the **Teacher tab** on the top menu bar. Look for administrative links on the lower right side of your personalized page. Click each link to perform the action or explore the content provided.

Teacher Tab (links when logged in):

My Info
- Edit My Information
- Update My Email or Password
- Add/Update My Image
- View My PlantingScience Profile

Apply for Upcoming Session

My Student Teams
- Team Setup Instructions (PDF)
- Registered Students

Action/Content in Link:

1. Confirm mailing address
2. Create unique password
3. Upload your photo
4. Complete session application here
5. Read and prepare students to register
6. Access after students register for a list of student usernames and passwords

Also on Teacher Page:

- Teacher-and-Mentor Forum
- Teacher-to-Teacher Forum
- Team Web Pages
- Resources for Student Investigations

Other Main Tabs:

- Research Gallery
- Plant Themes

Community Communication:

Discussion Forums are only visible to logged-in teachers, scientists and administrators. Neither students nor the general public have access to the discussion forum content.

Teacher and Mentor Discussions

This is the place for you to stay in contact with the mentors working specifically with *your* students. You will receive an email with instructions when your Teacher and Mentor Discussion topic is ready for the upcoming session. It is very important that you strive to keep the mentors updated on your classroom activity and schedule. Please inform the mentors as you move through the various phases of the inquiry, from preliminary experiences that set the stage for brainstorming questions to designing experiments, collecting data and interpreting results.

The list of schools/topics in this forum sorts with the most recently updated topic on top, not in alphabetical order. You might need to view the second page to find the link to your conversation thread.

To post a comment, scroll down to the bottom of the page and type in the "Quick reply" box, then click Submit. To keep the conversation easy to follow, please do not create new topics in the Teacher and Mentor forum.
Subscribe to your topic to receive email updates when posts are made.

Teacher-to-Teacher

Feel free to join discussions and create new topics in the Teacher-to-Teacher forum.

Tips for Forum Posts:

Upload your lesson plans or rubrics to share your expectations.

The mentors want to know what is happening in class so they can ask appropriate questions.

Relay if teams will be working with particular questions or materials, or if particular kinds of mentor dialog would benefit students.

Be sure to note dates affecting projects: school holidays, state testing, assemblies, trips, delays, etc.

Trouble-shooting and Contacts

Don't hesitate to ask for information or assistance. We are happy to help!

An email to psteam@plantingscience.org reaches the entire team.

Reach project staff:

Catrina Adams 314-558-2307 (Central) psteam@plantingscience.org

Mailing Address for Office: Botanical Society of America
PlantingScience Program
4475 Castleman Ave.
St. Louis, MO 63110

Fax for Botanical Society of America Office: 314-577-9515

Handy Checklist and Administrative Timeline

	Action	Date Completed
Before a Session	**1. Scheduling and Planning for Learning Goals:** __ Select three weeks (or longer) during the 2-month window of opportunity during the official session that your students will participate __ Plan to tailor inquiry and prepare students for team investigations	
	2. Technology Check and Security: __ Ensure school technology firewalls will not block secure access to www.plantingscience.org __ Ensure spam filters allow email from PSTeam@plantingscience.org and @botany.org	
	3. Consent Forms: __ Mail signed school authority form to BSA office. __ Collect signed student consent forms before students register online. Mail to BSA office when you have them all. Student signatures required; parent signature also required for child 12 years and younger. **4475 Castleman Ave., St. Louis, MO 63110 Fax: 314-577-9515**	
	4. **Website and Orientation:** __ Login, change password, upload image and confirm contact information __ Learn about student registration tickets, tracking student logins, monitoring projects __ View past student projects in Research Gallery and Gallery Archive __ Learn about discussion forums and other resources	
During A Session	**5. Students Register Online – Student Web Guide:** __ Students Register Online __ Teams are welcomed, introduced to their mentors, and begin team experiments	
	6. Teachers Confirm Receipt: __ automatically generated daily Teacher updates __ weekly PlantingScience Newsletters	
	7. Teachers Monitor In-Class and Online Interactions: __ Student-mentor dialog about Research Questions __ Student-mentor dialog about Experimental Design __ Student-mentor dialog about Collecting Data / Recording Observations __ Student-mentor dialog about Uploaded charts, graphs, tables / Explaining Results __ Student-mentor dialog about Presenting & Defending Conclusions with Evidence	
	12. Students Post Final Presentations	
Post	**13. Teachers complete Evaluation Survey**	