

Making Sense of SCIENCE

Next Generation Science Implementation

CLASSROOM INNOVATIONS

A PROTOCOL FOR TEACHER COLLABORATION

WestEd 



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Digital Resources

By purchasing this NGSI: Classroom Innovations protocol, you are granted access to a digital resource collection.

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Table of Contents

Introduction i

SESSION A 1

SESSION B 11



Introduction



The most valuable resource that
all teachers have is each other.
Without collaboration our growth is
limited to our own perspectives.

~Robert John Meehan

Collaboration plays an important role in the work of many professionals, including doctors and lawyers — who, like teachers, work with specialized knowledge and engage in complex decision making. A clear structure can help tremendously in making the process of teacher collaboration more productive and enjoyable. This guide offers a detailed set of steps and resources for getting together with peers to research classroom innovations that benefit next generation science classrooms, reflect on current practices, and respond to challenges. The guide supports you in sharing your expertise and offers resources to draw from in order to enrich that experience.

Using this protocol with a group of colleagues provides a window into next generation practices and how other teachers think about science teaching and learning. Their perspectives can help you broaden your own perspectives, brainstorm ideas for how to provide the best next steps for students, and problem-solve difficult teaching situations. If you collaborate with colleagues across grade levels, the protocol can help with the spiraling, or articulation, of science content and speaking and listening skills as students mature.

The Classroom Innovations guide is designed to support teachers in professional learning communities (PLCs) working to implement next generation classroom practices — one innovation at a time. Because we believe there is no one-size-fits-all format for this type of collaborative work, we've designed this PLC to flex to meet the needs of your unique learning group. All sessions are self-facilitated, with no outside expert or leader required. You can pair up with a colleague or pull together a large group of teachers. You can form a grade-level team or a cross-grade-level group. By design, the protocol offers a flexible approach that allows groups to choose the format and trajectory of their learning based on the collective needs of the group.

How is this guide structured?

Sessions kick off with a fun science activity to help you transition from your school day into this collaborative work time. You can choose whichever welcome activity best fits with your focus for the day. A description of welcome activities is provided later in this introduction.

After the welcome activity, you will have the opportunity to dive deeply into an innovation of your choice and prepare to implement that innovation in your classroom. There are several innovations available to explore as part of your digital resource collection, each with a different focus that will help you learn more about next generation teaching and learning. While the PLC itself is designed to be face-to-face, the Innovation Protocols are interactive PDFs. Each one provides links to a series of online resources. You'll explore these with your group, unpack the innovation, and create implementation plans.

Because each site has different needs and learning goals, this protocol allows for a lot of flexibility. If your group is less familiar with the Next Generation Science Standards, there are Innovation Protocols designed to help get teachers situated in the structure and intent of the standards. If your group is more advanced and ready to hit the ground running, there are Innovation Protocols designed to support more in-depth investigations into the classroom shifts that promote next generation science learning.

Depending on the size of your group you may decide to split up and explore different innovations. You may choose to investigate a single innovation multiple times. The choice is yours! Later in this introduction, we provide an overview of the Innovation Protocols and sample pathways.

Session A is designed as an introductory session. In this session your group will get situated and establish group norms. Your group will also use this time as a chance to establish a plan for your future meetings and begin your journey by diving into a classroom innovation of your choice.

Session B supports continued learning. In this repeatable session, you'll check in on each others' progress and share artifacts from your classroom that illustrate your successes and challenges implementing the innovation. Then you'll dig into another classroom innovation together.

How can we be most productive?

In general, collaborative study groups are most successful when they operate with clear goals and shared expectations. Here are some helpful tips to make your time the most productive.

Establish an attitude of inquiry. An inquiry stance is open to questions and appreciative of diverse ideas and evidence-based conversations. Sometimes the goal of a task is to reach a consensus — for example, having a shared, accurate understanding of a piece of science content. However, when it comes to the complex practice of teaching, focus more on sharing interpretations, considering alternate ideas, and exploring tradeoffs. Stretch your thinking, encourage participation from everyone, and listen openly to different perspectives.

Designate team roles. Because this protocol is self-facilitated, you may find that defining participant roles is helpful to keeping your group on task, on time, and moving toward the goal. For example, you might choose a reader, timekeeper, and recorder for each session. You may also wish to designate someone to collect materials used in the welcome activities, communicate logistical information to the group, and troubleshoot technology issues. How you divvy out roles is up to you, but work to find an equitable distribution of responsibility that everyone in the group feels comfortable with.

Decide on group norms. It is important to develop an environment that feels welcoming and respectful. Acknowledge that it's okay to try on new ideas, be wrong, change your mind, and revise your thinking. Honor your beginning and ending times, come prepared, and stay focused on the learning. A starter list of group norms might include:

-
- Everyone participates, and you can always pass.
 - Be an active listener.
 - Be honest when sharing ideas and take risks.
 - Find connections among ideas.
 - Respect and appreciate different ideas. Better yet, look forward to them.
 - Support each other's learning and risk taking.
 - Assume positive intentions.
 - Start and end on time.
 - Use technology in a learning mode.

Monitor your time. The times in this guide are suggestions. If your group is having a rich, meaningful conversation that is going longer than the allotted time, pause and make a conscious decision about how you will adjust the remainder of the session to accommodate the in-depth conversation or choose to table it and move on.

Attend to the needs of the group. Some of the best resources teachers have in supporting successful classroom practice are their peers! Meeting the needs of the group and attending to each others' requests is an important part of building a productive learning culture. Check in with each other at the start of each meeting to ensure that the planned focus is still the right focus and make adjustments as needed. If someone is experiencing a challenge, work as a group to address it so you can put your best foot forward as a learning community.

What materials do we need?

A materials list and print guide are provided as part of your digital resource collection. These include suggested supplies for welcome activities and other materials and equipment you'll need. While there are materials for the welcome activities that you will need to print, most of this course does not require printed handouts. However, many people prefer to jot notes by hand, so be sure to have paper and writing instruments available.

Innovation Protocol Descriptions

Innovation Protocols provide a framework for you to unpack the complexities of each innovation. As you engage with each protocol, you will explore a variety of resources. We have chosen resources that provide a solid grounding in that innovation, but there are likely many more! If you know of additional resources, we encourage you to explore them as well.

Getting-Started Innovations

NGSS Introduction

This protocol is useful for groups who are not yet familiar with the Next Generation Science Standards (NGSS).

The resources for this protocol include videos and articles that describe the instructional shifts suggested by the NGSS and outline its structure, including tips for how to read NGSS tables.

NGSS Implementation

High-quality NGSS implementation doesn't happen without teachers building an understanding of what NGSS-shifted instruction looks like and having the school-based supports needed to successfully transition to this new type of instruction. This protocol unpacks how NGSS-shifted instruction differs from traditional instruction. It also explores some of the common struggles teachers face when implementing NGSS-shifted instruction.

The resources for this protocol include articles and case studies that describe the shifts that take place during NGSS implementation, as well as the foundational supports needed for success.

Phenomena-Based Instruction

Everywhere we look there are a multitude of phenomena happening. Understanding these phenomena often requires a lot of deep science knowledge. This protocol provides an opportunity to explore strategies for phenomena-based instruction and examples of phenomena that are useful launching points for NGSS-shifted instruction.

The resources for this protocol include videos of adults and students engaged in phenomena-based instruction, as well as videos and articles that describe specific strategies to move toward phenomena-based instruction in your classroom.

Next-Steps Innovations

Productive Classroom Culture

Classrooms where students feel supported and valued are not only pleasant environments for them to be in, they are essential to making learning productive for all. This protocol explores the characteristics of classroom cultures that promote productive scientific discourse among students.

The resources for this protocol include videos and articles that describe the link between productive classroom culture, discourse, and the NGSS, as well as videos and articles that describe specific strategies to make productive classroom culture a reality.

Exploratory Discourse

Trying on ideas, wondering about connections, and being inspired by other's ideas is foundational to science and science learning. This protocol unpacks the characteristics of exploratory discourse in science, as well as the strategies for supporting exploratory discourse in the classroom.

The resources for this protocol include videos of adults and students engaged in exploratory discourse and articles that describe strategies to support students engaging in exploratory discourse.

Explanatory Discourse

Ultimately, the goal of science is to be able to explain phenomena and make sense of our world. This protocol focuses on the role of explanatory discourse in the sharing and communication of our ideas, and provides participants a chance to take a deeper look at the structure of this type of discourse and the ways in which we can support students making, evaluating, debating, and refining explanations.

The resources for this protocol include videos of adults and students engaged in explanatory discourse and articles that describe strategies to support students engaging in explanatory discourse.

Formative Assessment

This protocol is used for groups who are interested in the role of formative assessment in next generation science instruction. After exploring resources about formative assessment, teachers choose and make a plan to use a formative assessment with students before the next PLC meeting. Teachers are encouraged to bring in student work samples (print/video) to the next group meeting to reflect on the experience and further discuss the process of formative assessment.

The resources for this protocol include articles that describe the qualities of good formative assessment and the shifts required in formative assessment to meet the needs of the NGSS.

Engineering in the NGSS

This protocol dives into the role of engineering in the NGSS — including what engineering looks like in action, how it can be used during science investigations, and examples of engineering design structures and curricula.

The resources for this protocol include articles that provide background information on engineering principles and a video that shows engineering instruction in action.

Welcome Activity Descriptions

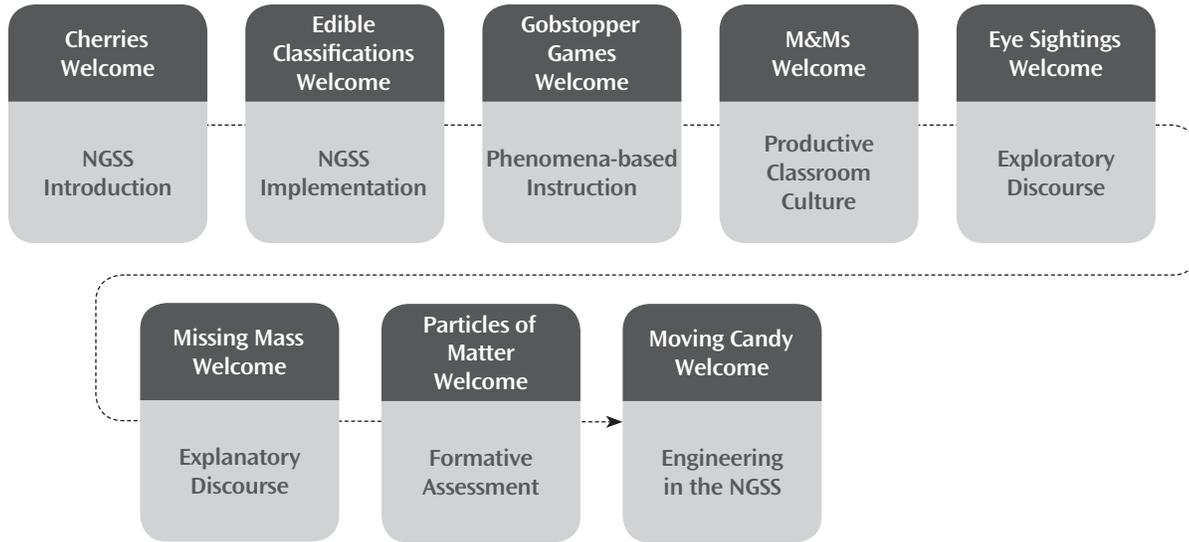
There are many ways to mix and match Welcome Activities and Innovation Protocols. We've included components in these activities that help set the stage for your exploration of an innovation. However, you should feel free to adapt or change activities to best suit your group's needs.

		Suggested Innovation Protocols							
		NGSS Introduction	NGSS Implementation	Phenomena-Based Instruction	Productive Classroom Culture	Exploratory Discourse	Explanatory Discourse	Formative Assessment	Engineering in the NGSS
Cherries	Explore energy and matter interactions in a cherry tree and human system using a simple model to show inputs and outputs.	•		•		•			
Edible Classifications	Consider the tradeoffs of different classification systems and the usefulness of each with a fun sorting activity using trail mix.	•	•			•			
Eye Sightings	Consider a model for showing how we see and perceive color in different lighting conditions. Explore how animal adaptations change the way they see and perceive color.			•		•			
Gobstopper Games	Explore experimental design! Make predictions and observe what happens to Gobstopper candies when exposed to milk and water.			•		•			
Missing Mass	Explore the difference in mass before and after popcorn kernels are popped. Use a particle-level model to help explain your thinking.			•		•	•		
m&Ms	Consider the factors that go into collaborative explorations. Make predictions, observations, and explanations surrounding a simple phenomenon — dropping M&Ms in water.			•	•	•			
Moving Candy	Engineer a candy moving machine with a handful of simple supplies. <i>Tip:</i> This activity can easily be reused by changing the objective and materials.	•							•
Particles of Matter	Explore the composition of substances with simple particle-level models. Consider how this type of activity is useful in assessing student understanding of the particulate nature of matter.	•						•	

Sample Learning Pathways

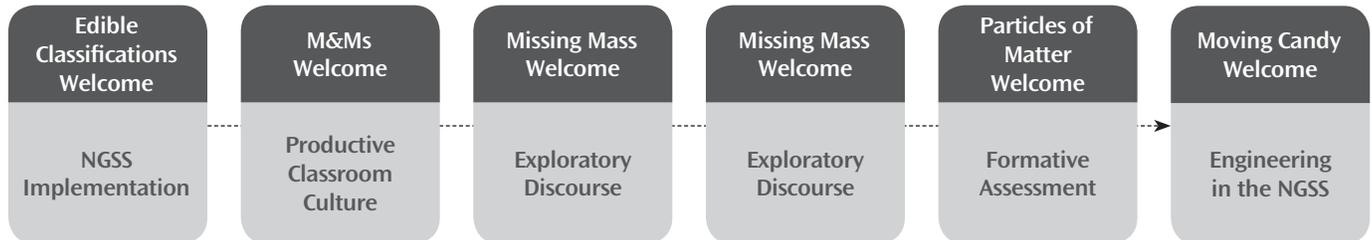
SAMPLE PATHWAY 1: The Full Compliment

This pathway assumes participants are new to the NGSS, and PLCs will meet regularly throughout the school year.



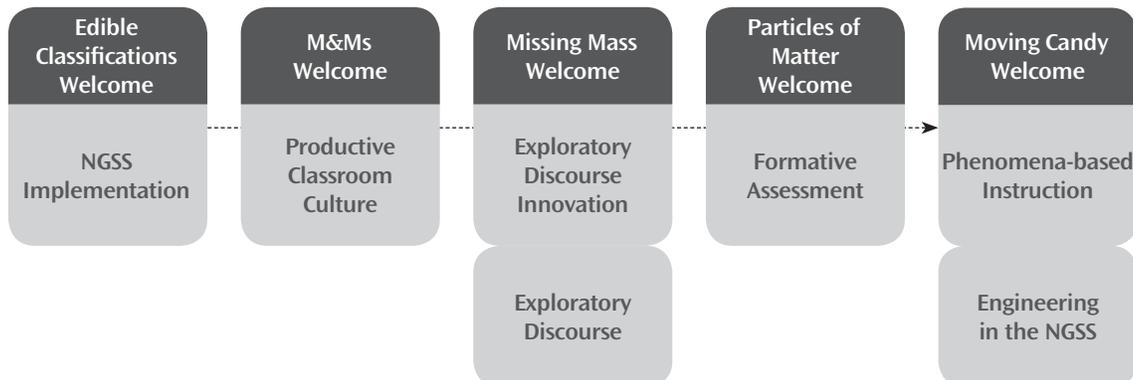
SAMPLE PATHWAY 2: Hitting the Ground Running

This pathway assumes participants have a firm grasp on the NGSS and are ready to work on implementing next generation innovations.



SAMPLE PATHWAY 3: The Double Stack

This pathway assumes participants have staff development days and can utilize that time as part of their PLC.



Learning Pathway Plan

Use the template below to draft your Innovation Pathway plan. Make note of any customization or choice points you can anticipate. Record dates, times, and locations if you already know them. Decide who will bring materials (e.g., printed materials, general and hands-on supplies).

SESSION: <input type="text"/>	Date: <input type="text"/>	Location: <input type="text"/>
Welcome Activity	Innovation Protocol	
Notes		

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