



Assessing for Learning Facilitator's Guide



WORKSHOP V: STUDENT SELF-ASSESSMENT

**A Professional Development Curriculum from the
Institute for Inquiry®**

The fifth in a set of five workshops for teacher professional development

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You can download your own copy of this guide at www.exploratorium.edu/ifi/assessing. A wealth of background material, for this and the other guides in the series, can be found at www.exploratorium.edu/ifi/library.

In order to access these materials, you will need Macromedia Flash Player 5 or higher and Adobe Acrobat Reader 4 or higher, available for free downloading at www.exploratorium.edu/ifi/help. These plug-ins may require additional memory.

**You can download any of the
ASSESSING FOR LEARNING workshop guides at
www.exploratorium.edu/ifi/workshops.**

A screenshot of the Exploratorium's "Workshops" website. The header reads "Workshops professional development experiences for educators" and "Institute for Inquiry". The main content area features a large image of hands holding a globe. Below this, there are sections for "Workshop Schedule" (See a current schedule of Institute for Inquiry offerings.), "Workshop Brochure" (Download information about our workshop offerings.), and "Lead your own Workshops" (A series of facilitator's guides published on the Web for professional developers working with teachers.). Under "Lead your own Workshops", there are two sub-sections: "Fundamentals of Inquiry" (Five workshops designed to introduce teachers to inquiry teaching) and "Assessing for Learning" (Available Fall 2006). The footer includes "ABOUT THE INSTITUTE | WORKSHOPS | LIBRARY" and the Exploratorium logo with "site index", "sponsors", and "help" links.

Student Self-Assessment

Welcome

Welcome to *Student Self-Assessment*, the fifth and final workshop in the ASSESSING FOR LEARNING curriculum. The five workshops in this series introduce formative assessment and offer ways for teachers to begin applying elements of formative assessment in their own classrooms.

This five-part curriculum is designed to be presented in sequence and in its entirety. To help facilitators review key concepts that pertain to the entire curriculum, each workshop guide contains a section on Formative Assessment Basics.

Created by British educator and author Wynne Harlen in collaboration with the staff of the Exploratorium Institute for Inquiry in San Francisco, this curriculum has been offered to science educators and professional developers at the Exploratorium since 1996.

In 2000 the National Science Foundation asked that the Institute for Inquiry make these workshops available to even more educators. The result is a series of guides that provide step-by-step instructions and access to support materials online so that professional developers and teacher educators can present these workshops on their own.

Lynn Rankin
Director
Institute for Inquiry

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Acknowledgments

ASSESSING FOR LEARNING is based on original work by British educator and author Wynne Harlen in collaboration with the Exploratorium's Institute for Inquiry in San Francisco. Formerly Director of the Scottish Research Council, Dr. Harlen has spent the last thirty years involved in research on assessment and student learning in primary science education. Her books, including *The Teaching of Science in Primary Schools*; *Primary Science: Taking the Plunge*; and *Teaching, Learning, and Assessing Science 5–12*, are used by educators throughout the world. Since 1996 she has been the primary presenter of a five-day series of workshops on formative assessment at the Institute for Inquiry. The core ideas and activities from those workshops, as well as Dr. Harlen's original drafts of this document, form the basis for these guides.

Curriculum Developer

Wynne Harlen

Project Directors

Lynn Rankin, Barry Kluger-Bell

Project Developers

Lynn Rankin, Fred Stein, Marilyn Austin

Project Producer

Ruth Tepper Brown

Project Designer

Kristina Hooper Woolsey, Woolsey & Associates

Project Writers

Buff Whitman-Bradley, Ruth Tepper Brown

Series Editor

Erin Van Rheen

Project Editors

Judith Brand, Martha Nicholson Steele, Laura Jacoby

Graphic Designers

Barbara Del Rio, Alisa Lowden, Gary Crounse,
Esther Kutnick, David Barker

Illustrator

Gary Crounse

Web Designers

Mike Petrich, Karen Wilkinson

Web Developers

Jenny Villagrán, Rob Rothfarb

Project Managers

Avon Swofford, Pat Koblenz

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ABOUT THIS WORKSHOP

- **The Workshop in Context**
- **Workshop Overview**

The Workshop in Context

ASSESSING FOR LEARNING

Student Self-Assessment is the fifth of five workshops in the **ASSESSING FOR LEARNING** curriculum. The workshops in this curriculum are designed to be used sequentially so that participants work step-by-step toward a full understanding of formative assessment. All five workshops take as their starting point the *Formative Assessment Basics*, introduced on page 9 of this guide and available in each of the five facilitator guides in this series.

The **ASSESSING FOR LEARNING** curriculum consists of the following workshops:



Workshop I: Introduction to Formative Assessment

Participants discover the purpose of formative assessment and find out how it differs from summative assessment (about 2 hours).



Workshop II: Assessing Process Skills

Participants learn how to observe and interpret students' use of the process skills of science (about 3 hours).



Workshop III: Effective Questioning

Participants identify questions that are useful for eliciting students' ideas and for encouraging the use of science process skills (about 2 hours).



Workshop IV: Assessing Science Ideas

Participants create indicators of development for specific scientific ideas and consider the nature of feedback that helps student learning (about 2 hours).

Workshop



Workshop V: Student Self-Assessment

Participants investigate the value of students assessing their own and their peers' work and explore ways to communicate goals and criteria to students (about 2 hours).

How to Use the Curriculum

This curriculum is designed to be presented in sequence and in its entirety. If you decide to present less than the full curriculum, it's important to communicate this to participants, so they aren't left with the impression that they have been introduced to all the main ideas related to formative assessment. For example:

- Doing only Workshop I would be a good introduction to formative assessment, but would not offer teachers any practical strategies to implement in the classroom.
- Doing Workshops II, III, IV, or V alone would offer classroom strategies, but without the overview of formative assessment to put those strategies in context.
- Doing Workshop I followed by one of the other workshops would provide an overview of formative assessment and a single strategy to implement it, but would give an incomplete picture of formative assessment practice.

Workshop Overview

A Quick Summary

Student Self-Assessment is the fifth and last in a set of five guides in the ASSESSING FOR LEARNING curriculum. The guides are designed to help facilitators plan and present professional development workshops for educators interested in developing an understanding of formative assessment and how to begin to apply it in their classroom.

This workshop was created to help teachers understand the nature of student self-assessment. It offers tools to help students assess their own work, and gives teachers the opportunity to appreciate the range of approaches possible for using self-assessment strategies.

The Goals of the Workshop

One of the overall aims of the ASSESSING FOR LEARNING curriculum is to help teachers understand formative assessment as a recurring cycle of events. Information about the Formative Assessment Cycle is provided in the Formative Assessment Basics section of this guide, which begins on page 9.

The Formative Assessment Cycle, presented in detail in Workshop I of this series (*Introduction to Formative Assessment*), begins with the collection of evidence relating to the science goals of student work. By interpreting that evidence, a teacher can determine students' current levels of understanding or abilities

relating to science goals, decide what next developmental steps students must take to achieve those goals, and finally, determine how to help students take those next steps.

This workshop—*Student Self-Assessment*—reflects the fact that students are at the center of the Formative Assessment Cycle. With the strategies and information in this guide, teachers can help students play an active part in their own learning.

Goals

- To help teachers understand the value of student self-assessment and provide them with practice in communicating learning goals to students.
- To give teachers practice in helping learners develop their own criteria for assessing their work.
- To give teachers a vision of a range of approaches for student self-assessment.

How the Workshop Works

This workshop takes about 2 hours and 15 minutes and is designed to be led by one facilitator, although you may prefer to have two facilitators working together.

Typically, planning takes about four hours, not including the time necessary to prepare materials.

In this guide, we list materials for 36 participants. For fewer participants, quantities of materials and other workshop logistics can be adjusted as needed.

We recommend 12 to 36 participants for our workshops. Having fewer than 12 does not allow for the lively group interaction that is such an important component of the workshop. Having more than 36 makes whole-group discussions unwieldy and can necessitate an additional facilitator.

We begin this workshop by clarifying the meaning of

self-assessment in the specific context for formative assessment and discuss why student self-assessment is crucial. Next, we address the importance of sharing with students the learning goals of their activities. Participants will consider the particular challenges of communicating goals of inquiry-based learning in terms that students can understand. Following that, participants practice doing an activity in which they work as learners to develop criteria for assessing the quality of their own work. This is an activity that teachers can adapt to use with their students in the classroom.

The workshop concludes with a consideration of various examples of how self-assessment is actually practiced in various classrooms. Participants discuss a range of approaches for student self-assessment, identifying the advantages and challenges of each approach, and with self-assessment in general.

The facilitator concludes the workshop by summarizing the main points of the workshop as expressed in the take-home messages.

About the Take-Home Messages

The take-home messages are brief statements that convey the central pedagogical ideas encountered during the workshop. By introducing these messages early on, facilitators set the context for what is to follow, and inform participants of the purpose and content of the workshop. This transparency of purpose is an important initial step in establishing an

atmosphere of trust between facilitators and learners. Such trust is critical in creating a climate in which learners feel comfortable expressing opinions and considering new ideas.

Understanding of the messages deepens as the workshop progresses, and as participants become intellectually engaged in building new ideas based on their firsthand experiences and their conversations with each other. The take-home messages are revisited at the end of the workshop as a way to summarize and reinforce the understandings participants have constructed.

Take-Home Messages

- Student self-assessment has a central role in formative assessment, significantly increasing time on task, enabling self-regulated learning, and raising achievement.
- It is important to communicate goals to students by using appropriate language, and to reinforce those goals through discussion and comments during activities.
- Given appropriate opportunities, students can develop criteria for assessing the quality of their work, and take responsibility for applying those criteria during and after activities.
- There are many ways to help students assess their work, but all require a teacher to provide time and conditions for this to happen.

FORMATIVE ASSESSMENT BASICS

- **The Inquiry Connection**
- **The Formative Assessment Cycle**
- **Additional Resources**

The Inquiry Connection

Formative Assessment and Learning Science through Inquiry

From their earliest years, children develop ideas about the world that make sense to them, but don't necessarily correspond to the scientific view. How do we help children develop their ideas into more scientific ones?

Experience and research show that merely teaching "correct" scientific ideas does not necessarily change students' understanding. Change is more likely to happen when students test their scientific ideas for themselves. Teaching through inquiry helps students test their existing ideas about scientific phenomena, consider alternative ideas, and gradually develop an understanding that is more consistent with evidence and with the scientific view of how things work. But students often need help with this process. Formative assessment gives teachers the means to help students express their ideas and rigorously test them.

In general, when students engage in science inquiry, they go through the following phases:

- They begin by observing and exploring materials, and they raise questions about their observations.
- They choose a question to investigate, and then plan and do an investigation to try to answer their question.
- During the course of the investigation, they come up with ideas to explain what they're seeing, and find ways to test those ideas.
- Finally, they interpret the results of their investigations and communicate those results to others.

In order to help students have productive inquiry experiences in which they express and test ideas that can lead to new scientific understanding, teachers need to check in and offer guidance in every phase of the process. To do their investigations, students must be able to ask questions that can be investigated. And in order for students to draw conclusions based on evidence, they need to be able to plan systematic investigations to gather that evidence. The teacher's role in this process is to find out how the student is doing in each phase, and help them make progress.

To know how students are doing, teachers need a way to "get into students' heads" and understand how they're thinking. Each of the above phases of inquiry is an entry point for the teacher to carry out assessment that will provide information on how students understand science concepts, and on how effectively they are using the process skills of science (such as observing, questioning, planning, interpreting and communicating). The teacher can then use this information to determine what next steps students need to take in order to increase their understanding of science concepts and improve their ability to use the process skills of science. The teacher can then guide students in ways that will help them take next steps in learning.

Ideas about Formative Assessment

"Ideas about assessments have undergone important changes in recent years. In the new view, assessment and learning are two sides of the same coin. . . . When students engage in assessments, they should learn from those assessments."

National Research Council, *National Science Education Standards*. (Washington, DC: National Academy Press, 1996), pp. 5–6.

But of course it is the students who do the learning—and the more they are aware of the learning goals of their activities, the more they are able to recognize for themselves how to make progress. Part of the teacher’s role, then, is to share goals with students, provide them with skills and opportunities for assessing their own progress, and help in deciding their next steps. All these aspects of teaching—gathering information about students’ learning, interpreting it in terms of their progress, using it to decide next steps, feeding back to students how to move forward, and helping students understand

Assessment and Inquiry

“Assessments have become more sophisticated and varied as they have focused on higher-order skills. Rather than simply checking whether students have memorized certain items of information, new assessments probe for students’ understanding, reasoning, and use of that knowledge—the skills that are developed through inquiry.”

National Research Council, *National Science Education Standards*.
(Washington, DC: National Academy Press, 1996, p. 6.)

the goals of their work and assess their own progress—are encompassed in the concept of formative assessment, and form the basis for the ASSESSING FOR LEARNING curriculum.

While formative assessment is essential when teaching science through inquiry, this powerful teaching strategy can also be applied effectively to all science teaching approaches (as well as any other curricular topic). Because formative assessment involves periodically checking students’ current understanding during—rather than after—instruction, it provides useful information which allows teachers to tailor their teaching to a single student’s, or a whole class’s, specific needs. Using assessment to inform teaching is important in any instructional approach. However, it is critical to inquiry, in which students are raising questions and designing investigations to test their own ideas. Teachers must assess progress at every step of the investigation in order to ensure that their investigations are sound enough for students to draw useful conclusions that help them more fully develop their scientific ideas.

The Formative Assessment Cycle

Overview

Assessment is part of every teacher's job. The type of assessment teachers are most familiar with—in which they examine students' work in order to determine grades, write evaluations, compare levels of achievement, and make decisions about promotion—is called *summative assessment*.

In doing *formative assessment*, teachers also examine and evaluate students' thinking—but in this case, they do so in order to make pedagogical decisions for the purpose of helping students get closer to learning goals. Teachers use the information they gather about student work to determine what students need to do next that will help them progress toward the goals of the lesson.

The value of this kind of assessment is attested to not only by individual teachers who have used it effectively in their classrooms, but also by a significant body of research, as the sidebar at right, "Research on Formative Assessment," indicates.

The Formative Assessment Cycle

It's useful to think of what teachers (and students) do in formative assessment as a cycle of events, as shown in the diagram on the next page and on M1. If you follow the diagram clockwise, you'll be able to see how the process can bring students ever closer to the learning goals.

Before instruction begins, the teacher decides what the learning goals will be. These goals, shown at the top of the diagram, can be scientific attitudes, conceptual ideas about science content, or science process skills, since all are important in science instruction.

The teacher also chooses an initial learning activity

Research on Formative Assessment

"In a review of research on assessment and classroom learning, Black and Wiliam [Black, P. J., and D. Wiliam. 1998. 'Assessment and Classroom Learning.' *Assessment in Education*. 5 (1) 7–74, 1998.] identified and analyzed 250 studies comparing classrooms where formative assessment was and was not practiced. This revealed striking evidence that, on almost every kind of academic measure, students whose teachers systematically applied formative assessment techniques outperformed similar students who did not receive such treatment. These differences were significant, both statistically and educationally.

"There was also evidence that the gain was greatest for lower-achieving students. This exhaustive study leaves the reader convinced that the improvement of formative assessment practices in United States classrooms might be the closest thing to the elusive 'magic bullet' that education reformers might find."

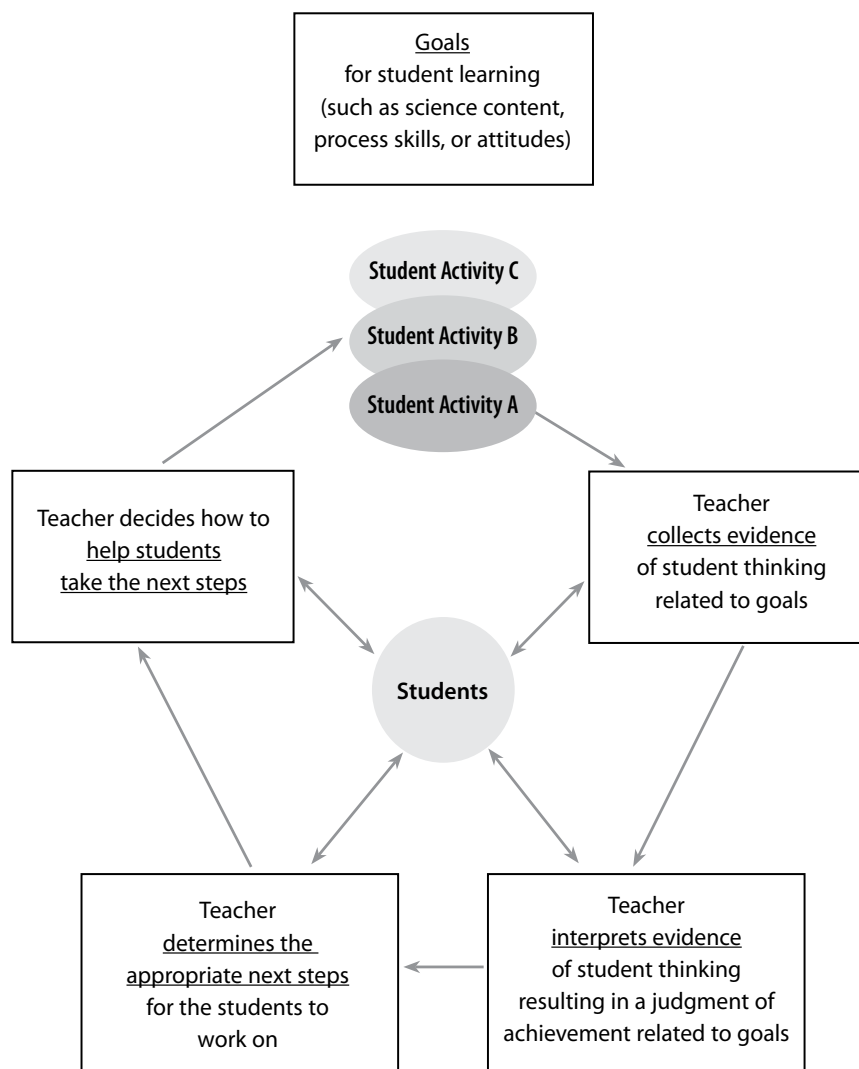
Wynne Harlen. *Enhancing Inquiry through Formative Assessment*. (San Francisco: Exploratorium, 2003) pp. 7–8.

(represented in the diagram as Activity A) meant to begin the process of helping students achieve the learning goals. Although the teacher can have plans for subsequent activities students might do to reach these goals, it's important to remain flexible. Information gathered and interpreted in the course of formative assessment may suggest ways of modifying plans so they more effectively address goals.

Teacher Collects Evidence Relating to Goals.

During the initial activity (Activity A), the teacher collects evidence of students' thinking in relation to the goals. The teacher can gather evidence in many ways, such as by watching students as they work,

Formative Assessment Cycle



questioning them, or by asking them to communicate their understanding through writing or drawing.

Gathering evidence should be an integral part of any lesson. Lessons may already include opportunities to elicit the use of certain process skills or the application of specific scientific ideas, or the teacher may need to plan something especially for this purpose. Planning

may involve deciding, for instance, what questions to ask in order to encourage the kinds of thinking and learning intended in a particular activity.

Lesson preparation that includes plans for eliciting student thinking in relation to the learning goals has a double benefit. First, it ensures that students use and develop process skills and scientific ideas; and

"One teacher, in planning a lesson on simple circuits, decided to have the students draw on the whiteboard all the circuits they tried to construct, both those that did and those that didn't work. This form of communication gave her an immediate picture of the way the students' ideas were developing and enabled her to work with those who were unsure and needed help understanding what is essential in a complete circuit."

Wynne Harlen. *Enhancing Inquiry through Formative Assessment*. (San Francisco: Exploratorium, 2003) p. 22.

second, it gives teachers opportunities to assess the development of those skills and ideas. In this way, teaching and assessment are closely intertwined.

Teacher Interprets Evidence. Once evidence of student work has been gathered, the teacher needs to interpret that evidence to find out how students are progressing toward their learning goals. In order to do this, the teacher considers more than just the extent to which the student has reached the learning goal, but also the student's experience, past achievements, recent progress, and the effort the student has made. The teacher's interpretation is then student-

A classroom teacher asked her students to draw a picture of a crayfish, label the parts, and describe the function of each. She wanted to see how her students used their process skills of close observation, and to elicit their understanding of structure and function. One student's drawing labeled only the legs, but distinguished between those used for movement and those used for feeding. Despite the fact that the student's work was incomplete, the teacher saw it as an indication that he had observed very closely and understood issues of structure and function. For the teacher, this was a sign of improvement, since the student had not been able to focus well in previous observations.

—Institute for Inquiry

referenced, allowing the teacher to match next steps with the needs of the individual student.

Teacher Determines Appropriate Next Steps. The process of interpreting evidence leads the teacher to arrive at a judgment about where students are in relation to the learning goals. In the diagram, the phrase "judgment of achievement" in the lower right-hand box refers to what the teacher thinks a student knows in relation to goals, and not how well the student is doing.

Once this judgment has been made, the teacher determines the developmental steps students need to take next in order to increase their understanding of scientific ideas, improve their science process skills, or enhance their scientific attitudes.

In a third-grade classroom, students were investigating the effects of water on plant growth: they had given different amounts of water to similar plants in various places around the room. The teacher decided that the next step was to have her students think about how to choose which condition to keep the same (such as the location of the plants) in order to make their experiment a "fair test."

—Institute for Inquiry

Teachers are accustomed to drawing on their experience to decide what would help students who show varying degrees of mastery. But there are also a number of sources that can help teachers consider the developmental progression of certain scientific ideas and process skills. For more information, see the Additional Resources on page 16.

It is this iterative process that distinguishes formative assessment from other kinds of assessment. Here, information about student achievement is gathered and interpreted and used to help make the next instructional decision.

In order to help her students plan for a “fair test,” a third-grade teacher asked her students how they could tell if differences in plant growth were due to differences in the amount of water each plant received, or to where the plant was located. The students responded by deciding that it would be important to keep all the plants in the same place. That way, they reasoned, they could test for the effect of watering without being confused by the effects of light or heat from different locations.

—Institute for Inquiry

For instance, if a teacher is trying to help further develop students’ conceptual ideas, useful strategies include helping students test their existing scientific ideas, providing access to more scientific ideas than they currently have, and enhancing communication and reflection. Teachers can help students design experiments and investigations to test their ideas. They can give students reference materials, or introduce them to alternative, more scientific ideas and support them in thinking about those ideas. And they can set up situations in which students work together to create explanations of scientific phenomena they encounter in experiments and investigations.

About the Student’s Role in the Formative Assessment Cycle

Students are at the center of the Formative Assessment Cycle because they play a central role in formative assessment. Every action a teacher takes during the cycle involves interactions with students.

In addition to teachers evaluating and supporting student progress toward learning goals, students can also take action on their own behalf. When students know about the goals of instruction, they can give the teacher evidence about their own understanding in relation to those goals. The more students can take on the role of self-assessment, the more they can move toward being able to decide their own next steps.

Student Self-Assessment

“Student participation is a key component of successful assessment strategies at every step. If students are to participate effectively in the process, they need to be clear about the target and the criteria for good work, to assess their own efforts in light of the criteria, and to share responsibility in taking action in light of the feedback.”

National Research Council. *Classroom Assessment and the National Science Education Standards*. (Washington, DC.: National Academy Press, 2000) p. 1.

Additional Resources

These resources can provide valuable information about formative assessment to facilitators and participants alike.

- ❑ Black, Paul, and Dylan Wiliam. "Inside the Black Box: Raising Standards through Classroom Assessment." Online article available at www.pdkintl.org/kappan/kbla9810.htm.
- ❑ Black, Paul, Christine Harrison, Clare Lee, Bethan Marshal, and Dylan Wiliam. *Working Inside the Black Box: Assessment for Learning in the Classroom*. London: King's College Department of Education & Professional Studies, 2002. Particularly useful for Workshops III, IV, and V.
- ❑ Harlen, Wynne. "Encouraging and Handling Children's Questions." Chapter 13 in *The Teaching of Science in Primary Schools*. London: David Fulton Ltd., 2000. Particularly useful for Workshop III.
- ❑ Harlen, Wynne. *Enhancing Inquiry through Formative Assessment*. San Francisco: Exploratorium, 2003. This monograph sets out research evidence and theoretical points to make the case for using formative assessment in inquiry science teaching. Available online at www.exploratorium.edu/ifi/resources/harlen_monograph.pdf.
- ❑ Harlen, Wynne. *Teaching, Learning & Assessing Science 5–12*. London: Sage Publications, 2006. This book presents a theoretical rationale for why science should be taught in constructivist ways. Chapters 7–12 offer an explanation of the role formative assessment plays in that type of teaching.

In addition to the resources above, the publications listed below can offer support for teachers interested in further information on science education standards and the developmental progression of science ideas and process skills at different grade levels.

- American Association for the Advancement of Science. *Atlas of Scientific Literacy*. Washington, DC: American Association for the Advancement of Science and the National Science Teachers Association, 2001.
- American Association for the Advancement of Science. *Benchmarks for Science Literacy*. New York: Oxford University Press, 1993.
- National Assessment of Educational Progress (NAEP). "The NAEP Science Achievement Levels." National Center for Education Statistics (NCES), 2002. <http://nces.ed.gov/nationsreportcard/science/achieveall.asp>.
- National Research Council. *National Science Education Standards*. Washington, DC: National Academy Press, 1996.

PLANNING AND PREPARATION

- **Workshop at a Glance**
- **Essential Planning Steps**
- **Sample Room Setup**
- **Charts, Overheads, and Handouts**
- **Materials and Equipment**

Workshop at a Glance

Facilitators needed: 1–2

Participants accommodated:
30–36

Time to present the session:
About 2 hours and 15 minutes

Planning and Preparation
4 hours + materials prep



PRESENTING THE WORKSHOP

Introducing the Workshop
5 minutes
Facilitator sets the context

Why Student Self-Assessment?
15 minutes
Small-group discussion

Sharing Learning Goals with Students
35 minutes
Participants practice communicating goals to learners and then discuss examples with the whole group

Establishing Shared Criteria for Assessing Work
55 minutes
In small groups, participants practice developing criteria for assessing their own work, then discuss examples with the whole group

Some Classroom Approaches to Student Self-Assessment
20 minutes
As a whole group, participants discuss various approaches to student self-assessment

Concluding the Workshop
5 minutes
Facilitator brings the workshop to a close



Reviewing the Workshop
Time as needed

Essential Planning Steps

Overview

The *Student Self-Assessment* workshop requires a good deal of planning and preparation. Below you'll find step-by-step instructions, divided into three categories: Before the Workshop, On the Day of the Workshop, and After the Workshop.

The workshop requires one facilitator, although you might choose to have two and divide up the steps. If two facilitators will be presenting the workshop, it's important to go over these steps together, arriving at a shared understanding of workshop goals. There's a lot to do, including reading through this entire guide, preparing to lead discussions, trying the workshop yourselves as if you were participants, arranging for an appropriate space, and preparing materials, charts, and handouts.

You'll also want to set aside time after the workshop to talk with your co-facilitator about what went well and what could be improved for subsequent workshops.

Before the Workshop

1. Read this guide all the way through. It is essential for you to read through this guide before doing any of the other planning steps. You may want to flag sections that don't make immediate sense to you, coming back to them as the goals of the workshop become clearer.

2. Become familiar with the formative assessment basics. Review the Formative Assessment Basics section, which begins on page 9. This is the foundation of the entire curriculum.

3. Prepare materials. Gather and organize all materials (see the complete list on pages 23–24).

- Prepare the handouts, charts, and overheads, and organize them in the

order in which you will use them during the workshop. Masters start on page 43. They are identified with the letter *M* and numbered in order of use.

- Study the list of Additional Resources on page 16, deciding which, if any, you will copy for distribution at the end of the workshop.

- One activity for participants involves the use of “Cartesian divers,” which are made of inexpensive materials and are simple to construct. Before the day of the workshop, you'll need to make one for each table group of six people. (For instance, 36 participants would need 6 Cartesian divers.) You will also need to have one Cartesian diver available to use as you go through the workshop, in preparation for presentation. See page 24 for instructions.

4. Do the workshop as learners. Meet with your co-facilitator, if there is one, and go through the workshop as if you were participants.

Planning Time Needed

Typically, planning takes about 4 hours, not including the time necessary to gather and prepare materials and equipment.

An Important Note from the Institute for Inquiry

This workshop is the result of many years of development with educators across the country. While its format may seem adaptable, using it in ways other than those described here will not only change the participants' experience, but the outcome as well. We recommend becoming familiar with the planning and presentation of the workshop and experiencing its intended results before considering any adaptation.

Do all the same tasks workshop participants will be asked to do. This will help you better understand the kinds of responses they will give, the kinds of problems that could come up, and the kinds of questions people may ask.

5. Go over the workshop as facilitators. Go through the workshop again, this time as facilitators. If there will be more than one facilitator, decide which sections and tasks each facilitator will be responsible for.

A Note about Scripts

Many of the steps in this guide contain scripted information, set in *italic type* and marked with gray arrows. The scripts are intended to illustrate one way of presenting information and instructions to workshop participants. While the content of the scripts is crucial, the exact wording is not. After thoroughly familiarizing yourself with the scripts and noting the important points, you may decide to convey the information in your own words rather than reading the scripts to participants word for word.

6. Familiarize yourself with each step. Be sure you understand the purpose of each section and each discussion. Keep the take-home messages (M2) in mind as your overall guide. These messages express the pedagogical ideas participants should take away from the workshop.

Note that some sections of the workshop will require extra preparation:

- In *Why Student Self-Assessment?* (page 27), you'll need to indicate (by writing an *F* or an *S* on a flip chart) whether points participants have made relate to formative or summative assessment. The clearest way to decide is to ask yourself, "Does this help students take the next steps in learning?" An example

of self-assessment for formative purposes would be "students deciding for themselves what they would need to do to improve their work." An example of self-assessment for summative purposes would be "students mark their own work to find how well they did."

- In *Sharing Learning Goals with Students* (page 29), it's not easy to state a learning goal without mixing it with the directions for the activity. For example, "Find a way to compare how long the bubbles last when you use these different solutions" can be a learning goal, while "Use your bubble wands to blow bubbles and then time them to see which bubble solution lasts the longest" is more of an instruction for how to do the activity. Practice differentiating the two when you go through the activity as learners. It's especially hard to write learning goals for ideas without giving the answer away. Try to tell participants the sorts of things they are going to learn, but not exactly what they are going to learn. For example, "See if you can find out what makes the sounds higher or lower" rather than "See that the higher sound is made when the string is vibrating more quickly."

- For the section called *Some Classroom Approaches to Student Self-Assessment* (page 35), participants survey several examples of approaches to student self-assessment. To prepare for this section, become familiar with handout M10: "Some Approaches to Student Self-Assessment" so that you can facilitate the conversation. Also, be aware of the questions that occur to you in reading these so that you can anticipate what participants may ask. The important point here is to create a classroom climate of mutual support. Doing this is also necessary for students to raise questions and express their real ideas, as we noted in *Workshop III: Effective Questioning*. The teacher can assist by expressing genuine interest in students'

errors and problems and using them to help further learning. The students then will begin to see for themselves that identifying their problems will help in their learning.

7. Be prepared to set the context.

- The facilitator who introduces the workshop should study the script in Introducing the Workshop (page 26) and practice presenting this information.
- The facilitator should also be prepared to relate the workshop to district goals, standards, and other professional development activities.

8. Plan time and space carefully.

- You'll need a space large enough for 30–36 participants to work together comfortably, and an arrangement of tables or desks with enough room for participants to engage in a simple science activity (see page 33). The room set-up needs to allow for participants to move easily between small-group and whole-group discussion (see Sample Room Set-up, page 22). You'll also need a place to post charts so all can see, and/or a blank wall for projecting overheads.
- Create a detailed schedule for facilitators to refer to during the workshop. Note the beginning and ending times for each step (e.g., Set context & distribute handouts, 9:00–9:05; Elicit participants' ideas on self-assessment, 9:05–9:10).
- Prepare a simplified version of the schedule for participants, which you can post at the beginning of the workshop. The Workshop at a Glance (page 18) can help serve as a guide. A sample schedule is shown to the right.

On the Day of the Workshop

1. Prepare the room. Set up your equipment and put handouts, charts, and overheads where you'll have access to them when you need them. Have Cartesian divers available as well: one diver for each table group.

2. Watch your schedule. Refer to the schedule you created (see Step 8, above) to keep the workshop on track.

After the Workshop

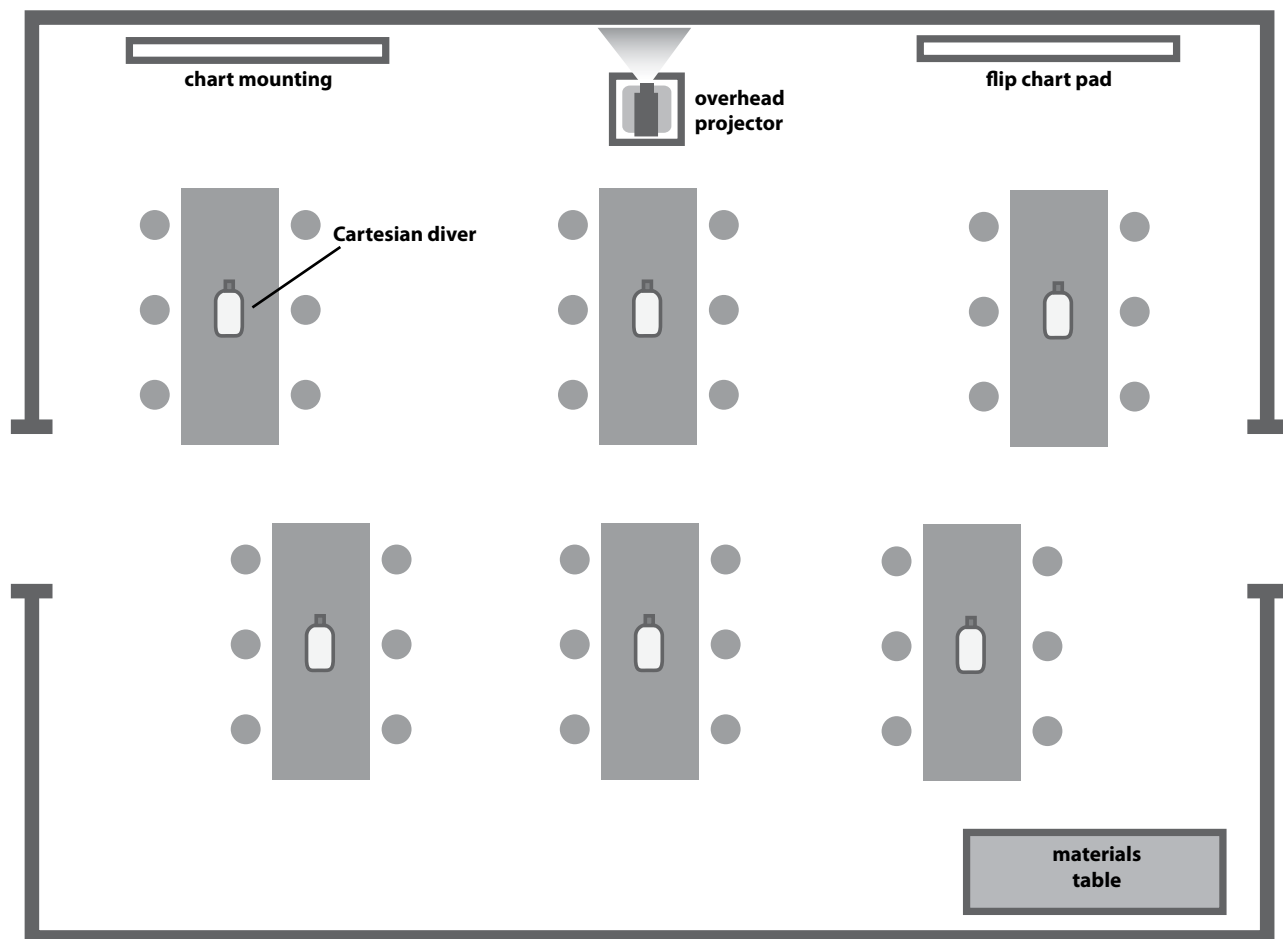
You and your co-facilitator (if there is one) should take some time to reflect on your experiences. Issues of logistics, communication, outcomes, and expectations can be addressed at this point. The Facilitation Review (page 39) will allow you to assess the results of your work and identify successes and challenges that can help guide subsequent workshops.

Sample Schedule for Participants

9:00–9:05	Introducing the Workshop
9:05–9:20	Why Student Self-Assessment?
9:20–9:55	Sharing Learning Goals with Students
9:55–10:50	Establishing Shared Criteria for Assessing Work
10:50–11:10	Some Classroom Approaches to Student Self-Assessment
11:10–11:15	Concluding the Workshop

Sample Room Setup

The diagram below shows one possible way to set up for 36 people. You'll need a space that can accommodate whole-group and small-group discussions.



Essential Features

- Even number of tables so you can switch papers between pairs of tables during the Establishing Shared Criteria for Assessing Work section.
- Flip chart pad
- One Cartesian diver on each table for the Establishing Shared Criteria for Assessing Work section.

Charts, Overheads, and Handouts

Masters begin on page 43. They are identified by the letter *M* and numbered in order of use. Note that some masters will be used for both a handout and a chart or overhead.

Charts or Overheads If you have access to a copy machine that can enlarge to poster size, enlarge these masters 400% to create charts that are 34" x 44". Otherwise, hand-copy facsimiles onto chart paper or poster paper approximately the same size. If you prefer to use an overhead projector, masters can be copied onto transparencies. If you use overheads, you'll need a marking pen to write on them.	Master Available on Page
<input type="checkbox"/> The Formative Assessment Cycle (for Introducing the Workshop)	M1
<input type="checkbox"/> Take-Home Messages (for Introducing the Workshop and Concluding the Workshop)	M2
<input type="checkbox"/> Key Aspects of Student Self-Assessment (for Why Student Self-Assessment?)	M3
<input type="checkbox"/> Teacher-Identified Benefits of Student Self-Assessment (for Why Student Self-Assessment?)	M4
<input type="checkbox"/> What Can Happen When Students Don't Know Learning Goals (for Sharing Learning Goals with Students)	M5
<input type="checkbox"/> Sharing Learning Goals with Students—Hints and Pitfalls (for Sharing Learning Goals with Students)	M7
Handouts Photocopy the handouts, making one for each participant.	Master Available on Page
<input type="checkbox"/> Take-Home Messages (for Concluding the Workshop)	M2
<input type="checkbox"/> Sharing Learning Goals with Students (for Sharing Learning Goals with Students)	M6
<input type="checkbox"/> Sharing Learning Goals with Students: Hints and Pitfalls (for Sharing Learning Goals with Students)	M7
<input type="checkbox"/> Sharing Learning Goals Activity Instructions (for Sharing Learning Goals with Students)	M8
<input type="checkbox"/> Cartesian Diver Activity Instructions (for Establishing Shared Criteria for Assessing Work)	M9
<input type="checkbox"/> Some Approaches to Student Self-Assessment (for Some Classroom Approaches to Student Self-Assessment)	M10
<input type="checkbox"/> Approaches to Student Self-Assessment Activity Instructions (for Some Classroom Approaches to Student Self-Assessment)	M11
<input type="checkbox"/> Advantages of Student Self-Assessment Identified from Practice (for Some Classroom Approaches to Student Self-Assessment)	M12

Materials and Equipment

Materials

Use this chart to keep track of what you need. All materials are simple and commonly available. Quantities are based on 36 participants working in table groups of 6 people each. Adjust as necessary.

Note that instructions for making Cartesian divers are shown below for facilitators, and available as a handout for participants on M9.

Item	Total Needed
<input type="checkbox"/> 2-liter plastic soda bottles with tops (for Cartesian diver activity)	6
<input type="checkbox"/> enough water to fill the soda bottles (for Cartesian diver activity)	As needed
<input type="checkbox"/> glass eyedroppers (for Cartesian diver activity)	6
<input type="checkbox"/> tall drinking glasses (for Cartesian diver activity)	6
<input type="checkbox"/> notepaper (for participant use during Cartesian diver activity)	As needed
<input type="checkbox"/> flip chart pad and stand (for facilitator use)	1
<input type="checkbox"/> marking pens (to record on flip chart)	2

MAKING CARTESIAN DIVERS

Make these divers before the day of the workshop. Participants will need one at each table.

For each diver you will need:

- 2-liter plastic soda bottle (or other “squeezeable” clear plastic container) with screw-on cap
- enough water to completely fill the bottle
- glass medicine dropper (one that sinks in water)
- tall glass of water for filling and floating the medicine dropper

Directions

1. Gradually draw water from the tall drinking glass into the eyedropper until the eyedropper floats in the glass with its top barely above the surface.
2. Fill the soda bottle almost to the top with water. Transfer the eyedropper to the soda bottle, being careful not to change the amount of water in the dropper.



3. Screw the cap tightly onto the water-filled plastic bottle.
4. Gently squeeze the bottle. As you squeeze, the “diver” will sink to the bottom. Stop squeezing, and it will rise back up to the top. Squeezing the bottle changes the fluid pressure inside, which affects the diver’s buoyancy.

Equipment

Item	Total Needed
<input type="checkbox"/> overhead projector (optional)	1
<input type="checkbox"/> marking pens for transparencies (if used)	1
<input type="checkbox"/> sink (or other way to provide water for Cartesian diver activity)	12 liters

PRESENTING THE WORKSHOP

- **Introducing the Workshop**
- **Why Student Self-Assessment?**
- **Sharing Learning Goals with Students**
- **Establishing Shared Criteria for Assessing Work**
- **Some Classroom Approaches to Student Self-Assessment**
- **Concluding the Workshop**

Introducing the Workshop

Overview

The facilitator establishes the tone for the workshop by stating its purpose and explaining how participants will work together. Letting everyone know what they will be doing is important in order to build trust and demonstrate your respect for the participants as learners. A respectful atmosphere is essential for fostering a free and open exchange of ideas.

3 Steps ♦ 5 Minutes

1. Set the context for the workshop. Relate the following information to participants:

- *This is the last of five workshops in the ASSESSING FOR LEARNING curriculum. The purpose of this workshop is to clarify what is involved in self-assessment and why it is important to student learning.*

2. Post chart M1: “The Formative Assessment Cycle” and explain:

- *Everything done in formative assessment is for the purpose of helping students to develop their own skills, knowledge, and ideas. This is why students are at the center of the formative assessment cycle. The more they understand what they are expected to learn, the better they will be able to concentrate on their work rather than on trying to guess what the teacher wants. When they are given the time and the tools to reflect on and evaluate their own work, students will be empowered and motivated to improve their work. And the more they are able to independently evaluate how they are doing and what they need to do to make progress, the more the teacher will be freed up to help those students who will benefit from extra attention.*

This workshop takes about 2 hours and 15 minutes. During the workshop, through activities and conversation, we’ll address the following take-home messages.

3. Post chart M2: “Take-Home Messages,” and read the messages aloud.

Materials Reminder

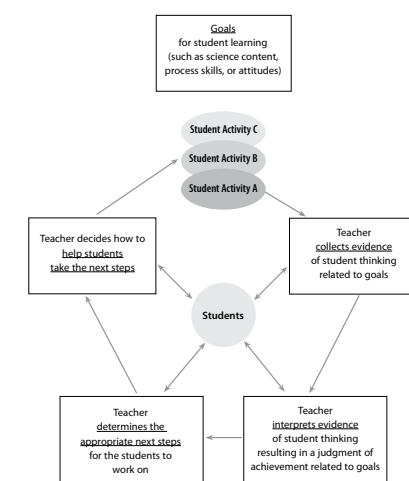
During this part of the workshop, facilitators will need to:

- Post chart M1: “The Formative Assessment Cycle”
- Post chart M2: “Take-Home Messages”

Take-Home Messages

- Student self-assessment has a central role in formative assessment, significantly increasing time on task, enabling self-regulated learning, and raising achievement.
- It is important to communicate goals to students by using appropriate language, and through discussion activities.
- Given appropriate support, students can assess the take responsibility for their learning.
- There are many ways for teachers to assess their work and for students to provide feedback for this to happen.

Formative Assessment Cycle



M2

M1

Why Student Self-Assessment?

Overview

Involving students in assessing their work requires commitment on the part of teachers to take special steps, a process that's not always easy. Student self-assessment involves students knowing the purpose of their work so that they will be able to judge how well they are doing and determine how to make improvements. Teachers will only adopt this kind of assessment if they are convinced that it is important and effective, and if they understand what is involved. In this section we start to clarify just what is involved in self-assessment and why it is important to student learning.

5 Steps ♦ 15 Minutes

1. Ask participants what they think is meant by student self-assessment. Pass out paper for participants to write on, and set up the flip chart. Say:

- *Take a few minutes to consider what you think is meant by the term "student self-assessment," and what the implications of student self-assessment are for both students and teachers. Write down your ideas.*

2. Take some responses. After 3 minutes, ask one participant to tell the group what ideas she wrote down. Record the salient points on the flip chart. Then ask others to share in the same way, recording their responses as well.

What is meant by student self-assessment?

Sample Responses from Teachers

- *students marking their own papers*
- *students assigning their own grades*
- *students reviewing their work to see how it could be done better*

3. Identify both formative and summative assessment.

Distinguish the responses related to formative assessment (such as students deciding for themselves what they need

to do to improve

their work) from those related to summative assessment (such as students marking their own class test to find their score). Indicate with an *S* or an *F* on the chart those responses that relate to summative or formative assessment. If in doubt about a particular response, ask yourself the question, 'Does this help students to take the next steps in their learning?' If so, the assessment is formative.

Tell participants:

- *I've indicated which points relate to formative and summative assessment. In this workshop, we are going to concentrate on self-assessment for formative purposes.*

4. Post chart M3: "Key Aspects of Student Self-Assessment." Tell people:

- *This chart shows some of the key aspects of formative self-assessment.*

Read the bulleted points aloud. Then, referring to the chart, ask group members to respond to the following question:

Materials Reminder

During this part of the workshop, facilitators will need to:

- Post chart M3: "Key Aspects of Student Self-Assessment"
- Post chart M4: "Teacher-Identified Benefits of Student Self-Assessment"
- Be sure all participants have paper to write on
- Have the flip chart and markers ready for recording participants' responses

STUDENT SELF-ASSESSMENT CHART OR OVERHEAD

Key Aspects of Student Self-Assessment

- Students know the purpose of their work, and the goals or objectives of the activities they are working on
- Students have some idea of what they should be striving for in terms of the quality of their work
- Students are able to see how well they are doing and where they need to improve
- Students have some idea of how to make improvements or move forward

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M3

- What do you think are the benefits of having students do these things?

Write down participants' responses on the flip chart. Having the ideas come from the participants increases the likelihood they will become invested in the importance of student self assessment. When the list is completed, keep it posted so that participants can add to it during the next steps.

5. Post chart M4: "Teacher-Identified Benefits of Student Self-Assessment." Tell participants:

- This is a list of the benefits of student self-assessment some other teachers have identified. If there's anything on it that strikes you as important, let me know and I'll add it to the list we made. Also, if other benefits come to you later in the activity, please tell me and I'll add them to our list as well.

Read through the list and acknowledge points that have already come up from the group.

STUDENT SELF-ASSESSMENT CHART OR OVERHEAD

Teacher-Identified Benefits of Student Self-Assessment

- Students are the focus of teaching, but have to do the learning
- Involvement in self-assessment facilitates ownership of their learning
- It enables them to be responsible for and accountable for their learning
- It provides for independence and can lead to self-regulated learning
- It raises students' self-esteem
- It promotes higher-order thinking, since it requires meta-cognitive thinking about learning
- It clarifies goals—for both teacher and student
- It enables students to give relevant feedback to the teacher
- When teachers do not have time for extended interaction with students, it means that the responsibility for formative assessment is shared
- It gives the teacher more time for interaction with individual students

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M4

Sharing Learning Goals with Students

Overview

One of the most important features of self-assessment is that it allows students to be aware of the purpose of their work. While the purpose may seem self-evident to the teacher, students do not always know why they are asked to do a particular assignment or activity. In this section, participants examine ways of communicating learning goals to learners, and find out how to distinguish between the communication of learning goals and activity instructions.

9 Steps ♦ 35 Minutes

1. Post chart M5: “What Can Happen When Students Don’t Know Learning Goals.” Explain to participants:

- *This chart addresses the importance of sharing learning goals with students. When teachers assign*

STUDENT SELF-ASSESSMENT CHART OR OVERHEAD

What Can Happen When Students Don't Know Learning Goals

A class spent three lessons investigating which of three kinds of paper was the strongest. A group of boys was observed and then interviewed after the lesson.

Interviewer: What do you think you learned from doing your investigation?

Robert: ...that graph paper is stronger; that green one

Interviewer: Right, is that it?

Robert: Um...

Interviewer: You spent three lessons doing that; seems a long time to spend finding out that graph paper is stronger

James: Yeah, and we also found out which...paper is stronger. Not just the graph paper, all of them.

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M5

activities for students, they usually tell their students what they want them to do, but don't always tell them why they want them to do it. Here's an example from a classroom of what can happen as a result.

Materials Reminder

During this part of the workshop, facilitators will need to:

- Post chart M5: “What Can Happen When Students Don’t Know Learning Goals”
- Distribute handout M6: “Sharing Learning Goals with Students”
- Post chart M7: “Sharing Learning Goals with Students: Hints and Pitfalls,” and distribute corresponding handout
- Distribute handout M8: “Sharing Learning Goals Activity Instructions”

2. Read the chart aloud. Then explain to participants:

- *In this case, the teacher's goal was for the students to understand how to plan investigations and do fair tests. This example raises the question of whether the students' activity—and their learning from it—would have been different if they had been aware of the teacher's goals.*

The teacher has to make a particular point of communicating goals—it doesn't happen automatically through giving students activities. How can this be done? That's the question we're concerned with here.

3. Distribute handout M6: “Sharing Learning Goals with Students.” Say:

- *This task focuses on one of the most important ways of communicating goals with students: directly telling them at the beginning of an activity.*

STUDENT SELF-ASSESSMENT HANDOUT

Sharing Learning Goals with Students

Communicating goals to students is essential for learning and for self-assessment, but it's not easy, particularly when working with young children. It certainly can't be done in the same terms used to communicate goals to teachers in standards documents or curriculum statements, or even teachers' guides—not only because of the language used, but also because the goals are stated in concepts students cannot yet understand.

For example, the *National Science Education Standards* identifies as a goal that students learn how "heat moves in predictable ways, flowing from warmer objects to cooler ones, until both reach the same temperature."¹ This knowledge, however, requires an understanding of heat, temperature, and heat flow, which has to be built up by doing a number of activities over time. As a result, a goal expressed in these terms to students would not be understandable prior to their undertaking the relevant activities.

More useful is when teachers communicate to students goals specific to a particular activity. If the teacher has "hidden" goals that are not shared with students, the students will not be able to focus their work to achieve what is intended.

There are a number of ways to communicate learning goals to students. For example:

- Direct the information to the whole class when introducing the activity.
- Write the goals on the board, or on a poster, and make sure they are visible throughout the course of the activity.
- Talk with groups or individuals to find out if they know the reason for doing the activity, in terms of learning goals.
- Comment on the procedures and outcomes of the activity in ways that reflect the goals.

Using a combination of some or all of these strategies is usually more effective than using just one. When introducing a lesson or activity, for example, including a statement about intended learning is a key factor in communicating goals. Reinforcement during an activity is also necessary, however, particularly if students seem to be straying from the goal. In the examples below, for instance, this might be accomplished by simply asking questions while students are working, such as "Can you explain how doing this will help you find out what makes the sound higher or lower?" or "How do you think this will help you find out which materials will be best at keeping the block from melting?" seem to be straying from the goal. This might be by asking "Can you explain how doing this will help you.... (e.g. find out what makes the sound higher and what makes it lower?)"

Teacher's Learning Goal	Communicating the Learning Goal to Students
To learn that the pitch of a sound made by an object depends on how rapidly it vibrates.	"When you make different sounds with these things, I want you to see if you can find out what makes the sound higher, and what makes it lower."
To plan an investigation that will be a fair test of which material will keep an ice block from melting for the longest amount of time.	"When you test these materials, I want to see if you can do it in a way that the test is fair, and that you are quite sure it is the material making the difference, and not something else."

Two examples of how a teacher might communicate learning goals to students.

1. National Research Council. *National Science Education Standards*. (Washington, DC: National Academy Press, 1996), p. 115.

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M6

Have participants spend 2–3 minutes looking at the handout. Then say:

- Let's consider the first example from the box at the bottom of the page: "When you make different sounds with these things, I want you to see if you can find out what makes the sound higher, and what makes it lower." This way of wording a learning goal helps tell the students what they are to try to find out in general without telling them the answer.

4. Post chart M7: "Sharing Learning Goals with Students: Hints and Pitfalls" and pass out the corresponding handout. Indicate the example in the second row of the first column and say:

- Contrast that statement with another example, in which the teacher tells the students what to do but is not as clear about why they are doing it.

Read from chart M7:

- "Try to make high sounds and low sounds with each of these things. You can do this by changing

the length of the string or by changing the amount of water in the bottle when you tap it."

Continue:

- In this statement, the teacher is telling students how to make high and low sounds with string or water, which is different from asking them to find out what makes high and low sounds in general. The teacher does have to tell students what to do, but she should not stop there. She should also indicate why they are doing it.

Here's another example in which the teacher basically tells the students the answer in the course of telling them what she wants them to do.

Read from chart M7:

- "Try to make different sounds with each of these things. Notice that the sound gets higher when the string vibrates more quickly, or when there's less air in the bottle."

STUDENT SELF-ASSESSMENT CHART OR OVERHEAD & HANDOUT

Sharing Learning Goals with Students: Hints and Pitfalls

Learning Goal Example	Hints and Pitfalls
"When you make different sounds with these things, see if you can find out what makes the sound higher and what makes it lower."	This way of wording a learning goal helps tell the students what they are to try to find out in general without telling them the answer.
"Try to make high sounds and low sounds with each of these things. You can do this by changing the length of the string or by changing the amount of water in the bottle when you tap it."	In this statement, the teacher is telling students how to make high and low sounds with string or water, which is different from asking them to find out what makes high and low sounds in general. The teacher has told them what to do, but should also indicate the purpose for which they are doing it.
"Try to make different sounds with each of these things. If you listen carefully, you'll hear that the sound gets higher when the string vibrates more quickly, or when there's less air in the bottle."	This statement tells the students what they are intended to learn. It gives "the answer" and the activity becomes one of confirming this, not thinking it out from the evidence.

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M7

Continue:

- *Because this statement tells the students what they are intended to learn, it gives “the answer” and the activity becomes one of confirming this, not thinking it out from the evidence.*

Leave the chart displayed for the next step when participants consider how to share learning goals with students.

5. Distribute handout M8: “Sharing Learning Goals Activity Instructions” and have participants do the activity. Ask participants to form working pairs at their tables. (There should be 3 pairs at each table.) Tell participants that each pair should choose either the Seeds activity or the Electricity activity to work on. Be sure you have groups working on each.

STUDENT SELF-ASSESSMENT HANDOUT

Sharing Learning Goals Activity Instructions

CHOOSE ONE OF THESE ACTIVITIES

Suppose you were planning one of these activities. For the grade level you choose, decide what your learning goal would be, and then work out the exact words you would use to share that goal with your students. Work first in pairs. Then we'll share ideas within the group.

Grade 2 Activity: Taking apart a seed to see what is inside.

Learning goal:

Words you would use to communicate that learning goal to students:

Grade 5 Activity: Comparing two lamps placed in series and parallel in a circuit

Learning goal:

Words you would use to communicate that learning goal to students:

Reflect on the work you just did. Then prepare a group response to the process.

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M8

Emphasize these points:

- *As you work through these instructions, you don't have to design activities or lessons. Your focus is to*

decide how you would communicate learning goals for these activities to students.

Start by deciding your learning goal for the activity. It could be a goal related to improving a science process skill or for understanding a science idea. Some activities could lead to either. For instance, an activity on melting ice cubes on different materials could have a process skill goal related to planning investigations and doing fair tests, or it could have a science idea goal related to finding out about insulators and conductors. So it's important to decide your learning goal so you can figure out an effective way to communicate it to students.

Then, specify the exact words that you would use to share the learning goals. Keep in mind the difference between giving activity directions and stating the learning goals. Try not to mix the two together. You have 10 minutes to work.

After 10 minutes, tell participants:

- *Each pair should briefly share with the others at your table what you've come up with. Then, after 5 minutes, I'll ask you to report back to the whole group.*

6. Have table groups report on the Seeds activity example. Ask one group to begin by reporting on the Seeds activity example, specifying the learning goal and the words they would use in communicating to students. Record on the flip chart the words they would use to communicate goals to students. Ask for comments and questions, and for another group or two to share their ways of communicating learning goals.

7. Have table groups report on the Electricity activity example. Choose a different group to lead off in reporting on the Electricity activity example, and take additional comments from other groups. Point out if any statements (related to either the

Seeds or the Electricity examples) have fallen into the pitfalls identified earlier—either stating what the students should do (e.g., “Split the seed in half and look at what’s inside”) or dictating what they should expect to find (e.g., “Set up the circuits according to the diagrams, and see if you can identify which bulb shines brighter.”) Also comment on the positive aspects of the examples, such as if they seem age-appropriate, separate instructions from learning goals, or state general ideas rather than specifics of what the students should find.

8. Summarize the main points that have been brought up. These are likely to include:

- Using words that are familiar to the students
- For concept-related goals, indicating what the students should find out about (or answering the question they have identified), rather than the results they are expected to find

- Expressing process skill goals in terms of “thinking about the best way to plan/compare/measure/record, etc.”

9. Conclude this section. Refer back to handout M6: “Sharing Learning Goals with Students” and say:

► *When you share learning goals with students, an initial statement of goals is only one way of communicating. This handout refers to other ways of sharing goals with students, such as posting the goals throughout a sequence of activities, or asking students what they think the goals are during the course of an activity. Using combinations of these ways of sharing goals are more effective because they reinforce your initial statement.*

Establishing Shared Criteria for Assessing Work

Overview

In this section, participants do an activity with a Cartesian diver, an activity that models how students can be taught to self-assess. Students are more likely to understand the criteria if they've been involved in establishing them. And having criteria is useful because when a group—such as a class of students—has a shared understanding of expectations for the level of quality for their work, they can reflect on their own work and take the necessary steps to make improvements. Although this is done here as a professional development exercise, it can be adapted to be used with students.

7 Steps ♦ 55 Minutes

1. Introduce the Cartesian diver activity (10 minutes). Distribute Cartesian divers, one to each pair of participants. Distribute handout M9: “Cartesian Diver Activity Instructions” and a piece of paper to each participant. Note that in the next step, work done at one table will be exchanged with work done at another table. Tell participants:

► As we just discussed, students need to know the goals of the activity to be able to do a self-assessment. In this activity, we'll address another important consideration: developing criteria—in this case, for a good written description—that can help students reflect on and improve their work.

In this activity, you'll explore the Cartesian divers on your tables, and then each person will write a description of the divers on a blank piece of paper, without putting your name on it. Then, collect the descriptions from your table and swap them with another table. As a table group, read the descrip-

tions aloud and use them to develop what you think are general criteria for what indicates a good description.

You'll swap

the descriptions back from the other table so you can look at the descriptions you wrote in relation to the criteria.

Let's start by taking 10 minutes to explore the Cartesian divers and write a description.

Materials Reminder

During this part of the workshop, facilitators will need to:

- Have one Cartesian diver for each pair of participants (see page 24)
- Distribute handout M9: “Cartesian Diver Activity Instructions”
- Distribute paper for participants to record criteria
- Have flip chart and marking pen for recording participants' criteria

STUDENT SELF-ASSESSMENT

HANDOUT

Cartesian Diver Activity Instructions

Explore the Cartesian diver for a few minutes. Then follow the instructions below.

Part 1

Goal: To describe an event for someone who did not see it.

- On the paper provided, describe what you saw when you explored the Cartesian diver so that someone who did not see it would know what happened. Use any combination of drawings or writing you wish. You have 10 minutes to do this.
- Work individually, but don't put your name on the paper.
- When you're finished, fold the paper once, put all your group's papers together, and shuffle them. Your papers will be traded with papers from another table.

Part 2

Goal: To identify criteria for assessing the descriptions from Activity 1.

- Your group will receive the papers from another group.
- Read them all. Then, working as a group, decide which descriptions are good, and which are not so good, bearing in mind the task and the goal. You can make separate piles, but don't write your choices on the papers.
- Write down how you distinguished between descriptions that were “good” and “not so good.” What criteria for a good description were you using?
- As a group, make a list of the criteria you decide on, and be prepared to share it.

Part 3

Goal: To do a self-assessment using the agreed-upon criteria.

- Retrieve your own paper when it is returned from the other group.
- Reread your description and consider whether it meets the criteria your group established in the previous activity.
- Does your description meet these criteria? If not, why not?
- Do you think knowing the criteria beforehand might have affected your description. If so, how?

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M9

2. Tables exchange descriptions and develop criteria (15 minutes).

After 10 minutes, ask participants to fold their papers in half, put them in a stack, and shuffle them. Tell participants that you are shuffling them so that no one will know whose paper is whose—a process that models what you might do in a classroom. Then take the papers from one table group and exchange them with the papers from another table.

After papers have been exchanged, say:

- *Look at Part 2 of the activity sheet. Start by reading the other table's descriptions, divide them into piles of good and not-so-good descriptions, discuss what indicators of quality you saw in the ones you thought were good that weren't in the ones you didn't. Take 15 minutes to work as a group and come up with a list of criteria for a high-quality description. At the end of 15 minutes, you'll share your list of criteria with the whole group.*

3. Groups share the criteria they developed (10 minutes).

After 15 minutes, call for the attention of the whole group, and then ask one table group for the criteria it identified for a good description. Write the criteria on a flip chart. Ask others to add to this list until all ideas are collected. Do this for about 10 minutes.

4. Participants evaluate their descriptions (5 minutes).

Return papers to the original tables and ask participants to retrieve their own descriptions. Say:

- *For students, the culmination of this activity would be to look at the rubric and reflect on how well their description meets the criteria of a good description.*

Then ask:

- *Do you think knowing the criteria beforehand might have affected your description? If so, how?*

5. Participants reflect on the usefulness of identifying criteria for students. Tell them:

Criteria for Good Descriptions

- *Relevant parts are identified by writing or drawing*
- *Any drawings are detailed and labeled*
- *The mode of communication is appropriate to the event being described*
- *Actions needed to make changes are identified accurately*
- *The effect of actions is identified*
- *Events are described in sequence*

Participant-generated lists of criteria for good descriptions are likely to include some of the points listed above.

- *Take 5 minutes to consider the following questions with your table group:*

- How realistic and useful do you think it is to have students develop on agreed-upon criteria for their work, as we just did?
- What are the advantages and possible disadvantages?

Be prepared to share some of your thinking.

6. Groups share responses (10 minutes). After 5 minutes, take responses out loud. When participants articulate possible disadvantages or impracticalities, ask if anyone can think of a way that the disadvantage can be avoided or the impracticality overcome.

7. Summarize and conclude this section. After the discussion, summarize by explaining:

- *Students can improve the quality of their work by understanding what constitutes quality work. As discovered in the activity we just did, students are more likely to understand criteria for quality work when they are involved in coming up with the criteria. There are some practical challenges involved when including students in establishing criteria for good work, but there are also a variety of ways to address these challenges.*

Some Classroom Approaches to Student Self-Assessment

Overview

In this section of the workshop, participants consider some approaches that have been used by teachers to help students assess their own work.

3 Steps ♦ 20 Minutes

1. Distribute handouts M10: "Some Approaches to Student Self-Assessment" and M11: "Approaches to Student Self-Assessment Activity Instructions." Tell participants:

"Approaches to Student Self-Assessment Activity Instructions." Tell participants:

► Look at handout M11: "Some Approaches to Student Self-Assessment Activity Instructions." It asks you to read the accounts of student self-assessment in handout M10, and then fill out the chart at the bottom of M11. The first box lists students generating and using their own criteria, which is the process we addressed in the activity we just did. Please take 10 minutes and work in pairs to comment on the next three approaches, which are discussing best work, self-marking, and paired marking. Then, we'll

discuss your responses to these approaches. Finally, notice that there is a place to add other approaches to the list. If you are aware of any, please add them there.

Materials Reminder

During this part of the workshop, facilitators will need to:

- Distribute handout M10: "Some Approaches to Student Self-Assessment"
- Distribute handout M11: "Approaches to Student Self-Assessment Activity Instructions"
- Distribute handout M12: "Advantages of Student Self-Assessment Identified from Practice"

STUDENT SELF-ASSESSMENT HANDOUT

Some Approaches to Student Self-Assessment

There are many different ways students can assess their own work. These four examples can give you some ideas of possible approaches.

- 1. Students generate their own criteria**
In this approach, students work together to generate criteria for the quality of some aspect of their work. Once they agree on these criteria, they can evaluate their work accordingly. One example of this approach is illustrated by the Cartesian diver activity done earlier in this workshop.
- 2. Students choose and discuss their "best work"**
In this approach, students select examples of their work that they consider their "best work." They then discuss these pieces, choosing those pieces. During the discussion, they generate criteria without dictating the think that was your best investigation very carefully and made sure the rest of the class knew what they thought.
- 3. Students mark their own work**
In this approach, students look for places where they need more work. Students reviewing to underline places where they believe they need more work.
- 4. Students mark each other's work**
In this approach, students assess each other's work and suggest improvements.

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M10

STUDENT SELF-ASSESSMENT HANDOUT

Approaches to Student Self-Assessment Activity Instructions

1. Read the brief accounts of approaches to self-assessment in M10: "Some Approaches to Student Self-Assessment"
2. Add other approaches that you have come across.
3. Comment on each from your experience.

Prepare to report responses from the group along the lines:

Approach	Comments
Students generate and use their own criteria	
Students discuss their best work	
Students mark their own work	
Students mark each other's work	

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M11


STUDENT SELF-ASSESSMENT HANDOUT

Advantages of Student Self-Assessment Identified from Practice

In classrooms where self and peer assessment is part of the culture, the following advantages have been recognized:

- Children see assessment as a process in which they have a role to play—one which allows them to contribute to their own learning.
- Children feel more involved and responsible for their own learning, which increases their self-esteem and helps develop perseverance.
- Teachers can focus on single groups or students because the whole class is more independent.
- Teachers can learn about students' understanding by how they assess themselves and their peers.
- Children's inquiries become more scientific because they learn to evaluate their conclusions based on evidence in order to self-assess.
- Children become more reflective as learners.
- Children become more aware of goals and motivated to reach them, because they are helping to set those goals.
- Children write for a purpose because they have each other for an audience when they do paired marking.

(Adapted from an article by Carolyn Lindsey and Shirley Clarke in *Primary Science Review*, no 66, 2001)

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M12

2. Discuss approaches. At the end of 10 minutes, tell participants:

► Let's hear some of your comments—either about the approaches in particular or about self-assessment in general.

Ask one group to report, then ask if other groups have other comments. If people report challenges relating to particular approaches, ask if others have any ideas for overcoming these challenges.

Then ask participants to share any other approaches they are aware of besides those included on handout M10: “Some Approaches to Student Self-Assessment.” Accept all suggestions.

3. Distribute handout M12: “Advantages of Student Self-Assessment Identified from Practice,” and ask participants to read it. Then ask participants to share any other advantages they are aware of

besides those included on the handout. After taking suggestions, say:

- *As we can see, there are many advantages, but the first bullet seems to say it particularly well: “Children see assessment as a process in which they have a role to play—one which allows them to contribute to their own learning.”*

Concluding the Workshop

Overview

Bring the workshop to a close by summarizing what participants did, and the concepts they considered, in terms of the central pedagogical ideas expressed in the take-home messages.

3 Steps ♦ 5 Minutes

1. Review the take-home messages. Tell participants:

► During this workshop, we've discussed self-assessment, practiced writing learning goals that could be shared with students, developed criteria for assessing the quality of our own work, and considered the advantages and disadvantages of several approaches to self-assessment.

As we noted at the beginning of the workshop, the main pedagogical ideas that emerged from the work we've done are expressed in the take-home messages.

Read the take-home messages aloud.

2. If appropriate, summarize aspects of formative assessment addressed in the five ASSESSING FOR LEARNING workshops. Say:

► In the five ASSESSING FOR LEARNING workshops we've completed, we've introduced the idea of formative assessment and distinguished it from summative assessment. We've seen some approaches for gathering and interpreting evidence about both science

process skills and science ideas. Among these approaches are observ-

ing students while they are doing activities, or by asking them questions, either verbally or through

Materials Reminder

During this part of the workshop, facilitators will need to:

- Re-post chart M2: "Take-Home Messages" and distribute the corresponding handout
- Distribute any additional materials you have prepared for participants

assignments. We've discussed the importance of responding to the information that is gathered in order to help students take next steps, which is the crux of formative assessment. We've practiced one of the more available opportunities for teachers to help students take next steps—through responding to their written work. And we've just worked on some approaches for helping involve students in the process of self-assessment, stressing the benefit of students knowing the goals for an activity and the criteria for determining

what it means to meet the goals, in the same way it is a benefit for the teacher to know these things.

Awareness of these ideas is meant to equip you to look for opportunities to apply them to your teaching.

3. Thank participants and bring the workshop to a close. Pass out any additional resources you've prepared.

STUDENT SELF-ASSESSMENT

CHART OR OVERHEAD & HANDOUT

Take-Home Messages

- Student self-assessment has a central role in formative assessment, significantly increasing time on task, enabling self-regulated learning, and raising achievement.
- It is important to communicate goals to students by using appropriate language, and to reinforce those goals through discussion and comments during activities.
- Given appropriate opportunities, students can develop criteria for assessing the quality of their work, and take responsibility for applying those criteria during and after activities.
- There are many ways to help students assess their work, but all require the teacher to provide time and conditions for this to happen.

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M2

REVIEWING THE WORKSHOP

- **Facilitation Review**

Facilitation Review

Overview

It's a good idea to set aside some time after the workshop to get together with your co-facilitator (if there was one) and reflect on what worked and what didn't work. You can think and talk about your own facilitation and the workshop design, and consider what adjustments you can make for subsequent workshops. You'll also want to consider how the group's understanding of formative assessment developed during the workshop.

If you were the sole facilitator, take some time to consider the questions below and jot down notes for use when you present the workshop again.

4 Steps ♦ Time as needed

1. Acknowledge what you did well, and reflect on the goals. Start by taking a few minutes to talk about what went well during the workshop. Share any insights you gained about good facilitation strategies. Identify some things you did that helped groups get over difficult spots. Also, ask yourselves what you might do differently next time to improve the workshop.

2. Go through the workshop from beginning to end. Discuss not only how you facilitated different parts of the workshop, but also what participants did and what they learned in each part of the workshop:

- Were all participants fully engaged in all parts of the workshop? Were there some steps that seemed particularly difficult for any of them? What could you do to encourage more active participation or help participants through difficult spots?

- Did participants develop their own understanding of the take-home messages? If so, how did they demonstrate their understanding? If not, what could you do differently to help them arrive at an understanding?
- Were participants inspired to consider applying some of their new ideas in their own classrooms?

3. Review the logistics of the workshop.

- Did you remain on schedule?
- Did you ever feel rushed to complete a step or did you finish early?
- What adjustments could you make that would be helpful?
- How did the distribution and cleanup of materials go?
- Is there anything you could do next time to make the workshop run more smoothly?

4. Consider how you worked together with your co-facilitator.

- Were you able to transition smoothly from one part of the workshop to the next?
- Were you able to transition smoothly between the roles of primary and secondary facilitator?
- Did you communicate effectively with each other during the workshop?
- What could you do to improve transitions and communication?

MORE FROM THE INSTITUTE FOR INQUIRY

- **About the Exploratorium Institute for Inquiry**
- **More Workshops on the Web**

About the Exploratorium Institute for Inquiry

The Exploratorium is San Francisco's innovative museum of science, art, and human perception. Here, hundreds of interactive exhibits engage visitors in seeking answers to the questions that emerge as they play and experiment with all kinds of intriguing phenomena.

The process of discovery and exploration is at the foundation of the Exploratorium Institute for Inquiry (IFI), a group of scientists and educators dedicated to developing and promoting inquiry-based science learning.

For more than thirty years, we have been educating teachers, administrators, and professional developers about the theory and practice of inquiry-based learning. Our workshops emphasize both the impor-

tance of engaging learners in firsthand experience with materials and phenomena, and the necessity for learners to play an active role in building new knowledge. Our work is shaped and refined by our own knowledge and experience, and by the invaluable input of teachers and professional developers working in the field.

For more information contact

Exploratorium Institute for Inquiry

3601 Lyon Street
San Francisco, CA 94123-1099
Phone: (415) 561-0330
Fax: (415) 561-0307
E-mail: ifi@exploratorium.edu
Web site: www.exploratorium.edu/ifi



Since 1969, the Exploratorium has been bringing hands-on learning to visitors from around the world. Filled with hundreds of interactive exhibits, the museum offers programs for the public as well as for science and education professionals.

More Workshops on the Web

In addition to the ASSESSING FOR LEARNING curriculum, the Exploratorium also offers a series of five FUNDAMENTALS OF INQUIRY workshops. You can find more information at www.exploratorium.edu/ifi/workshops.

The FUNDAMENTALS OF INQUIRY curriculum is organized into these three areas:

Elements of Inquiry

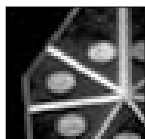
Three workshops that serve as building blocks for an immersion into inquiry by focusing on various hands-on approaches and process skills related to inquiry learning.



Workshop I: Comparing Approaches to Hands-On Science

Participants discover that different approaches to hands-on teaching support different goals for learning (about 3.5 hours).

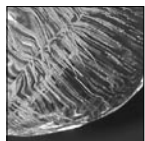
Preview the workshop at www.exploratorium.edu/ifi/comparing



Workshop II: Process Skills

Participants identify the tools needed to carry out inquiry—the process skills—and examine the role of these skills in learning (about 3.5 hours).

Preview the workshop at www.exploratorium.edu/ifi/skills



Workshop III: Raising Questions

Participants examine the kinds of questions learners ask about phenomena and find out how to turn “noninvestigable” questions into “investigable” ones (about 3.5 hours).

Preview the workshop at www.exploratorium.edu/ifi/questions

Immersion in Inquiry

In this workshop, participants plan and conduct an investigation that illustrates how deep conceptual content—in this case, about stream flow and erosion—can be learned through a carefully orchestrated science inquiry process. At the same time, the activity illuminates the process of inquiry itself.



Workshop IV: Stream Table Inquiry

Participants experience inquiry firsthand, learning scientific process and content through an extended investigation (about 6 hours).

Preview the workshop at www.exploratorium.edu/ifi/streamtable

Connections to the Classroom

This last workshop focuses on helping participants make connections between what they have experienced in the previous workshops and what they can do in their classrooms to incorporate more science inquiry.



Workshop V: Subtle Shifts: Adapting Activities for Inquiry

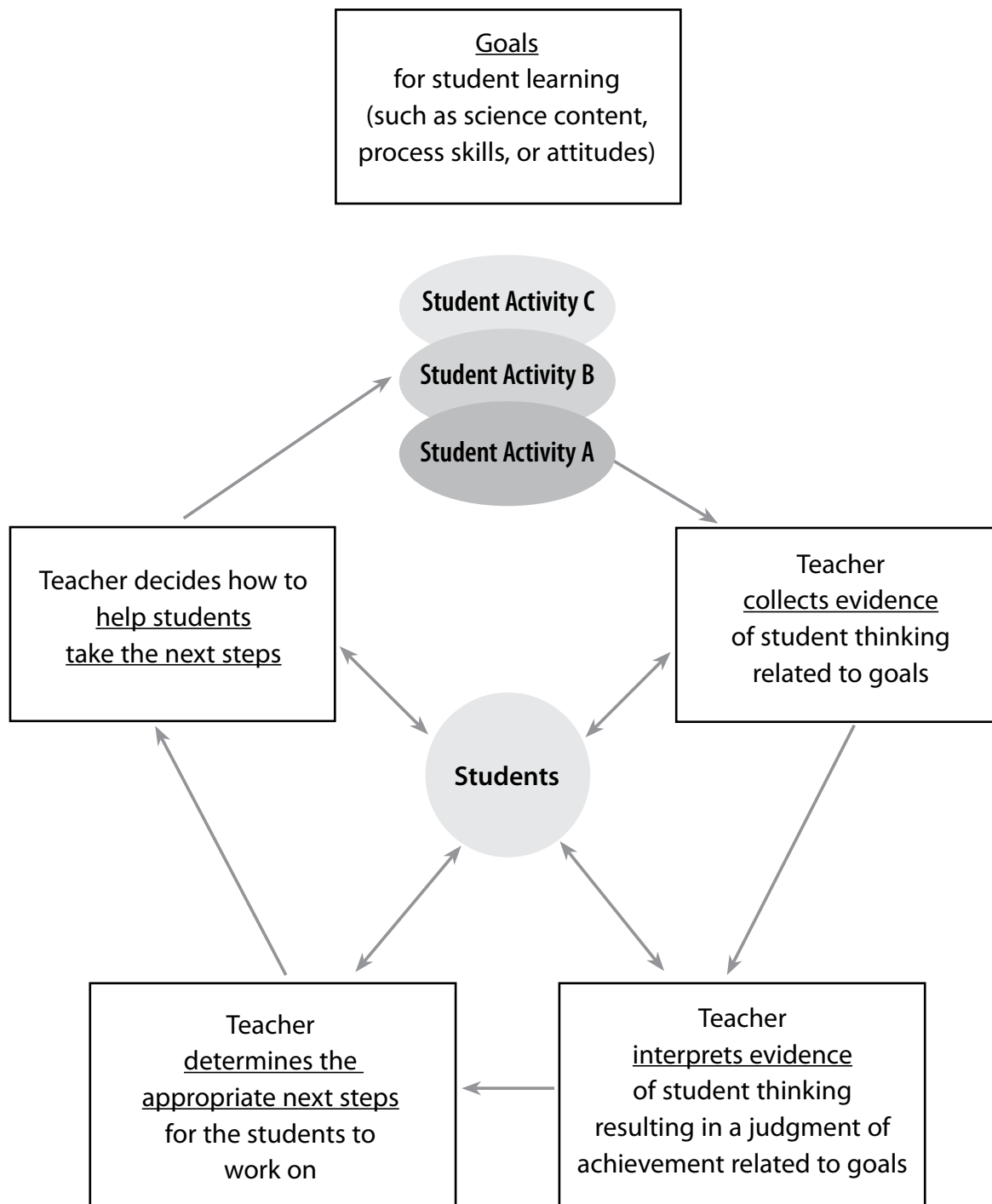
Participants examine how current classroom activities can be modified to incorporate elements of inquiry (about 3 hours).

Preview the workshop at www.exploratorium.edu/ifi/subtleshifts

REPRODUCIBLE MASTERS

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• The Formative Assessment Cycle	chart or overhead	M1
• Take-Home Messages	chart or overhead & handout	M2
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• Teacher-Identified Benefits of Student Self-Assessment	chart or overhead	M4
• What Can Happen When Students Don't Know Learning Goals	chart or overhead	M5
• Sharing Learning Goals with Students	handout	M6
• Sharing Learning Goals with Students: Hints and Pitfalls	chart or overhead & handout	M7
• Sharing Learning Goals Activity Instructions	handout	M8
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• Some Approaches to Student Self-Assessment	handout	M10
• Approaches to Student Self-Assessment Activity Instructions	handout	M11
• Advantages of Student Self-Assessment Identified from Practice	handout	M12

Formative Assessment Cycle



Take-Home Messages

- Student self-assessment has a central role in formative assessment, significantly increasing time on task, enabling self-regulated learning, and raising achievement.
- It is important to communicate goals to students by using appropriate language, and to reinforce those goals through discussion and comments during activities.
- Given appropriate opportunities, students can develop criteria for assessing the quality of their work, and take responsibility for applying those criteria during and after activities.
- There are many ways to help students assess their work, but all require the teacher to provide time and conditions for this to happen.

Key Aspects of Student Self-Assessment

- Students know the purpose of their work, and the goals or objectives of the activities they are working on
- Students have some idea of what they should be striving for in terms of the quality of their work
- Students are able to see how well they are doing and where they need to improve
- Students have some idea of how to make improvements or move forward

Teacher-Identified Benefits of Student Self-Assessment

- Students are the focus of teaching, but have to do the learning
- Involvement in self-assessment facilitates ownership of their learning
- It enables them to be responsible for and accountable for their learning
- It provides for independence and can lead to self-regulated learning
- It raises students' self-esteem
- It promotes higher-order thinking, since it requires meta-cognitive thinking about learning
- It clarifies goals—for both teacher and student
- It enables students to give relevant feedback to the teacher
- When teachers do not have time for extended interaction with students, it means that the responsibility for formative assessment is shared
- It gives the teacher more time for interaction with individual students

What Can Happen When Students Don't Know Learning Goals

A class spent three lessons investigating which of three kinds of paper was the strongest. A group of boys was observed and then interviewed after the lesson.

Interviewer: What do you think you learned from doing your investigation?

Robert: *...that graph paper is stronger; that green one...*

Interviewer: Right, is that it?

Robert: *Um...*

Interviewer: You spent three lessons doing that; seems a long time to spend finding out that graph paper is stronger.

James: *Yeah, and we also found out which...paper is stronger. Not just the graph paper, all of them.*

Sharing Learning Goals with Students

Communicating goals to students is essential for learning and for self-assessment, but it's not easy, particularly when working with young children. It certainly can't be done in the same terms used to communicate goals to teachers in standards documents or curriculum statements, or even teachers' guides—not only because of the language used, but also because the goals are stated in concepts students cannot yet understand.

For example, the *National Science Education Standards* identifies as a goal that students learn how "heat moves in predictable ways, flowing from warmer objects to cooler ones, until both reach the same temperature."¹ This knowledge, however, requires an understanding of heat, temperature, and heat flow, which has to be built up by doing a number of activities over time. As a result, a goal expressed in these terms to students would not be understandable prior to their undertaking the relevant activities.

More useful is when teachers communicate to students goals specific to a particular activity. If the teacher has "hidden" goals that are not shared with students, the students will not be able to focus their work to achieve what is intended.

There are a number of ways to communicate learning goals to students. For example:

- Direct the information to the whole class when introducing the activity.
- Write the goals on the board, or on a poster, and make sure they are visible throughout the course of the activity.
- Talk with groups or individuals to find out if they know the reason for doing the activity, in terms of learning goals.
- Comment on the procedures and outcomes of the activity in ways that reflect the goals.

Using a combination of some or all of these strategies is usually more effective than using just one. When introducing a lesson or activity, for example, including a statement about intended learning is a key factor in communicating goals. Reinforcement during an activity is also necessary, however, particularly if students seem to be straying from the goal. In the examples below, this might be accomplished by simply asking questions while students are working, such as "Can you explain how doing this will help you find out what makes the sound higher or lower?" or "How do you think this will help you find out which materials will be best at keeping the block from melting?"

Teacher's Learning Goal	Communicating the Learning Goal to Students
To learn that the pitch of a sound made by an object depends on how rapidly it vibrates.	"When you make different sounds with these things, I want you to see if you can find out what makes the sound higher, and what makes it lower."
To plan an investigation that will be a fair test of which material will keep an ice block from melting for the longest amount of time.	"When you test these materials, I want to see if you can do it in a way that the test is fair, and that you are quite sure it is the material making the difference, and not something else."

Two examples of how a teacher might communicate learning goals to students.

1. National Research Council. *National Science Education Standards*. (Washington, DC: National Academy Press, 1996), p. 115.

Sharing Learning Goals with Students: Hints and Pitfalls

Learning Goal Example	Hints and Pitfalls
<i>"When you make different sounds with these things, see if you can find out what makes the sound higher and what makes it lower."</i>	This way of wording a learning goal helps tell the students what they are to try to find out in general without telling them the answer
<i>"Try to make high sounds and low sounds with each of these things. You can do this by changing the length of the string or by changing the amount of water in the bottle when you tap it."</i>	In this statement, the teacher is telling students how to make high and low sounds with string or water, which is different from asking them to find out what makes high and low sounds in general. The teacher has told them what to do, but should also indicate the purpose for which they are doing it.
Try to make different sounds with each of these things. If you listen carefully, you'll hear that the sound gets higher when the string vibrates more quickly, or when there's less air in the bottle.	This statement tells the students what they are intended to learn. It gives "the answer," and the activity becomes one of confirming this, not thinking it out from the evidence.

Sharing Learning Goals

Activity Instructions

CHOOSE ONE OF THESE ACTIVITIES

Suppose you were planning one of these activities. For the grade level you choose, decide what your learning goal would be, and then work out the exact words you would use to share that goal with your students.

Work first in pairs. Then you'll share ideas with the other pairs at your table. Last, we'll have a whole-group discussion.

Grade 2 Activity: Taking apart a seed to see what is inside.

Learning goal:

Words you would use to communicate that learning goal to students:

Grade 5 Activity: Comparing two lamps placed in series and parallel in a circuit.

Learning goal:

Words you would use to communicate that learning goal to students:

Cartesian Diver

Activity Instructions

Explore the Cartesian diver for a few minutes. Then follow the instructions below.

Part 1

Goal: To describe an event for someone who did not see it.

- On the paper provided, describe what you saw when you explored the Cartesian diver so that someone who did not see it would know what happened. Use any combination of drawings or writing you wish. You have 10 minutes to do this.
- Work individually, but don't put your name on the paper.
- When you're finished, fold the paper once, put all your group's papers together, and shuffle them. Your papers will be traded with papers from another table.

Part 2

Goal: To identify criteria for assessing the descriptions from Activity 1.

- Your group will receive the papers from another group.
- Read them all. Then, working as a group, decide which descriptions are good, and which are not so good, bearing in mind the task and the goal. You can make separate piles, but don't write your choices on the papers.
- Write down how you distinguished between descriptions that were "good" and "not so good." What criteria for a good description were you using?
- As a group, make a list of the criteria you decide on, and be prepared to share it.

Part 3

Goal: To do a self-assessment using the agreed-upon criteria.

- Retrieve your own paper when it is returned from the other group
- Reread your description and consider whether it meets the criteria your group established in the previous activity.
- Does your description meet these criteria? If not, why not?
- Do you think knowing the criteria beforehand might have affected your description? If so, how?

Some Approaches to Student Self-Assessment

There are many different ways students can assess their own work. These four examples can give you some ideas of possible approaches.

1. Students generate their own criteria

In this approach, students work together to generate criteria for the quality of some aspect of their work. Once they agree on these criteria, they can evaluate their work accordingly. One example of this approach is illustrated by the Cartesian diver activity done earlier in this workshop.

2. Students choose and discuss their “best work”

In this approach, students select examples of their best work and talk about their reasons for choosing those pieces. During the discussion, the teacher can comment on the work, suggesting criteria without dictating choices. A teacher might say, for example, “I’m glad you think that was your best investigation. Even if you didn’t get the result you expected, you did it very carefully and made sure the result was fair.”

3. Students mark their own work

In this approach, students look for how they succeeded in an activity, and where they might need more work. Students reviewing their own written work, for example, might be asked to underline places where they believe they achieved the learning goal, and put a wavy line under areas they think might need more work.

4. Students mark each other’s work

In this approach, students assess each other’s work, providing “next step” comments to help suggest improvements.

Approaches to Student Self-Assessment

Activity Instructions

1. Read the brief accounts of approaches to self-assessment in M10: "Some Approaches to Student Self-Assessment"
2. Add other approaches that you have come across.
3. Comment on each from your experience.

Approach	Comments
Students generate and use their own criteria	
Students discuss their best work	
Students mark their own work	
Students mark each others' work	

Advantages of Student Self-Assessment Identified from Practice

In classrooms where self- and peer assessment is part of the culture, the following advantages have been recognized:

- Children see assessment as a process in which they have a role to play—one which allows them to contribute to their own learning.
- Children feel more involved and responsible for their own learning, which increases their self-esteem and helps develop perseverance.
- Teachers can focus on single groups or students because the whole class is more independent.
- Teachers can learn about students' understanding by how they assess themselves and their peers.
- In the process of self-assessing, children learn to evaluate their conclusions based on evidence, and so their inquiries become more scientific.
- Children become more reflective as learners.
- Children become more aware of goals and motivated to reach them, because they are helping to set those goals.
- Children write for a purpose because they have each other for an audience when they do paired marking.

Adapted from an article by Carolyn Lindsay and Shirley Clarke in *Primary Science Review*, no 68, 2001