

**Using Artifacts to Characterize Reform-Oriented Instruction:  
The Scoop Notebook and Rating Guide**

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**USING ARTIFACTS TO CHARACTERIZE REFORM-ORIENTED INSTRUCTION:  
THE SCOOP NOTEBOOK AND RATING GUIDE<sup>1</sup>**

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**Abstract**

This document includes the final data collection and scoring tools created by the “Scoop” project, a five-year project funded through the Center for Evaluation, Standards, and Student Testing (CRESST), to develop an alternative approach for characterizing classroom practice. The goal of the project was to use artifacts and related materials to represent classroom practice well enough that a person unfamiliar with the teacher or the lessons can make valid judgments about selected features of practice solely on the basis of those materials. The artifacts and other materials were collected in a binder called the Scoop Notebook. Thus, the project sought to answer the question, “Can accurate judgments about reform-oriented instructional practice be made based on the classroom artifacts and teacher reflections assembled in the Scoop Notebook?”

This document describes the Scoop Notebook and the rating guides, gives instructions for assembling the materials and explaining the process to teachers, and discusses two

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<sup>1</sup> Many people contributed to the success of this project. Although they are unnamed in our project reports, we would like to acknowledge the importance of the 96 middle-school mathematics and science teachers who assembled Scoop Notebooks as part of our pilot and field studies. Many researchers were part of our team during the five years of the project. In addition to the named authors on this report, the following people contributed directly to the development and refining of the Scoop Notebook and rating guide: Alicia Alonzo, Suzanne Arnold, Dionne Barnes, Daniel Battey, Laura Creighton, Victoria Deneroff, Elizabeth Dorman, Mary Lou Gilbert, Sherrie McClam, Shannon Moncure, Joi Spencer, and Alice Wood. Linda Daly from RAND produced the formatted Scoop Notebook pages, sticky notes and other project materials. We are also grateful for the patient and reliable assistance provided by Donna White and Lisa Loranger. Finally, we wish to acknowledge the support and encouragement of Eva Baker and Joan Herman, who were more than just CRESST administrators, but were interested and provocative colleagues.

potential uses of the Scoop Notebook—as a tool to characterize classroom practice or as a tool for teacher professional development. The appendices present the final versions of the Scoop Notebook and rating guide for both mathematics and science.

## **Introduction**

This document includes the final data collection and scoring tools created by the “Scoop” project, a five-year project funded through the Center for Evaluation, Standards, and Student Testing (CRESST), to develop an alternative approach for characterizing classroom practice (Borko, Stecher, Alonzo, Moncure, and McClam, 2003; Borko, Stecher, Alonzo, Moncure, and McClam, 2005; Borko et al., 2006; Stecher et al., 2005; Stecher et al., 2007). The goal of the project was to use artifacts and related materials to represent classroom practice well enough that a person unfamiliar with the teacher or the lessons can make valid judgments about selected features of practice solely on the basis of those materials. The artifacts and other materials were collected in a binder called the Scoop Notebook.

The study was motivated not only by the goal of developing a good descriptive instrument but also by the desire to describe a particular set of instructional practices. The target of description for the project was “reform-oriented” practice, in particular ten dimensions of instruction that are consistent with the visions of reform-oriented classrooms portrayed in the National Science Education Standards (National Research Council [NRC], 1996) and Principles and Standards for School Mathematics (National Council of Teachers of Mathematics [NCTM], 2000). These national standards and the curriculum materials that were produced to support them embody a particular approach to teaching mathematics and science that encompasses both content (“what is taught”) and pedagogy (“how it is taught”). We used previous research as a basis for identifying 10 dimensions of reform-oriented instructional practice in each content area. The science dimensions reflect the emphasis in the science standards (NRC, 1996) on the active engagement by students in inquiry-based activities in which they explain and justify their scientific thinking, both verbally and in writing, to develop a knowledge base in science. The mathematics dimensions reflect the focus in the mathematics standards (NCTM, 2000) on students in mathematics classrooms solving problems with multiple solutions and solution strategies, explaining and justifying their solutions, and communicating their mathematical thinking to others.

The “Scoop Notebook” consists of a one-week process in which teachers collect artifacts of instructional practice (e.g., lesson plans, instructional materials, student

work), take photographs of the classroom set-up and learning materials, write responses to reflective questions, and assemble the results in a three-ring binder. The rating guide can be used to rate either the Scoop Notebook or classroom observations along the ten dimensions of reform-oriented practice. Two versions of the Scoop Notebook and rating guide were created—a mathematics version and a science version. They were developed and field-tested in middle school classrooms, although we believe that they are appropriate for other grade levels as well.

The project sought to answer the question, “Can accurate judgments about reform-oriented instructional practice be made based on the classroom artifacts and teacher reflections assembled in the Scoop Notebook?” This document describes the Scoop Notebook and the rating guides, gives instructions for assembling the materials and explaining the process to teachers, and discusses two potential uses of the Scoop Notebook—as a tool to characterize classroom practice or as a tool for teacher professional development. The appendices present the final versions of the Scoop Notebook and rating guide for both mathematics and science. For details about the research conducted on this project, please refer to Stecher et al. (2007) and the other reports cited above.

## **The Scoop Notebook**

### **Contents of the Scoop Notebook**

We developed the Scoop Notebook using an analogy to the way in which scientists approach the study of unfamiliar territory (e.g., the Earth’s crust, the ocean floor). Just as scientists may scoop up a sample of materials from the place they are studying and take it back to their laboratories for analysis, materials can be “scooped” from classrooms (e.g., lesson plans, student work) to be examined later. We packaged the Scoop Notebook as a three-ring binder, consisting of the following main components (see Appendices A and B):

- project overview
- teacher directions for collecting and labeling artifacts
- materials for assembling the notebook

The first section of the notebook contains the project overview, which briefly introduces the teachers to the Scoop Notebook. We present the analogy of a scientist “scooping” materials for examination and the rationale for the assembly of a Scoop Notebook. These introductory pages provide the teachers with a checklist highlighting the procedures to follow before, during, and after the Scoop collection period. In addition, there is a final checklist for teachers to review before handing in the assembled Scoop Notebook.

The second section provides detailed instructions for collecting the classroom Scoop. This section includes explicit instructions and examples of how to:

- select a class and timeframe for the Scoop;
- complete the daily calendar;
- take photographs and complete the photograph log;
- collect classroom artifacts and daily instructional materials;
- select student work, assignments, and a formal classroom assessment;
- label daily instructional materials and student work; and
- respond to daily reflection questions.

The third section of the notebook contains all the materials that teachers need for assembling the Scoop Notebook:

- the pre-Scoop, daily and post- Scoop reflection questions, with accompanying examples
- the daily calendar form
- the photograph log
- pocket folders for classroom artifacts (one for each day of the Scoop)
- a pocket folder for student work and an assessment example

In addition to these three sections, the Scoop Notebook contains a zipper pocket with sticky notes for labeling the artifacts and student work, a disposable camera, and a

cassette tape. The cassette tape is provided for use by teachers who prefer to audio tape the reflections, rather than write them by hand or computer.

For the most part, the mathematics and science Scoop Notebooks are the same. They differ primarily in terms of the examples included as illustrations in the instructions. An example in the mathematics notebook might be “directions for pattern and function activity;” while in the science notebook it would be “directions for lab activity.”

### **Procedures for Assembling the Scoop Notebook**

Detailed directions in the Scoop Notebook explain which artifacts to collect and how to label them. The directions also instruct the teachers to answer reflection questions prior to, during, and after the Scoop period.

#### **Artifacts**

Directions in the notebook ask teachers to collect three categories of artifacts: materials generated prior to class (e.g., lesson plans, handouts, scoring rubrics), materials generated during class (e.g., writing on the board or overheads, student work), and materials generated outside of class (e.g., student homework, projects). The teachers are encouraged to include any other instructional artifacts not specifically mentioned in the directions. They are asked to label each artifact with an “Instructional Materials” sticky note indicating what the artifact is (e.g., copy of overhead transparency used for warm-up activity, rubric for grading homework assignment, directions for lab activity) and the date.

In addition, teachers are requested to make entries in the daily calendar, briefly describing the length of the lesson, the topic, and the instructional materials used. A disposable camera is included in the Scoop Notebook for teachers to take pictures of the classroom layout and equipment, transitory evidence of instruction (e.g., work written on the board during class), and materials that cannot be included in the notebook (e.g., posters and three-dimensional projects prepared by students). Teachers are also to fill out a photograph log, identifying the subject and date of each picture.

Teachers are asked to select three different instances of student-generated work (e.g., in-class assignments, homework). For each selection, they are asked to collect three examples representing a range from high to low quality. Because we are interested in teachers’ judgments about the quality of student work, directions specify

that their selections should be based on the quality of the work rather than the ability of the students. Teachers are instructed to make an independent selection of student work for each assignment, rather than tracking the same students throughout the artifact collection process. The Scoop Notebook contains “Teacher Reflections on Student Work” sticky notes to be filled out and attached to each example of student work. The sticky note asks the teachers to rate the quality of the work (high, medium, or low), to describe the reason for giving that rating, and to explain what they learned about the student’s understanding of the material from the work.

Finally, teachers are asked to include a recent formal classroom assessment task (e.g., test, quiz, prompt or task description for a portfolio piece, paper, performance, final project, demonstration) that is representative of the assessments they use. They are also asked to include the scoring rubric or answer key, and examples of student responses to the assessment, if available.

## **Reflections**

In addition to collecting instructional artifacts, teachers are asked to respond to three different sets of reflective questions. These questions attempt to elicit information about a teacher’s classroom practice which classroom artifacts alone might not provide (e.g., the context of the series of lessons within the curriculum, a description of student interactions during a lesson, teachers’ reactions to the lessons). Prior to the beginning of the Scoop period teachers respond to pre-Scoop reflection questions about the classroom context, typical lesson format and assessment strategies, and an overview of the lessons to be included in the Scoop Notebook. During the Scoop period, teachers respond to daily reflection questions “as soon as possible” after completion of each lesson. These questions ask the teacher to describe the lesson, and to discuss how well the learning objectives were met, changes that occurred to the original plan, and modifications that may be made to the next day’s lesson. After the conclusion of the Scoop period, teachers answer post-Scoop questions which ask them to explain how the series of lessons fit in with their long-term goals for the students, whether this series of lesson was typical of their instruction, how well the Scoop Notebook portrays their instruction, and what other materials might be included to create a better portrayal.

## **The Rating Guides**

The project adopted reform-oriented mathematics and science instruction as its pedagogical focus. We used previous research, along with the *National Science Education*



*Standards* (NRC, 1996) and *Principles and Standards for School Mathematics* (NCTM, 2000) as a basis for identifying 10 dimensions of reform-oriented instructional practice in each content area. The science dimensions reflect the emphasis in the science standards on students' active engagement in inquiry-based activities in which they ask and pursue questions, construct and test explanations, and communicate their scientific thinking both verbally and in writing. The mathematics dimensions reflect the focus in the mathematics standards (NCTM, 2000) on students in mathematics classrooms solving problems with multiple solutions and solution strategies, explaining and justifying their solutions, and communicating their mathematical thinking to others.

We developed short definitions of the dimensions as well as longer, more detailed scoring guides (See Appendices C and D). We found that both definitions and scoring guides were necessary to describe the elements of reform-oriented instruction clearly enough to be used to characterize classroom practice on the basis of either the Scoop Notebook or classroom observations. Each dimension is rated on a five-point scale, ranging from low (1) to high (5). For each dimension, the scoring rubric contains the general definition, and more detailed descriptions and specific classroom examples of high (5), medium (3), and low (1) levels of practice. For most dimensions, the intermediate ratings (medium-high [4] or medium-low [2]) are not described and do not have classroom examples.

In addition to the 10 dimensions of instructional practice, raters are asked to assign an Overall Reform rating representing the rater's holistic impression of the instructional practices of the teacher. The rating is not an average of the 10 dimensions but represents a cumulative answer to the question: "How well does the series of lessons reflect a model of instruction consistent with dimensions previously described, taking into account both the curriculum and the instructional practices?"

The scoring sheet that accompanies the guide also asks raters to provide a justification for each rating, i.e., a brief written description of the evidence used for arriving at the given rating. For example: a rater who assigned a value of "3" on the multiple representations dimension might list examples of artifacts that incorporated the use of multiple representations, as well as artifacts that did not. A complete justification would also explain how the evidence corresponded to the rating criteria, e.g., "a rating of 3 was assigned because the teacher and curriculum appeared to promote the use of multiple representations but there was no evidence of use by students." When the raters had problems assigning a rating, they often described the inconsistencies in the evidence that caused problems. For example: a rater might report

that the teacher’s reflections indicated the use of multiple representations by students, but that there was no evidence of multiple representations in the examples of student work.

The rating guides can be used for rating the Scoop Notebook as well as classroom observations. In either situation, when multiple raters are involved in a project, we suggest that they participate in training sessions prior to using the rating guides, in order to ensure that all raters use the guides in a similar manner. During these training/calibration sessions, participants should review and rate the same material, compare scores, discuss differences, and reach consensus on the application of the rating criteria. In our work, we used Scoop Notebooks set aside for this purpose and videotapes of middle-school mathematics and science lessons for the training sessions.

When rating a Scoop Notebook or a classroom observation the reader assigns a value on each dimension and an Overall Reform rating. A justification is written for each rating based on the evidence in the Notebook or from the classroom observation. For the purpose of our project, we completed one set of ratings along the 10 dimensions and the Overall Reform dimension for the complete set of classroom artifacts and reflections in the Scoop Notebook. When using the rating guide for a series of classroom observations, we completed a set of ratings for each day’s lesson, and a set of Summary Observation ratings after the series of observations. Raters used field notes taken during the observation to review the sequence and events of the observed lesson and to inform decisions about the value assigned to each dimension. In addition, researchers who observed in classrooms were given access to the Scoop Notebook and were asked to rate the classroom again on the basis of a combination of information sources—classroom field notes, daily and Summary Observation ratings, and the materials in the Scoop Notebook. These “Gold Standard” ratings represented our best estimate of the “true” status of the series of lessons on the ten dimensions of reform-oriented practice. Our recommendation for the use of the rating guides by others would be to develop a plan that incorporates only those procedures for rating which meet the needs of the program and the teachers assembling Scoop Notebooks.

## **Directions**

### **Assembling a Scoop Notebook**

Use a one- to two-inch binder with a clear presentation cover. Place the title page of the Scoop Notebook in the front cover. Place an additional copy of the Final

Checklist (Scoop Notebook, page 4) in the inside pocket of the binder. Include the following items in a three-ring zipper pocket:

- disposable camera with flash
- audio cassette
- pack of yellow “Instructional Materials” sticky notes<sup>2</sup>
- pack of white “Teacher Reflections on Student Work” sticky notes<sup>3</sup>

Place the Table of Contents (Scoop Notebook, page 1) behind the zipper pocket. Print and insert three notebook dividers with the following labels: Scoop Overview, Directions, and Materials. Copy the Scoop Notebook, using a different color paper for each section, and insert the pages in the appropriate notebook section, as described below:

- Scoop Overview: pages 2 to 4 (yellow)
- Directions: pages 5 to 13 (blue)
- Materials: pages 14 to 21/22 (green)

Finally, include plastic portfolio pockets—one pocket per each day’s lesson to be included in the Scoop Notebook. Label each pocket with the appropriate day number (e.g., “Day 1 Scooped Materials”). Include one final pocket, labeled “Classroom Assessment Task.”

### **Introducing the Scoop Notebook to Teachers**

In our work, we met with teachers either individually or in small groups, for approximately one-half hour, to go over instructions for compiling information in the Scoop Notebook. We found that this approach was sufficient to produce reasonably complete notebooks. That is, teachers provided most of the artifacts of practice we requested. Most teachers answered all of the reflection questions, although the level of detail in their responses varied considerably. If time and resources are available, it might be helpful to provide additional guidance and support, for example by asking

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<sup>2</sup> Follow the sample on page 9 of the Scoop Notebook. Print on a 3-inch by 4-inch sticky label.

<sup>3</sup> Follow the sample on page 11 of the Scoop Notebook. Print on a 4-inch by 6-inch sticky label

teachers to complete notebook materials for one day and then reviewing their materials and providing feedback. This additional level of assistance might encourage teachers to provide photographs and logs that better depict classroom dynamics and activities, more complete selections of assignments and student work, and more detailed reflections.

## **Potential Uses of the Scoop Notebook**

### **A Tool for Representing Reform-Oriented Classroom Practice**

The goal of our project was to develop a procedure for gathering a collection of instructional artifacts and teacher reflections that would allow us to characterize a series of lessons in a manner similar to an observer in the classroom. The central question guiding this effort was whether similar judgments about the extent to which the lessons embody the 10 dimensions of reform-oriented instructional practice could be obtained from artifacts and from direct observation. We believe that the Scoop Notebook, as presently constituted, provides a reasonably accurate portrayal of selected dimensions of instructional practice. The reliability and validity are sufficient to support using notebook ratings in situations where aggregate descriptions are needed, such as for describing practices of groups of teachers, or as part of evaluations of instructional or curricular program reform efforts. For example: a Scoop Notebook might be useful for providing information about changes that occur over time as a result of adopting a new science or mathematics curriculum.

On the other hand, our analyses indicate that the reliability and validity of the ratings are currently not sufficient to justify the use of the Scoop Notebook for making high-stakes decisions about individual teachers. It might be possible, however, to use the notebook in combination with other measures of teacher background, attitudes, or content knowledge, as part of a system of indicators that could support valid inferences about individual classroom practice in high-stakes situations. It might also be the case that the quality of the information collected by teachers in the notebook (and thus conceivably the technical quality of the ratings of this information) would be higher in situations where teachers are personally invested in providing the most complete and detailed information possible about their classroom practices. Further research would clearly be needed to validate using the Scoop Notebook in combination with other data sources, or in situations with higher teacher investment, for high-stakes purposes.

## **A Tool in a Professional Development Program**

We also believe that the Scoop Notebook can be valuable as a learning tool for teachers, particularly if it is incorporated into a professional development program directed at helping teachers understand their own practice. In the context of such a program, teachers may find the Scoop Notebook helpful for describing and reflecting on their own instructional practices, and for collaborating with colleagues and researchers to better understand the nature of mathematics and science learning and teaching in their classrooms. As one example, teachers could use the Scoop Notebook to examine changes in their instructional practices over time or across instructional units. Similarly, information gathered in the Notebook could help teachers to think systematically about the ways in which different aspects of reform instruction might be more or less suitable for lessons with different objectives or content foci.

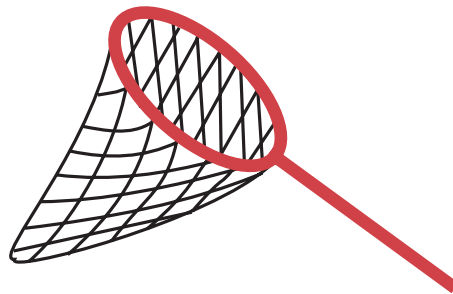
Importantly, when the Scoop Notebook is used as a tool within a professional development program, the reflection questions can be modified to better fit the specific learning goals of that program. The teachers can use these questions to guide their personal reflections on the learning goals in relation to their own practice (as they collect classroom artifacts and assemble the Scoop Notebook), as well as their discussions with colleagues within the professional development program.

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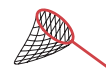
**APPENDIX A:  
THE SCOOP NOTEBOOK (MATHEMATICS)**

# **The Scoop Project**



## **What Is It Like to Learn Mathematics in Your Classroom?**

**University of Colorado, Boulder  
RAND, Santa Monica**



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### **Part 1: Project Overview**

- ❑ What is it Like to Learn Mathematics in Your Classroom?
- ❑ Scoop Checklist
- ❑ Final Checklist

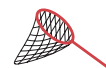
### **Part 2: Directions for Collecting the Classroom Scoop**

- ❑ Selecting a Class
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- ❑ Collecting Artifacts
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- ❑ Pocket Folders for Student Work
- ❑ Pocket Folder for Formal Classroom Assessment Task (and Student Work, if applicable)





## What Is It Like to Learn Mathematics in Your Classroom?

### Capturing What Takes Place in Your Mathematics Instruction

We are trying to find ways to describe mathematics instruction that capture the important features of each class. Probably the most accurate way to do this would be to observe every lesson, catalog every assignment, and examine every test. However, this method is too burdensome for both teachers and researchers. As a result, we are trying out an alternative way to collect information that will tell us about each mathematics class.

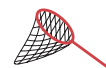
### A Scoop of Classroom Material

One way that scientists study unfamiliar territory (e.g., freshwater wetlands, Earth's crust) is to scoop up all the material they find in one place and take it to the laboratory for careful examination. Analysis of a typical Scoop of material can tell a great deal about the area from which it was taken.

We would like to do something similar in classrooms, i.e., scoop up a typical week's worth of material and use it to learn about the class from which it was taken. The artifacts would include assignments, homework, tests, projects, problem solving activities, and anything else that is part of instruction during the week.

Some things you might include as part of your Scoop are:

- materials prepared for the class: e.g., worksheet assignments, overhead transparency masters, tests, formal classroom assessments
- materials generated during class: e.g., in-class notes, problems on the board
- materials produced by students: e.g., homework, in-class assignments, projects, journal entries, portfolio pieces
- photographs of the classroom taken during the week, to provide a visual image of the teaching and learning environment: e.g., the seating arrangement of your room each day, the white/chalkboard at different periods throughout the lesson, student projects

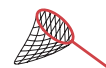


If you think of other things that could help us to understand your classroom, please include these as part of your Scoop.

### **Reflections on the Scoop**

In addition, we want to know about your plans for the Scoop period, your reactions to each day's lesson, and your overall thoughts about the set of lessons. We will ask you to respond to reflection questions:

- before the Scoop period begins,
- after each day's lesson, and
- at the end of the series of lessons in the Scoop timeframe.



## Scoop Checklist

Please read this checklist before beginning the Scoop. Once you have started the Scoop, refer back to the checklist as necessary to make sure you have completed the daily activities. At the end of the Scoop period, review this checklist, as well as the Final Checklist, to be sure your notebook is complete.

### Before the Scoop:

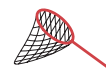
- Read through your Scoop Notebook and ask questions about anything that is unclear.
- Select a class and timeframe to use for the Scoop.
- Write or tape record a Pre-Scoop Reflection.

### Each Day During the Scoop:

- Record your scooped class plans daily in the calendar provided.
- Collect daily instructional materials, including handouts and worksheets used for instruction. Label each item with one of the yellow sticky labels provided, and complete the information on the label.
- Take photos of your classroom with the camera provided and record descriptions of the photos in the photograph log.
- Write down or photograph information and assignments from your chalk/whiteboard and overhead transparencies daily (if these transparencies cannot be copied).
- Select samples of student work. Label each item with a white sticky label, and answer the questions on the label. (*Note: Collect at least 3 assignments and 3 samples of student work per assignment over the course of the Scoop.*)
- Write or tape record a Daily Reflection at the end of each day.

### After the Scoop:

- Write or tape record a Post-Scoop Reflection.
- Make a copy of a recent formal class assessment and scoring rubric or answer key.
- Copy examples of three students' responses to the assessment (if available).
- Review the Final Checklist to be sure the Scoop Notebook is complete.

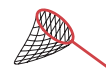


### **Final Checklist**

Please be sure you have completed all of the items listed below before returning your notebook.

- Pre-Scoop reflections
- The Classroom Scoop materials for 5 days
- Assignments and examples of student work
- Formal classroom assessment task (with student work, if applicable) and scoring rubric
- Completed calendar of scooped classes
- Completed photograph log and used camera
- Daily reflections
- Post-Scoop reflections

***THANK YOU FOR YOUR PARTICIPATION!***



## **Directions for Collecting the Classroom Scoop**

Please scoop up a typical week's worth of material from one of your classes. We can then use these scooped materials to learn about your class. You may feel that some of the things we ask you to collect are more reflective of your class than others, but please collect it all.

### **Selecting a Class**

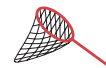
Please collect the Scoop from one of your classes. Choose a class that represents your typical practice.

### **Selecting a Timeframe**

Please collect the Scoop for the equivalent of five consecutive days of instruction in your selected class. It is ideal for the Scoop to begin at the start of a new instructional unit or topic. You may start on any day of the week (i.e., the scooped days do not have to be Monday through Friday). You should start scooping at a logical point in your lesson plans. For example: if you are starting a new unit of instruction on Wednesday, then your Scoop should start on Wednesday.

The five days of instruction might not coincide with five consecutive school days. If you teach on a block schedule, you should collect your Scoop for the equivalent of five days of instruction on a regular (non-block) schedule, assuming 50-minute periods. This will most likely be 3 days of instruction on the block schedule.

Even if you typically teach your class every day, your class schedule may be disrupted by assemblies, disaster drills, etc. Please do not include these days or other non-instruction days in your Scoop; instead, add replacement instructional days at the end.



## Taking Photographs

Photographs are a good way to capture the learning environment in your classroom and to provide a sense of what your daily lessons look like. So, throughout the Scoop timeframe, please *take photographs regularly* with the disposable camera that we provided. We have not obtained permission for students' faces to be photographed, so please try to avoid taking pictures of students' faces.

We are interested in seeing photographs of:

- the classroom set-up (such as seating arrangement) every day
- bulletin boards
- contents of white/chalkboard at several points during the lesson
- student work on the board or on an overhead transparency (if it is not possible to include the actual overhead transparency or a photocopy)
- lesson activities
- instructional tools (e.g., manipulatives, calculators) used during the lesson. If the tools are being used by students, be sure to include only the students' hands in the picture and not their faces.
- students working in class (for example working with a partner or in a group)

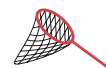
Please take pictures of any other things that you feel will help us to better “see” and understand your classroom and teaching.

You may want to consider asking a responsible student in the class to take some of the pictures for you while the lesson is taking place and record them in the photograph log. It would be best if you still prompted the student when to take the picture.

We would like 4 to 5 pictures per day during the Scoop timeframe. Be sure to *complete the photograph log*. See the example below.

### **Please remember:**

- ❑ Try to avoid taking pictures of students' faces.
- ❑ Use the flash when taking pictures. (*Exception: When taking a picture of a white board or overhead, do not use a flash because it creates too much glare. If you do use a flash, take the picture at an angle to the board. It is better to photocopy overhead transparencies than to take pictures of them being projected on the screen.*)



- Provide a brief description of each photograph that you take in the Photograph Log.

### Photograph Log Example

Photo # on camera	DATE	DESCRIPTION
27	11/2/06	Layout of my room, looking from the perspective of a student
26	11/2/06	Warm-up activity on the board
25	11/2/06	Notes written on the board during class discussion
24	11/2/06	Homework assignment written on the board
23	11/3/06	Manipulatives students are using today
22	11/3/03	Students working on a problem in small group (from the back)
21	11/3/06	Completed group poster on dream house project

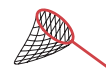
### Collecting Artifacts

There are two kinds of artifacts that we are interested in collecting: instructional materials and student work. We would like you to scoop **all of your instructional materials**. As the teacher, you will have generated most of these materials; however, there are instances in which students may contribute to instructional materials by writing on an overhead transparency or creating an instructional document. Please include these instructional materials as well.

The second type of artifact to collect is student work. We would like you to scoop **only samples of student work**. Detailed instructions on selecting student work will follow.

### Collecting Daily Instructional Materials

It may help to think of scooping materials and taking photographs each day at three different points:



## 1 BEFORE THE LESSON

Scoop all instructional materials you prepare for the class. For example:

- *written plans*
- *copies of Teacher's Edition's suggestions to teachers, if you are using this to guide your instruction*
- *handouts (e.g., notes, worksheets, problem descriptions)*
- *assignments (e.g., directions for a project, pages to be read in a textbook)*
- *overhead transparency masters*
- *tests or other forms of assessment (including rubric, if applicable)*

Photograph any changes to your classroom. For example:

- *the seating arrangement*
- *assignments, questions, problems, or instructions written on the chalk/whiteboard*
- *materials which have been added to the bulletin board*
- *instructional tools to be used during the lesson*

## 2 DURING THE LESSON

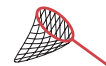
Scoop all instructional materials you generate during the class. For example:

- *notes or problem and questions written on an overhead transparency*
- *notes written to yourself about the lesson*
- *notes written to yourself about the students*

Photograph

- *the white/chalkboard throughout the lesson*
- *changes to the classroom set-up*
- *the set-up and use of instructional tools*
- *students working in groups to solve problems (without students' faces, please)*





### ③ AFTER THE LESSON

Scoop any instructional materials that were not yet scooped before or during the lesson.

For example:

- *copies of overhead transparencies used in class*
- *photocopies of revised lesson plans or notes to self on lesson plan or Teacher's Edition suggestions*
- *copies of student-created instructional materials such as rubrics or review questions*

#### Photograph

- *any materials created during the lesson that cannot be scooped, such as a poster or project*
- *any changes to the classroom that could not be photographed with students in the room, such as the seating arrangement or set-up of instructional tools or materials*

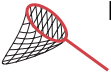
NOTE: Include any additional materials that will help us understand the lesson.

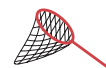
### Labeling Daily Instructional Materials (Yellow Sticky Labels)

Use the **yellow sticky labels** to identify all instructional materials you place in the Pocket Folders for Daily Artifacts. Use these to let us know how each item fits into the timeframe of scooped materials. Indicate:

- *the date*
- *a brief description of the artifact.* For example:
  - *directions for group project*
  - *rubric used for grading assessment*
  - *copy of overhead transparency used for the warm-up activity*

### Sample Yellow Sticky Label (3 inches by 4 inches)

	Instructional Materials
	Date: _____
Description:	



## Selecting Student Work

We would like you to choose some student work that is indicative of the kind of work your students do. This work can be from individual students or from a group assignment.

**Select at least three activities or assignments** central to the unit you are teaching during the course of the Scoop. For each activity or assignment, pick three examples of student work that represent a range of quality (high, medium, and low).

**Scoop** examples of high, medium, and low quality student work for each of the three activities or assignments. For example:

- *worksheets*
- *in-class assignments*
- *journal entries*
- *portfolio pieces*
- *homework assignments*
- *projects*
- *reports or write-ups of problem-solving activities*

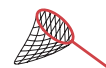
**Note:** You do not have to provide sample work from the **same** students for each of the activities or assignments.

**Make a photocopy** of any student-generated materials for which this is possible. Be sure to cover the student's name before making the photocopy.

For student-generated materials that cannot be photocopied (e.g., a 3D model), please **take a picture** of the student's work. Be sure to cover the student's name before taking the picture, and do not include the student's face in the picture.

## Labeling and Reflecting on Student Work (White Sticky Labels)

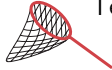
Use a **white sticky label** to identify each sample of student work you place into the Pocket Folder for Student Work.



On each white sticky label please tell us:

- *whether the student work is of high, average, or low quality*
- *why you rated it this way*
- *what this work tells you about the student's understanding of the material*

### Sample White Sticky Label (4 inches by 6 inches)



Teacher Reflection on Student Work

Date: \_\_\_\_\_

➤ Quality of this work? (*circle*)    High    Medium    Low

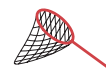
➤ Why did you rate it this way?

➤ What does this work tell you about the student's understanding of the material?

## Selecting a Formal Classroom Assessment Task and Examples of Student Performance

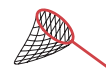
Select a recent formal classroom assessment task (i.e., test, quiz, prompt or task description for a portfolio piece, paper, performance, final project, demonstration) that is representative of the assessments you use. **It's not necessary for it to have occurred during the timeframe of the Scoop.** Please attach a **yellow** sticky label and include it in the Pocket Folder for Formal Classroom Assessment Task. Also include a scoring rubric or answer key if available.



If you have copies of student responses to the assessment, please choose three examples that represent low, average, and high quality work and include them as well. Also include your written feedback to the students, if available. Please attach a **white** sticky label to each student response and answer the three questions. Be sure to remove the student's name or other identifying marks.

For student responses to an assessment task prompt that cannot be photocopied (e.g., a 3D model, a student performance), please take a picture of the student's work or include a copy of the student's rating sheet on the assessment. Be sure to cover the student's name before taking the picture or making a copy of the rating sheet, and do not include the student's face in the picture.

*Please be sure to include a recent assessment, even if you do not have copies of student responses to include with it. Include feedback if available.*



## Completing the Daily Calendar of “Scooped” Classes

The Calendar of “Scooped” Classes is designed to give us a roadmap of the class sessions from which you will be scooping. The calendar asks for the following information:

□ **DATE**

□ **LENGTH OF SESSION**

For most teachers, this will be the number of minutes in the class period and it will not vary from day to day.

□ **TOPIC OF SESSION**

In this section, please add a descriptive title for the day’s activities. For example:

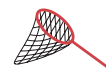
- Comparing tables, graphs and equations as ways to represent the relationship between two variables
- Review converting ratios and fractions to percents
- In-class work on review problems from Middle School Mathematics, Chapter 3, pages 114-116
- Problem solving activity— describe geometric patterns using pictures, tables, and formulas
- Investigation: Begin project to build a scale model of a dream house, considering costs, area, etc.

□ **CURRICULUM MATERIALS USED**

List any materials used in the lesson, which were not specified above. For example:

- If you are using a standard curriculum, indicate the title and page number(s) of the chapter, unit, section, or investigation.
- examples of graphs and tables from newspapers or magazines
- directions for pattern and function activity
- guiding questions for problem-solving activity on building dream house
- vocabulary list from unit on coordinate geometry

NOTE: For all of the materials, please be sure you have included a copy or taken a picture with the disposable camera.



## Responding to the Reflection Questions

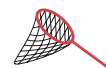
There are three sets of reflection questions:

1. The Pre-Scoop reflection questions should be answered **before** you begin the Scoop collection period.
2. The Daily Reflection questions should be answered **each day** as soon as possible after the scooped class. Having access to your immediate thoughts and reactions is crucial. Please make every effort to jot down your reflections right away after each Scoop class.
3. The Post-Scoop reflection questions should be answered **after** you complete the Scoop period and are ready to turn in your materials.

You may provide your responses in several different formats. Please choose one of the following that is most convenient for you:

- **Write** your answers on a separate sheet of paper.
- **Type** your answers on a computer and print them  
*or*
- **Send** them to us on a disk or over email.
- **Audiotape** your answers.

*If you choose to audiotape your responses, you do not need to use a new tape each day. However, please state your name and the date at the beginning of each set of responses.*



## Pre-Scoop Reflection Questions

To be answered once, before the Scoop period begins.

1. *What about the context of your teaching situation is important for us to know in order to understand the lessons you will include in the Scoop?*

This may include:

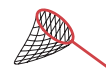
- characteristics of students
- features of the school and/or community
- description of the curriculum and/or textbook you are using and the students' past experience with it
- anything else you may find pertinent to our understanding of your teaching environment

For example: in the past teachers have told us they wanted us to know about features of their teaching situation such as:

- Many of the students in the class are second-language learners.
- The school just had a large turnover of staff.
- This is the students' first experience with an activity-based curriculum.
- This is the students' first experience with block scheduling.
- Students in this cohort have a reputation for having difficulty working together.

2. *What does a typical lesson look like in your classroom? If it varies day to day, then please describe the various possibilities.*

This may include:



- daily “routine” activities, such as checking homework at the start of class
- the format of the lesson (lecture, discussion, group work, etc.)
- description of a typical week if you have different lesson formats for each day (For example: introduction lecture on Monday, group work on Tuesday, review questions on Wednesday, etc.)

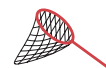
For example:

- The students come in and start with a 5-minute warm-up question that is written on the board. We then check the homework as a group for about 10 minutes. For the next 20 minutes, I teach the new concept in a lecture/whole class discussion format. Finally, the students work independently (or sometimes in partners) on questions and problems that utilize the concepts taught. During the last few minutes of class, I explain the homework and they copy the assignment from the board.
- It really varies from day to day, depending on the kind of math content and problems we are working on. Usually I have a problem on the board when the students arrive to class. We discuss it briefly as a whole class to be sure they all understand the problem, and then they begin to work on it in groups. I walk around to help answer questions and facilitate the group discussions. When they are done solving the problem in their groups, each group takes a turn presenting/defending their solution to the class. I wrote that this varies, because sometimes we will work on a few problems in a period and other times the groups work together on a single problem for the period, and we don’t take turns presenting solutions until the next day.

3. *How often do you assess student learning, and what strategies/tools do you use?*

This may include commercially-produced assessments, teacher-created assessments, and informal assessments (e.g., check student homework, listen to student discussions).





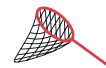
4. *What are your overall plans for the set of lessons that will be included in the Scoop?*

This may include:

- a description of what the students have been learning until the point when the Scoop begins
- an overview of the lessons you will be teaching during the Scoop (e.g., description of math content, lesson goals/objectives, instructional strategies, student activities)

For example:

- We are in the middle of a unit on representations of data. This week, we will start out by exploring the strengths and weaknesses of various data representations (graphs, tables, etc.) using examples from newspapers and other media sources. We will take data sets from these sources and represent them in different forms to see how the various representations change our impressions of the data.
- This week, we are working on developing students' understandings of ratios and proportions and their ability to solve problems that use ratios and proportions. We will begin the week by reviewing what students have previously learned about both topics. Then we will learn how to simplify ratios and how to convert from proportions to percentages. Students will solve a number of word problems, involving ratios and proportions.



## Daily Reflection Questions

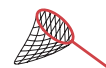
To be answered every Scoop day, after the class is over.

*Having access to your immediate thoughts and reactions following the lesson is crucial. Please make every effort to jot down your reflections right away after each Scoop class.*

1. *What were your objectives/expectations for student learning during this lesson?*

For example:

- My goal for this lesson (and all the lessons during the Scoop) was for students to understand that a line on a graph represents a relationship between two variables ( $x$  and  $y$ ). Today I used a comparison between a positive and a negative slope of a line graph. The objective of the lesson was for students to create two graphs: one with a positive and one with a negative slope. For each graph, the students needed to identify two variables that have a positive (or negative) relationship and create logical data to fit that relationship. I wanted the students to choose practical examples from their own life. (I gave the example of amount of ice cream eaten every day and pounds gained.) They then needed to graph the data correctly. I was also checking that they could draw the graphs correctly, because we worked on this in the last unit I taught.
- Today's lesson had two different objectives. During this unit, we will be working on problems using fractions and percents. The first objective today was to begin using problem-solving strategies such as creating a representation of the problem (by drawing or using manipulatives) and then using this representation to create a solution. The second objective was for students to develop the ability to communicate mathematically. I wanted the students to work on their mathematical communication abilities by both working in groups and also writing in journals. Mathematical communication is an objective we have been working on all year. I didn't expect students to get to a "mastery" level for either of these objectives, but rather be at a "novice" level and show some improvement.



2. *Describe the lesson in enough detail so we understand how the Scoop materials were used or generated.*

For example:

- Class started with a problem of the day that was written on the board (see photo of board #4). Then we reviewed the homework, and I answered students' questions (see copy of homework assignment). The majority of class was spent doing a whole-class review of multiplication of mixed numbers (see handout and photo of board at end of class #5). Towards the end of the lesson, students worked individually on a set of problems in the textbook, which they are expected to complete for homework (page 113 odd-numbered problems).
- At the beginning of class, students turned in their group projects (see samples of student projects) comparing various representations of data on the number of M&Ms of each color in a bag of M&Ms. They spent about 10 minutes writing in their journals about their work on the project (see copy of sample journals). The rest of the class was taken up with sharing each group's results, followed by an introduction to the next activity with M&Ms – determining the proportion of M&Ms of each color in each bag of candy and comparing the proportions across groups (see handout).

3. *Thinking back to your original plans for the lesson, were there any changes in how the lesson actually unfolded?*

For example:

- I thought that we would have a chance to explore the differences between line graphs and bar graphs, but I discovered that a number of students in the class didn't have a firm grasp of line graphs. So, we backtracked and created a line graph on the board. We plotted the students' grades on the last chapter test against the number of hours of television students watched last week.
- My lesson for the day was addition of polynomials. But at the beginning of class, one of the students asked how come NBC News had declared



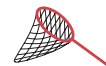
the winner of last night's election just 1 hour after the polls had closed, with less than 1% of the votes counted. Since we had done a unit on statistics just a couple of weeks ago, I thought it would be a good opportunity to discuss statistical sampling. The students became very interested and we talked about actually doing a survey of the school and analyzing it. Don't know if we'll have time to fit it in.

4. *How well were your objectives/expectations for student learning met in today's lesson? How do you know?*

For example:

- Based on yesterday's class I assumed that everybody would be able to use the procedure for converting from decimals to percents. However, I was surprised that a couple of students struggled with problems converting percentages less than 10 % to decimals. I realized that they were struggling through...
- My expectations for group work were met. Although some groups struggled to cooperate towards the beginning of class and had a hard time getting started, most seemed engaged with the task by the end of the lesson. They had worked out an approach to counting M&Ms by color and creating a table and graph to record their data. They also did a good job of allocating tasks to each of the group members. I realized that my expectations were met by...

5. *Will today's class session affect your plans for tomorrow (or later in the unit)? If so, how?*
6. *Is there anything else you would like us to know about this lesson that you feel was not captured by the Scoop?*



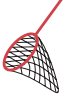
## Post-Scoop Reflection Questions

To be answered at the end of the Scoop timeframe.

When answering these questions, please consider the entire set of lessons and all the materials you have gathered for the Scoop notebook.

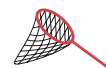
1. *How does this series of lessons fit in with your long-term goals for this group of students?*
2. *How representative of your typical instruction was this series of lessons (with respect to content, instructional strategies and student activities)? What aspects were typical? What aspects were not typical?*
3. *How well does this collection of artifacts, photographs, and reflections capture what it is like to learn mathematics in your classroom? How “true-to-life” is the picture of your teaching portrayed by the Scoop?*
4. *If you were preparing this notebook to help someone understand your teaching, what else would you want the notebook to include? Why?*

Please refer to the Final Checklist to be sure you have included everything in the notebook.



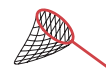
## Daily Calendar

	DAY #1	DAY #2	DAY #3	DAY #4	DAY #5
Date					
Length of session					
Topic of session					
Curriculum materials used					



# Photograph Log

Photo # on camera	DATE	DESCRIPTION
27		
26		
25		
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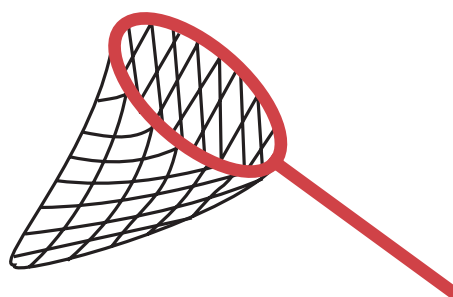
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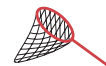
**APPENDIX B:  
THE SCOOP NOTEBOOK (SCIENCE)**

# **The Scoop Project**



## **What Is It Like to Learn Science in Your Classroom?**

**University of Colorado, Boulder  
RAND, Santa Monica**



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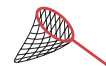
- ❑ What is it Like to Learn Science in Your Classroom?
- ❑ Scoop Checklist
- ❑ Final Checklist

### Part 2: Directions for Collecting the Classroom Scoop

- ❑ Selecting a Class
- ❑ Selecting a Timeframe
- ❑ Taking Photographs
- ❑ Collecting Artifacts
  - Collecting Daily Instructional Materials
  - Labeling Daily Instructional Materials
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  - Labeling Student Work
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- ❑ Photograph Log
- ❑ Yellow and White Sticky Labels
- ❑ Pocket Folders for Daily Instructional Materials
- ❑ Pocket Folders for Student Work
- ❑ Pocket Folder for Formal Classroom Assessment Task (and Student Work, if applicable)



## What Is It Like to Learn Science in Your Classroom?

### Capturing What Takes Place in Your Science Class

We are trying to find ways to describe science instruction that capture the important features of each class. Probably the most accurate way to do this would be to observe every lesson, review every assignment, and examine every test. However, this method is too burdensome for both teachers and researchers. As a result, we are trying out an alternative way to collect information that will tell us about each science class.

### A Scoop of Classroom Material

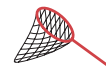
One way that scientists study unfamiliar territory (e.g., freshwater wetlands, Earth's crust) is to scoop up all the material they find in one place and take it to the laboratory for careful examination. Analysis of a typical scoop of material can tell a great deal about the area from which it was taken.

We would like you to do something similar in your classroom, i.e., scoop up a typical week's worth of material that we can use to learn about your class. The artifacts would include assignments, homework, tests, projects, problem solving activities, and anything else that is part of instruction during the week.

Some things you might include as part of your Scoop are:

- materials prepared for the class: e.g., worksheet assignments, overhead transparency masters, tests, formal classroom assessments
- materials generated during class: e.g., in-class notes, problems on the board
- materials produced by students: e.g., homework, in-class assignments, projects, journal entries, portfolio pieces
- photographs of the classroom taken during the week, to provide a visual image of the teaching and learning environment: e.g., the seating arrangement of your room each day, the white/chalkboard at different periods throughout the lesson, room arrangement and equipment for laboratory activities, student projects.

If you think of other things that could help us to understand your classroom, please include these as part of your Scoop.



## Reflections on the Scoop

In addition, we want to know about your plans for the Scoop week, your reactions to each day's lesson, and your overall thoughts after the lessons are complete. We will ask you to respond to reflection questions:

- before the Scoop period begins,
- after each day's lesson, and
- at the end of the series of lessons in the Scoop timeframe.

## Scoop Checklist

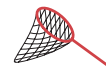
Please read this checklist before beginning the Scoop. Once you have started the Scoop, refer back to the checklist as necessary to make sure you have completed the daily activities. At the end of the Scoop period, review this checklist, as well as the Final Checklist, to be sure your notebook is complete.

### Before the Scoop:

- Read through your Scoop Notebook and ask questions about anything that is unclear.
- Select a class and timeframe to use for the Scoop.
- Write or tape record a Pre-Scoop Reflection.

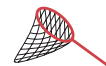
### Each Day During the Scoop:

- Record your class plans daily in the Scoop calendar provided.
- Collect daily instructional materials, including handouts and worksheets used for instruction. Label each item with one of the yellow sticky labels provided, and complete the information on the label.
- Take photos of your classroom with the camera provided and record descriptions of the photos in the photograph log.
- Write down or photograph information and assignments from your chalk/whiteboard and overhead transparencies daily (if these transparencies cannot be copied).
- Select and copy samples of student work. Label each item with a white sticky label, and answer the questions on the label (*Note: Collect at least 3 assignments and 3 samples of student work per assignment over the course of the Scoop*).
- Write or tape record a Daily Reflection at the end of each day.



**After the Scoop:**

- Write or tape record a Post-Scoop Reflection.
- Make a copy of a recent formal class assessment and scoring rubric or answer key.
- Copy examples of three students' responses to the assessment (if available).
- Review the Final Checklist to be sure the Scoop Notebook is complete.

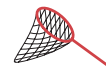


## **Final Checklist**

Please be sure you have completed all of the items listed below before returning your notebook.

- Pre-Scoop reflections
- The Classroom Scoop materials for 5 days
- Assignments and examples of student work
- Formal classroom assessment task (with student work, if applicable) and scoring rubric
- Completed calendar of scooped classes
- Completed photograph log and used camera
- Daily reflections
- Post-Scoop reflections

***THANK YOU FOR YOUR PARTICIPATION!***



## Directions for Collecting the Classroom Scoop

Please scoop up a typical week's worth of materials from one of your classes. We can then use these scooped materials to learn about your class. You may feel that some of the things we ask you to collect are more reflective of your class than others, but please collect it all.

### Selecting a Class

Please collect the Scoop from one of your classes. Choose a class that represents your typical practice.

### Selecting a Timeframe

Please collect the Scoop for the equivalent of five consecutive days of instruction in your selected class. It is ideal for the Scoop to begin at the start of a new instructional unit or topic. You may start on any day of the week (i.e., the scooped days do not have to be Monday through Friday). You should start scooping at a logical point in your lesson plans. For example: if you are starting a new unit of instruction on Wednesday, then your Scoop should start on Wednesday.

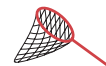
The five days of instruction might not coincide with five consecutive school days. If you teach on a block schedule, you should collect your Scoop for the equivalent of five days of instruction on a regular (non-block) schedule, assuming 50-minute periods. This will most likely be 3 days of instruction on the block schedule.

Even if you typically teach your class every day, your class schedule may be disrupted by assemblies, disaster drills, etc. Please do not include these days or other non-instruction days in your Scoop; instead, add replacement instructional days at the end.

### Taking Photographs

Photographs are a good way to capture the learning environment in your classroom and to provide a sense of what your daily lessons look like. So, throughout the Scoop timeframe, please *take photographs regularly* with the disposable camera that we provided. We have not obtained permission for students' faces to be photographed, so please try to avoid taking pictures of students' faces.

We are interested in seeing photographs of:



- the classroom set-up (such as seating arrangement) every day
- bulletin boards
- contents of white/chalkboard at several points during the lesson
- student work on the board or on an overhead transparency (if it is not possible to include the actual overhead transparency or a photocopy)
- lesson activities
- instructional tools (e.g., lab equipment, manipulatives, calculators) used during the lesson. If the tools are being used by students, be sure to include only the students' hands in the picture and not their faces.
- students working in class (for example working with a partner or in a group)

Please take pictures of any other things that you feel will help us to better “see” and understand your classroom and teaching.

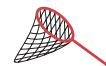
You may want to consider asking a responsible student in the class to take some of the pictures for you while the lesson is taking place and record them in the photograph log. It would be best if you still prompted the student when to take the picture.

We would like 4 to 5 pictures per day during the Scoop timeframe. Be sure to *complete the photograph log*. See the example below.

**Please remember:**

- ❑ Try to avoid taking pictures of students' faces.
- ❑ Use the flash when taking pictures. (*Exception: When taking a picture of a white board or overhead, do not use a flash because it creates too much glare. If you do use a flash, take the picture at an angle to the board. It is better to photocopy overhead transparencies than to take pictures of them being projected on the screen.*)
- ❑ Provide a brief description of each photograph that you take in the Photograph Log.





## Photograph Log Example

Photo # on camera	DATE	DESCRIPTION
27	11/2/06	Layout of my room, looking from the perspective of a student
26	11/2/06	Warm-up activity on the board
25	11/2/06	Notes written on the board during class discussion
24	11/2/06	New room arrangement for laboratory activity
23	11/3/06	Laboratory equipment students will use today
22	11/3/03	A group of students doing the lab activity
21	11/3/06	New room arrangement for quiz review

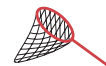
### Collecting Artifacts

There are two kinds of artifacts that we are interested in collecting: instructional materials and student work. We would like you to scoop **all of your instructional materials**. As the teacher, you will have generated most of these materials; however, there are instances in which students may contribute to instructional materials by writing on an overhead transparency or creating an instructional document. Please include these instructional materials as well.

The second type of artifact to collect is student work. We would like you to scoop **only samples of student work**. Detailed instructions on selecting student work will follow.

### Collecting Daily Instructional Materials

It may help to think of scooping materials and taking photographs each day at three different points:



## 1 BEFORE THE LESSON

Scoop all instructional materials you prepare for the class. For example:

- *written plans*
- *copies of Teacher's Edition's suggestions to teachers, if you are using this to guide your instruction*
- *handouts (e.g., notes, worksheets, laboratory instructions, problem descriptions)*
- *assignments (e.g., directions for a project, pages to be read in a textbook)*
- *overhead transparency masters*
- *tests or other forms of assessment (including rubric, if applicable)*

Photograph any changes to your classroom. For example:

- *the seating arrangement*
- *assignments, questions, problems, or instructions written on the chalk/whiteboard*
- *materials which have been added to the bulletin board*
- *instructional tools or lab equipment to be used during the lesson*

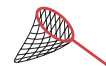
## 2 DURING THE LESSON

Scoop all instructional materials you generate during the class. For example:

- *notes or problems and questions written on an overhead transparency*
- *notes written to yourself about the lesson*
- *notes written to yourself about the students*

Photograph

- *the white/chalkboard throughout the lesson*
- *changes to the classroom set-up*
- *the set-up and use of instructional tools or lab equipment*
- *students working in groups to solve problems (without students' faces, please)*
- *students working in pairs on laboratory activity*



### ③ AFTER THE LESSON

Scoop any instructional materials that were not yet scooped before or during the lesson.

For example:

- *copies of overhead transparencies used in class*
- *photocopies of revised lesson plans or notes to self on lesson plan or Teacher's Edition suggestions*
- *copies of student-created instructional materials such as rubrics or review questions*

#### Photograph

- *any materials created during the lesson that cannot be scooped, such as a poster or project*
- *any changes to the classroom that could not be photographed with students in the room, such as the seating arrangement or set-up of instructional tools or materials*

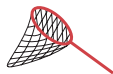
NOTE: Include any additional materials that will help us understand the lesson.

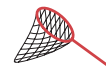
### Labeling Daily Instructional Materials (Yellow Sticky Labels)

Use the **yellow sticky labels** to identify all instructional materials you place in the Pocket Folders for Daily Artifacts. Use these to let us know how each item fits into the timeframe of scooped materials. Indicate:

- *the date*
- *a brief description of the artifact.* For example:
  - *directions for group project*
  - *rubric used for grading assessment*
  - *copy of overhead transparency used for the warm-up activity*

### Sample Yellow Sticky Label (3 inches by 4 inches)

	Instructional Materials
	Date: _____
Description:	



## Selecting Student Work

We would like you to choose some student work that is indicative of the kind of work your students do. This work can be from individual students or from a group assignment.

**Select at least three activities or assignments** central to the unit you are teaching during the course of the Scoop. For each activity or assignment, pick three examples of student work that represent a range of quality (high, medium, and low).

**Scoop** examples of high, medium, and low quality student work for each of the three activities or assignments. For example:

- *worksheets*
- *in-class assignments*
- *journal entries*
- *portfolio pieces*
- *homework assignments*
- *projects*
- reports or write-ups of problem-solving or laboratory activities

**Note:** You do not have to provide sample work from the **same** students for each of the activities or assignments.

**Make a photocopy** of any student-generated materials for which this is possible. Be sure to cover the student's name before making the photocopy.

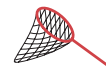
For student-generated materials that cannot be photocopied (e.g., a 3D model), please **take a picture** of the student's work. Be sure to cover the student's name before taking the picture, and do not include the student's face in the picture.

## Labeling and Reflecting on Student Work (White Sticky Labels)

Use a **white sticky label** to identify each sample of student work you place into the Pocket Folder for Student Work.

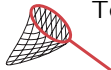
**On each white sticky label please tell us:**

- *whether the student work is of high, average, or low quality*
- *why you rated it this way*



- *what this work tells you about the student's understanding of the material*

### Sample White Sticky Label (4 inches by 6 inches)



Teacher Reflection on Student Work

Date: \_\_\_\_\_

➤ Quality of this work? (*circle*)    High    Medium    Low

➤ Why did you rate it this way?

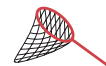
➤ What does this work tell you about the student's understanding of the material?

### Selecting a Formal Classroom Assessment Task and Examples of Student

#### Performance

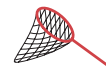
Select a recent formal classroom assessment task (i.e., test, quiz, prompt or task description for a portfolio piece, paper, performance, final project, demonstration) that is representative of the assessments you use. **It's not necessary for it to have occurred during the timeframe of the Scoop.** Please attach a **yellow** sticky label and include it in the Pocket Folder for Formal Classroom Assessment Task. Also include a scoring rubric or answer key if available.

If you have copies of student responses to the assessment, please choose three examples that represent low, average, and high quality work and include them as well. Also include your written feedback to the students, if available. Please attach a **white** sticky label to each student response and answer the three questions. Be sure to remove the student's name or other identifying marks.



For student responses to an assessment task prompt that cannot be photocopied (e.g., a 3D model, a student performance), please take a picture of the student's work or include a copy of the student's rating sheet on the assessment. Be sure to cover the student's name before taking the picture or making a copy of the rating sheet, and do not include the student's face in the picture.

*Please be sure to include a recent assessment, even if you do not have copies of student responses to include with it. Include feedback if available.*



## Completing the Daily Calendar of “Scooped” Classes

The Calendar of “Scooped” Classes is designed to give us a roadmap of the class sessions from which you will be scooping. The calendar asks for the following information:

□ **DATE**

□ **LENGTH OF SESSION**

For most teachers, this will be the number of minutes in the class period and it will not vary from day to day.

□ **TOPIC OF SESSION**

In this section, please add a descriptive title for the day’s activities. For example:

- Review the names and characteristics of the three groups of rocks (igneous, sedimentary, metamorphic)
- Group Laboratory Activity: observe the characteristics of a rock to decide if it is igneous, sedimentary, or metamorphic
- Use the identification tables in the textbook to identify each rock specimen
- Complete the discussion questions for the laboratory activity

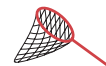
□ **CURRICULUM MATERIALS USED**

List any materials used in the lesson, which were not specified above.

For example:

- If you are using a standard curriculum, indicate the title and page number(s) of the chapter, unit, section, or investigation.
- list of rock specimens utilized in the activity
- directions and handouts for the laboratory activity
- blank copies of identification charts to be completed by students

NOTE: For all of the materials, please be sure you have included a copy or taken a picture with the disposable camera.



## Responding to the Reflection Questions

There are three sets of reflection questions:

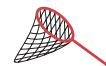
1. The Pre-Scoop reflection questions should be answered **before** you begin the Scoop collection period.
2. The Daily Reflection questions should be answered **each day** as soon as possible after the scooped class. Having access to your immediate thoughts and reactions is crucial. Please make every effort to jot down your reflections right away after each Scoop class.
3. The Post-Scoop reflection questions should be answered **after** you complete the Scoop period and are ready to turn in your materials.

You may provide your responses in several different formats. Please choose one of the following that is most convenient for you:

- **Write** your answers on a separate sheet of paper.
  - **Type** your answers on a computer and print them
- or*
- **Send** them to us on a disk or over email.
  - **Audiotape** your answers.

*If you choose to audiotape your responses, you do not need to use a new tape each day. However, please state your name and the date at the beginning of each set of responses.*





## Pre-Scoop Reflection Questions

To be answered once, before the Scoop period begins.

1. *What about the context of your teaching situation is important for us to know in order to understand the lessons you will include in the Scoop?*

This may include:

- characteristics of students
- features of the school and/or community
- description of the curriculum and /or textbook you are using and the students' past experience with it
- anything else you may find pertinent to our understanding of your teaching environment

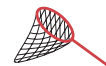
For example: in the past teachers have told us they wanted us to know about features of their teaching situation such as:

- Many of the students in the class are second-language learners.
- The school just had a large turnover of staff.
- This is the students' first experience with an activity-based curriculum.
- This is the students' first experience with block scheduling.
- Students in this cohort have a reputation for having difficulty working together.

2. What does a typical lesson look like in your classroom? If it varies day to day, then please describe the various possibilities.

This may include:

- daily "routine" activities, such as checking homework at the start of class
- the format of the lesson (lecture, discussion, group work, etc.)
- description of a typical week if you have different lesson formats for each day (For example: introduction lecture on Monday, hands-on activity on Tuesday, review questions on Wednesday, etc.)



For example:

- The students come in and start with a 5-minute warm-up question that is written on the board. We then check the homework as a group for about 10 minutes. For the next 20 minutes, I teach the new concept in a whole class lecture/discussion format. Finally, the students work individually (or sometimes in partners) on questions and problems that utilize the concepts taught. During the last few minutes of class, I explain the homework and they copy the assignment from the board.
- It really varies from day to day, depending on the kind of science content we are working on. Usually I have a warm-up review question on the board when the students arrive to class. We discuss it briefly as a whole class to be sure they all understand the concept. I then sometimes have them do a hands-on extension activity in pairs or groups while I walk around to help answer questions and facilitate the group discussions. When they are done with the activity in their groups, each group takes a turn presenting/defending their findings to the class. Other times, they work individually on problems and questions. I also take the class to the library about 2 or 3 times a month in order to do research for projects or mini reports that I assign. When we are in the library, they typically work either individually or in pairs, depending on the assignment.

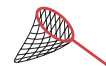
3. *How often do you assess student learning, and what strategies/tools do you use?*

This may include commercially-produced assessments, teacher-created assessments, and informal assessments (e.g., check student homework, listen to student discussions).

4. *What are your overall plans for the set of lessons that will be included in the Scoop?*

This may include:

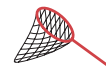
- a description of what the students have been learning until the point when the Scoop begins



- an overview of the lessons you will be teaching during the Scoop (e.g., description of science content, lesson goals/objectives, instructional strategies, student activities, lab activities)

For example:

- We are in the middle of a unit on conservation of mass. This week, we will start out by reviewing the use of some laboratory equipment (such as spring scale, graduated cylinder, etc.). The students will then work through a series of lab activities in which they will “prove” the law of conservation of mass. We will end the week with reading and questions from the textbook.
- This week we are using the process of discovery to work on developing students’ understanding of why earthquakes and volcanoes occur along plate boundaries. We will begin the week by reviewing what students have previously learned about both topics. They will plot recent volcanic and earthquake activity on a map of the world. Then, they will compare these locations with a map of plate boundaries. There will be a written test at the end of the week.



## Daily Reflection Questions

To be answered every Scoop day, after the class is over.

*Having access to your immediate thoughts and reactions following the lesson is crucial. Please make every effort to jot down your reflections right away after each Scoop class.*

1. *What were your objectives/expectations for student learning during this lesson?*

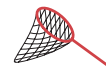
For example:

- My goal for this lesson (and all the lessons during the Scoop) was for students to understand relationships among organisms and their physical environment. The objective of the lesson was for students to use the information they gathered yesterday on an ecosystem or their choice (e.g. ocean, prairie, rainforest, desert, high tundra, deciduous forest) in order to draw a visual representation of the ecosystem. Through this lesson I was checking if they know ways in which organisms interact and depend on one another through food chains and food webs in an ecosystem.
- Today's lesson had two different objectives. During this unit, we will be working on using appropriate tools, technologies and measurement units to gather and organize data. The first objective today was to begin solving problems involving units of measurement and calculating unit conversions. The second objective was for students to develop an understanding of the structure of the universe. Measurement conversion is an objective we have been working on all year. I didn't expect students to get to a "mastery" level for either of these objectives, but rather be at a "novice" level and show some improvement.

2. *Describe the lesson in enough detail so we understand how the Scoop materials were used or generated.*

For example:

- Class started with a full-class review of food chains and food webs. The students have already researched and collected information about an ecosystem of their own choice. Today they used this information to



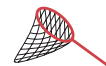
create a visual food chain or food web showing the interrelationships of organisms in the selected ecosystem. I asked them to make sure their drawings included one major producer, consumer, or decomposer in the ecosystem and to organize their food chain or food web so that it shows that each organism is connected to other organisms in the food chain or food web. The lesson will continue tomorrow with each student completing his or her visual and hanging it up on the back bulletin board (see photos).

- At the beginning of class students met for about 20 minutes in their project groups (Driving through the Solar System Project). In groups, students worked together to calculate the amount of time it would take to travel within the solar system if they were traveling at the speed of an automobile (i.e., 75 mph). Each group was given a different starting point and destination within the solar system (example: Earth to Mars). They then wrote in their journals about their work on the project (see copy of sample journals). The rest of the class was taken up with sharing each group's results

3. *Thinking back to your original plans for the lesson, were there any changes in how the lesson actually unfolded?*

For example:

- I thought that we would have a chance to explore the differences between the various ecosystems, but I discovered that a number of students in the class didn't have a firm grasp of the relationship between organisms in an ecosystem. So, we backtracked and reviewed those principles through an example of a freshwater ecosystem.
- I didn't originally plan on the students writing in their journals. However, when the students were working in their groups, the discussions were so rich. They were really "talking science," listening, and responding to each other. Since the discussions were so good, I decided I wanted them to individually reflect and write their thoughts in their journals.



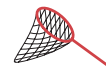
4. *How well were your objectives/expectations for student learning met in today's lesson? How do you know?*

For example:

- Based on yesterday's class I assumed that everybody would have a good understanding of the relationship between organisms in an ecosystem. After we discussed the concept again with the freshwater ecosystem example, I think the students showed a greater understanding. I used the students' participation in the class discussion and the development of their visuals to know that they have met the objectives.
- My expectations for group work and unit measurements and conversions were met. Although some groups struggled to cooperate towards the beginning of class and had a hard time getting started, most seemed engaged with the task by the end of the lesson. Their group projects and presentations to the class provided evidence of their understanding of the science concepts and their ability to work in groups. When I read their individual journal entries I was able to see that most students did "get it" but a few are still struggling.

5. *Will today's class session affect your plans for tomorrow (or later in the unit)? If so, how?*

6. *Is there anything else you would like us to know about this lesson that you feel was not captured by the Scoop?*



### **Post-Scoop Reflection Questions**

To be answered at the end of the Scoop timeframe.

When answering these questions, please consider the entire set of lessons and all the materials you have gathered for the Scoop notebook.

1. *How does this series of lessons fit in with your long-term goals for this group of students?*
2. *How representative of your typical instruction was this series of lessons (with respect to content, instructional strategies and student activities)? What aspects were typical? What aspects were not typical?*
3. *How well does this collection of artifacts, photographs, and reflections capture what it is like to learn science in your classroom? How “true-to-life” is the picture of your teaching portrayed by the Scoop?*
4. *If you were preparing this notebook to help someone understand your teaching, what else would you want the notebook to include? Why?*

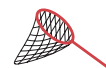
*Please refer to the Final Checklist to be sure you have included everything in the notebook.*



## Daily Calendar

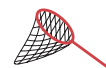
	DAY #1	DAY #2	DAY #3	DAY #4	DAY #5
Date					
Length of session					
Topic of session					
Curriculum materials used					





# Photograph Log

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**APPENDIX C:  
MATHEMATICS SCOOP RATING GUIDE  
CRESST ARTIFACT PROJECT**

The Rating Guide is designed to be used for rating the Scoop Notebook as well as classroom observations. In general, the language applies equally well in both cases. However, in some cases, we modified language or added examples to reflect differences between the two types of ratings. [Comments that apply just to observation or notebooks are noted in brackets.]

The Rating Guide consists of three parts: a quick reference guide; a description of all the rating levels with examples; and a reporting form for recording ratings and justifications/evidence.

*For all dimensions (unless otherwise specified)...*

- *Rate each dimension based on the highest level you found in the notebook or observed during the lesson. (Guiding principle: “When in doubt, be nice.” i.e., give the higher of the 2 ratings.)*
- *The rating should take into account teacher, students, and materials that are used.*
- *Remember, a rating of “5” does not mean perfection; it means that the lesson or series of lessons meets the description of a 5.*
- *One characteristic (limitation) of the Scoop rating scale is that there are many different ways a classroom can be a “medium” on each dimension.*
- *A rating of “medium” may be based on the frequency of multiple features of a dimension (e.g., assessment) and/or different levels of enactment by teachers and students (e.g., explanation/justification). In particular:*
  - *frequent occurrence of some features and limited occurrence of others*
  - *medium occurrence of all features*
  - *medium levels of enactment by both teacher and students*
  - *high level of enactment by one and low level by the other*

**Specific Notes for Observation Ratings:**

1. Take notes during the observation of each lesson.
2. Complete an observation rating each day and then a “summary rating” at the end of the series of observations (after all days of observation).
3. The summary rating completed at the end of the series of observations is a holistic rating (rather than mathematical average).
4. It is sometimes difficult to rate a dimension based on the observation of one lesson, especially when the dimension description includes a “series of lessons.”

## Quick Reference Guide for CRESST SCOOP Ratings

**1. Grouping.** The extent to which the teacher organizes the series of lessons to use groups to work on mathematical tasks that are directly related to the mathematical goals of the lesson and to enable students to work together to complete these activities. Active teacher role in facilitating groups is not necessary.

[The focus for observation of a single lesson is on the nature of the activities, and how integral the group activity is to the substance of the lesson (and not necessarily the amount of time spent in groups.)]

**2. Structure of Lessons.** The extent to which the series of lessons is organized to be conceptually coherent such that activities are related mathematically and build on one another in a logical manner.

NOTE: The focus of this dimension is on design, rather than enactment.

[Ratings of observations should take into account interruptions for procedural activities that are not part of the instructional unit, when these interruptions consume a non-trivial amount of time.]

**3. Multiple Representations.** The extent to which the series of lessons promotes the use of multiple representations (pictures, graphs, symbols, words) to illustrate ideas and concepts. The extent to which students select, use, and translate among (go back and forth between) mathematical representations in an appropriate manner.

NOTE: dimension includes both exposure (by teacher or curriculum) and use by students.

**4. Use of Mathematical Tools.** The extent to which the series of lessons affords students the opportunity to use appropriate mathematical tools (e.g., calculators, compasses, protractors, Algebra Tiles), and that these tools enable them to represent abstract mathematical ideas.

NOTE: When students use equipment and/or objects to collect data that are later used in exploring mathematical ideas, the equipment/objects are not considered to be mathematical tools unless they are also explicitly used to develop the mathematical ideas.

**5. Cognitive Depth.** Cognitive depth refers to command of the central concepts or “big ideas” of the discipline, generalization from specific instances to larger concepts, and

connections and relationships among mathematics concepts. This dimension considers two aspects of cognitive depth: lesson design and teacher enactment. That is, it considers the extent to which lesson design focuses on achieving cognitive depth and the extent to which the teacher consistently and effectively promotes cognitive depth.

**6. Mathematical Discourse Community.** The extent to which the classroom social norms foster a sense of community in which students feel free to express their mathematical ideas honestly and openly. The extent to which the teacher and students “talk mathematics,” and students are expected to communicate their mathematical thinking clearly to their peers and teacher, both orally and in writing, using the language of mathematics.

NOTE: There is a “high bar” on this dimension because there is an expectation for students to have an active role in promoting discourse; this should not be only the teacher’s role. This is in contrast to Explanation/Justification. The rating does take into account whether discourse focuses on mathematics content but not the cognitive depth of that content.

**7. Explanation and Justification.** The extent to which the teacher expects and students provide explanations/justifications, both orally and on written assignments.

NOTE: Simply “showing your work” on written assignments – i.e., writing the steps involved in calculating an answer – does not constitute an explanation. This is different from “cognitive depth” because it is not dependent on “big ideas” in the discipline.

**8. Problem Solving.** The extent to which instructional activities enable students to identify, apply and adapt a variety of strategies to solve problems. The extent to which problems that students solve are complex and allow for multiple solutions.

NOTE: This dimension focuses more on the nature of the activity/task than the enactment. To receive a high rating, problems should not be routine or algorithmic; they should consistently require novel, challenging, and/or creative thinking.

**9. Assessment.** The extent to which the series of lessons includes a variety of formal and informal assessment strategies that measure student understanding of important mathematical ideas and furnish useful information to both teachers and students (e.g., to inform instructional decision-making).

[Often the observer will need to make inferences about how the teacher is using the information, or plans to use the information, especially on a daily observation.]

**10. Connections/Applications.** The extent to which the series of lessons helps students connect mathematics to their own experience, to the world around them, and to other disciplines. The extent to which series of lessons help students apply mathematics to real world contexts and to problems in other disciplines.

NOTE: The experiences may be teacher-generated or student-generated, but they should relate to the students' actual life situations.

**11. Overall.** How well the series of lessons reflects a model of instruction consistent with dimensions previously described. This dimension takes into account both the curriculum and the instructional practices.

NOTE: The rating on this dimension is implicitly a weighted average of the ratings on the first ten dimensions, with greater weight being given to Problem Solving, Cognitive Depth, Mathematics Discourse Community, and Explanation/Justification.

## Description of CRESST SCOOP Rating Levels

**1. Grouping.** The extent to which the teacher organizes the series of lessons to use groups to work on mathematical tasks that are directly related to the mathematical goals of the lesson and to enable students to work together to complete these activities. Active teacher role in facilitating groups is not necessary.

[The focus for observation of a single lesson is on the nature of the activities, and how integral the group activity is to the substance of the lesson (and not necessarily the amount of time spent in groups).]

*High:* Students consistently work in groups doing activities that are directly related to the mathematical goals of the lesson.

Example: Students do some work in groups on most days that information is scooped. For example: on one day the class is divided into groups of 3 or 4 students. Students are asked to compare the average monthly temperature for 4 cities in different parts of the world. Each group discusses and decides how to represent the data in both tabular and graphic forms, and prepares an overhead transparency with its table and graph. The class reconvenes; one member of each group shows the group's transparency and explains its decisions about how to display the data. All group members participate in answering questions that their classmates raise about the table and graph. Each student then answers the following question in his or her journal: "Which of these cities has the best climate? Why do you think so?"

Example: Lessons are organized so that students consistently work on their homework assignments in groups during class time, and all or almost all students are active participants during these sessions.

*Medium:* Either students occasionally work in groups doing activities that are directly related to the mathematical goals of the lesson OR students regularly work in groups doing rote or routine activities (e.g., checking each other's homework for accuracy and completeness, doing flashcards).

Example: Students do some work in groups on some days during which information is scooped. For example: on one day, students are given a table with information about average monthly temperatures for 4 cities in different parts of the world, and a blank graph with the x-axis and y-axis defined. They work in groups to display the tabular information by plotting points on their graphs. They then work individually to answer the following questions in their journals: "Which of these cities has the best climate? Why do you think so?" The class reconvenes and several students volunteer to read their journal entries aloud.



Example: Students do some group work each day, primarily to review materials learned during whole class instruction. For example: on one day, they work in pairs using flash cards to test each other on equivalencies between fractions and percents.

*Low:* Students do not work in groups OR group activities do not involve mathematics.

Example: Students work in pairs to check each other's math notebooks for completion before turning them in.

Example: Instruction occurs only in whole-class or individual settings.

**2. Structure of Lessons.** The extent to which the series of lessons is organized to be conceptually coherent such that activities are related mathematically and build on one another in a logical manner.

NOTE: The focus of this dimension is on design, rather than enactment.

[Ratings of observations should take into account interruptions for procedural activities that are not part of the instructional unit, when these interruptions consume a non-trivial amount of time.]

*High:* The series of lessons is conceptually coherent throughout; activities are related mathematically and build on one another in a logical manner.

Example: In a unit on fractions, instruction begins with a discussion on where students have seen fractions before in their everyday lives in order to elicit students' prior knowledge. The teacher then involves students in an activity where they are required to use fractions for following a recipe and figuring out the price of gasoline. The lesson culminates with a discussion of the different strategies that students used to approach and complete the activity. The teacher assigns the students to bring in newspaper examples of fractions and decimals for the next day's lesson.

*Medium:* The series of lessons is conceptually coherent to some extent, but some activities appear to not be related to one another, OR some activities do not appear to follow in a logical order.

Example: In a unit on fractions, instruction begins with a discussion on where students have seen fractions before in their everyday lives. Next, the teacher demonstrates how to add fractions and discusses why a common denominator is needed. Before continuing with fractions, the teacher hands back a test on area and perimeter taken the previous week and answers questions about it. Then the teacher presents students with a recipe. Students are instructed to read the recipe, which includes several fractions (i.e.,  $\frac{1}{3}$  cup of sugar), and answer questions about the quantities involved. The lesson culminates in an activity in which students add together two fractions and describe a situation where they might have to add fractions together.

*Low:* The series of lessons does not appear to be logically organized and mathematically connected.

Example: One day there is a lesson on graphing linear equations. The next day, the teacher hands back homework from yesterday that involved area and perimeter, and teacher answers questions about it. On the third day, students work on a worksheet introducing graphing calculators. They then practice graphing linear equations. On the final day of the scoop, they work on an unrelated Problem of the Day, in preparation for the state assessment.

**3. Multiple Representations.** The extent to which the series of lessons promotes the use of multiple representations (pictures, graphs, symbols, words) to illustrate ideas and concepts. The extent to which students select, use, and translate among (go back and forth between) mathematical representations in an appropriate manner.

NOTE: dimension includes both exposure (by teacher or curriculum) and use by students.

*High:* Students are regularly exposed to quantitative information in a variety of forms. Students use multiple representations to present data and relationships, select representations appropriate to the tasks, and translate among them.

Example: In a lesson on patterns and functions, the teacher presents sequences in a variety of formats, including numerical lists, geometric patterns, tables, and graphs. Students are expected to identify functions that describe the underlying numerical sequence. Students are also asked to come up with different representations for a variety of functions presented by the teacher, and to indicate which representations are most appropriate for answering different questions about the mathematical functions.

*Medium:* Use of multiple representations has some but not all of the features mentioned above. Students are sometimes exposed to quantitative information in a variety of forms. Students sometimes use multiple representations, select representations appropriate to the tasks, or translate among them.

Example: In a lesson on patterns and functions, the teacher presents sequences as numerical lists and also as geometric patterns. Students are expected to write functions that describe the underlying numerical sequence. Students are also asked to come up with geometric patterns for specific functions presented by the teacher.

Example: In a lesson on patterns and functions, the teacher presents sequences in a variety of formats, including numerical lists, geometric patterns, tables, and graphs. However, student

work focuses exclusively on translating between tables and graphs, or between functions and graphs. The problems indicate which representations to use.

*Low:* Most presentation of numbers and relationships are done in a single form, and most of the work produced by students follows this form.

Example: In a lesson on patterns and functions, the teacher presents numerical sequences and asks students to write functions that describe the sequence.

**4. Use of Mathematical Tools.** The extent to which the series of lessons affords students the opportunity to use appropriate mathematical tools (e.g., calculators, compasses, protractors, Algebra Tiles), and that these tools enable them to represent abstract mathematical ideas.

NOTE: When students use equipment and/or objects to collect data that are later used in exploring mathematical ideas, the equipment/objects are not considered to be mathematical tools unless they are also explicitly used to develop the mathematical ideas.

*High:* Students' use of mathematical tools (including manipulatives) forms a regular and integral part of instruction throughout the series of lessons. The students are encouraged to use these tools in ways that express important mathematical ideas and to discuss the relationships between the tools and these ideas.

Example: Students are engaged in the task of modeling a long-division problem. Different types of tools are assigned to groups; some use base-ten blocks, some use play money, and some use loose centimeter cubes. Each group has a piece of chart paper on which they represent the way they modeled the problem. The students present their solution and the class discusses the affordances of each representation. On the following day, the students model a division problem with a remainder and discuss different ways to represent the remainder. Later in the week students create their own division story problems that other groups represent with manipulatives of their choice, explaining that choice.

Example: In a unit on linear equations, students use a graphing calculator to graph linear equations. Next, they use graphing calculator to explore how the slope and intercept of a line are affected by changing the coefficient of the x-term and the constant term in the point-slope form of the equation. They then use tables of values to identify coordinates of points for graphing equations on graph paper, and they compare the understandings fostered by these two approaches to graphing.

*Medium:* Students are encouraged to use mathematical tools (including manipulatives) to solve problems with little or no explicit connection made between

the representation and mathematical ideas OR they use tools occasionally to express important mathematical ideas.

Example: Students are asked to solve a long division problem. Students are encouraged to use manipulatives to solve the problem. When most of the students are finished, the class convenes and the teacher chooses students to explain their solutions to the class. Students may comment that they chose one method of solution and associated manipulatives over another (or chose not to use manipulatives) because “it’s faster,” but the mathematical concepts behind these choices are left undeveloped.

Example: In a unit on linear equations, students use tables of values to identify coordinates of points for graphing equations on graph paper. They graph a set of lines to explore how the slope and intercept of the lines are affected by changing the coefficient of the x-term and the constant term in the equations. Then they confirm the accuracy of the graph using a graphing calculator

*Low:* Students are permitted to use mathematical tools (including manipulatives) if they are having difficulty with a mathematics procedure, or the only tools that are used are the standard paper, textbooks, and chalkboard.

Example: Students are asked to solve a long division problem. Several students ask for the teacher’s help and he suggests they try using base-ten blocks to model the problem. The teacher stays with the students and assists them in using the materials.

**5. Cognitive Depth.** Cognitive depth refers to command of the central concepts or “big ideas” of the discipline, generalization from specific instances to larger concepts, and connections and relationships among mathematics concepts. This dimension considers two aspects of cognitive depth: lesson design and teacher enactment. That is, it considers the extent to which lesson design focuses on achieving cognitive depth and the extent to which the teacher consistently and effectively promotes cognitive depth.

*High:* Lessons focus on central concepts or “big ideas” and promote generalization from specific instances to larger concepts or relationships. The teacher consistently promotes student conceptual understanding. The teacher regularly attempts to engage students in discussions or activities that address central mathematical ideas and principles.

Example: The teacher designs a series of lessons in which students are asked to use their understandings of variable to symbolically represent the word problem “There are 6 times as many students as teachers at Lynwood School. Write a number sentence that shows the relationship between the number of students and the number of teachers.” After generating an equation, each student graphs her equation and writes an explanation of the relationship. The

students volunteer their conjectures, which are written on the board. Then the teacher facilitates a discussion about the students' conjectures and linear relationships between two variables.

*Medium:* The series of lessons has some but not all of the features mentioned above. Lessons may focus on mastery of isolated concepts, but not on connections among them (e.g., they may require students to explain or describe the concept but not to use it or apply it), OR, the teacher sometimes attempts to engage students in discussions about connections between mathematical concepts and sometimes demonstrate these connections, but not consistently.

Example: Students are asked to represent the above word problem in an equation. The students then are asked to plug in 5 sets of numbers to see if their equation works. The teacher selects two or three equations as anonymous examples and leads the class in comparing the equations and determining whether they are correct.

*Low:* Lesson focuses on procedural mathematics, e.g., disconnected vocabulary, formulas, and procedural steps. These are elements of mathematics that can be memorized without requiring an understanding of the larger concepts. The teacher rarely attempts to engage students in instructional activities that demonstrate the connectedness of mathematical concepts and principles. The teacher's interactions with students focus on correctness of their answers rather than on conceptual understanding.

Example: The teacher defines the terms variable and linear relationship and tells the students they will be working on these concepts. Students are then given the equation  $6 \times t = s$  and told that it represents the same word problem as above. The students have to plug in 5, 10, 20, 50, and 100 for  $t$  to see how many students would be at the school.

**6. Mathematical Discourse Community.** The extent to which the classroom social norms foster a sense of community in which students feel free to express their mathematical ideas honestly and openly. The extent to which the teacher and students "talk mathematics," and students are expected to communicate their mathematical thinking clearly to their peers and teacher, both orally and in writing, using the language of mathematics.

NOTE: There is a "high bar" on this dimension, because there is an expectation for students to take an active role in promoting discourse; this should not be only the teacher's role. This is in contrast to Explanation/Justification. The rating does take into account whether discourse focuses on mathematics content but not the cognitive depth

of that content.

[The kind of indirect evidence we might find in the notebook includes:

- teacher reflections, such as:
  - I had students compare their solution strategies with one another;
  - I consciously try to get students to voice their ideas;
  - I walked around and listened to students' conversations
  - I encourage students to ask each other questions when they present their solutions to the class.
- peer reflections on student written work
- lesson plans showing discussion of mathematical topics]

*High:* Students consistently are encouraged to express their mathematical thinking to other students and the teacher, and they are supported by the teacher and other students in their efforts to do so. Students' ideas are solicited, explored, and attended to throughout the lesson, and students consistently use appropriate mathematical language. Emphasis is placed on making mathematical reasoning public, raising questions and challenging ideas presented by classmates.

Example: Students are using reallocation to find "fair prices" for different sizes and shapes of floor tile. As the students work in groups, the teacher moves around the room listening to their discussions and, at times, joining them. In answer to student questions, the teacher responds with suggestions or her own questions, keeping the focus on thinking and reasoning. Later, each group is expected to show the whole class how they used reallocation to find the prices of the tiles. The teacher encourages the use of appropriate mathematical language during this discussion. Classmates actively engage with the presenters by raising questions, challenging assumptions, and verbally reflecting on their reactions to the findings presented. The teacher asks probing questions, and pushes the thinking of both presenters and peers. These discourse patterns appear to be the norm.

*Medium:* Students are expected to communicate about mathematics in the classroom, but communication is typically teacher-initiated (e.g., the teacher attempts to foster student-to-student communication but students don't communicate with each other without teacher mediation). The use of appropriate mathematical language may or may not be consistent.

Example: Students are using reallocation to find "fair prices" for different sizes and shapes of floor tile. As the students work in groups, the teacher moves around the room listening to their discussions. When students stop her and ask for help or ask a question about the assignment, the

teacher tells students how to reallocate portions of the tiles in order to calculate their areas. At the end of the activity, students from each group are asked to show how they reallocated the tile areas. Their classmates listen to presentations, but do not ask questions, challenge results or react to the findings. Although students participate in the discussion, the teacher takes responsibility for developing the mathematical content. The students are typically giving answers to the teacher's questions, rather than engaging in student to student communication. The teacher is quick to provide content if it is missing from the presentations, or asks leading questions trying to prompt presenters into filling in the missing content.

*Low:* The teacher transmits knowledge to the students primarily through lecture or direct instruction. Those discussions that occur are typically characterized by IRE (initiation, response, evaluation) or "guess-what's-in-my-head" discourse patterns. Students rarely use appropriate mathematical language. Student-to-student communication, when it occurs, is typically procedural and not about mathematical thinking.

Example: The teacher works on the overhead projector to show students how to use reallocation to find "fair prices" for pieces of floor tile in different sizes and shapes. As she works, she calls on students to suggest reallocation possibilities, evaluating the correctness of each student's response as it is given. All of the teacher's questions have known answers. If "correct" answers are not given, the teacher asks the question again or provides the answer.

**7. Explanation and Justification.** The extent to which the teacher expects and students provide explanations/justifications, both orally and on written assignments.

NOTE: Simply "showing your work" on written assignments – i.e., writing the steps involved in calculating an answer – does not constitute an explanation. This is different from "cognitive depth" because it is not dependent on "big ideas" in the discipline.

*High:* Teacher consistently expects students to explain their mathematical thinking and problem solving strategies, both orally and on written assignments. Students' explanations show their understanding of generalized principles or previously proved conjectures, rather than examples or an appeal to authority. NOTE: We need to see evidence not only of teacher expectations, but also of a variety of students giving explanations and justifications.

Example: For the problem  $125x+137=127x+135$ , a student explains that she knew there were two more groups of  $x$  on the right side and that 137 is two more than 135. So she simplified the equation to  $2=2x$ . She pointed out that the only way you can get the same number back in multiplication is to multiply that number by one. Therefore  $x$  has to be one.

Example: In a whole class discussion, one student justifies that  $a \times b \div b = a$  is always true by saying that when you divide a number by itself, you get one. So it's really like multiplying by one, and any number times one gets you the original number. Several other students also share the explanations they had written on their papers.

*Medium:* Teacher sometimes expects students to explain their mathematical thinking and problem solving strategies. Students sometimes provide explanations/justifications that include mathematical ideas. Students' explanations are usually procedural rather than conceptual. Or, teacher consistently expects students to explain their mathematical thinking, but students often do not provide such explanations.

Example: A student explains that she subtracted  $125x$  from both sides like she did on the previous problem. That gave her  $137 = 2x + 135$ . Then she subtracted 135 from both sides because she can only subtract the smaller number from the larger one. That gave her  $2 = 2x$ . Next she divided 2 into both sides and that gave her  $1 = x$ . Although the teacher consistently asks students to explain their mathematical thinking, students typically describe the procedures they used to get their answers.

Example: In proving whether  $a \times b \div b = a$  is true a student generates the example of  $5 \times 4 \div 4 = 5$ . But he makes no reference to conjectures or properties about dividing a number by itself or multiplying a number by one. No justification is made on whether the equation is always true or not.

*Low:* Students rarely provide explanations. When they do, their explanations typically are procedural, and their justifications are generally an appeal to authority.

Example: "I subtracted the same number from both sides and divided to get one." Student explains the steps but never why he did them.

Example: "It's true because the book says it is" or "it just is." "You (the teacher) said yesterday that it was true."

**8. Problem Solving.** The extent to which instructional activities enable students to identify, apply and adapt a variety of strategies to solve problems. The extent to which problems that students solve are complex and allow for multiple solutions.

NOTE: this dimension focuses more on the nature of the activity/task than the enactment. To receive a high rating, problems should not be routine or algorithmic; they should consistently require novel, challenging, and/or creative thinking.



*High:* Problem solving is an integral part of the class' mathematical activity. Students work on problems that are complex, integrate a variety of mathematical topics, and lend themselves to multiple solution strategies. Sometimes problems have multiple solutions OR sometimes students are asked to formulate problems as well as solve them.

Example: During a unit on measurement, students regularly solve problems such as: "Estimate the length of your family's car. If you lined this car up bumper to bumper with other cars of the same size, about how many car lengths would equal the length of a blue whale?" After solving the problem on their own, students compare their solutions and discuss their solution strategies. The teacher reinforces the idea that there are many different strategies for solving the problem and a variety of answers because the students used different estimates of car length to solve the problem.

Example: At the end of a unit on ratio and proportion, pairs of students are asked to create problems for their classmates to solve. Several pairs produce complex problems such as the following: "Baseball Team A won 48 of its first 80 games. Baseball Team B won 35 of its first 50 games. Which team is doing better?"

*Medium:* Problem solving occurs occasionally and is a central component of some of the class's mathematical activity. For the most part, students work on problems that incorporate one or two mathematical topics and require multiple steps. Some problems lend themselves to multiple solution strategies. Rarely if ever do problems have multiple solutions AND rarely are students asked to formulate problems.

Example: During a unit on measurement, the teacher presents problems such as: "A car is exactly 3.5 meters long. If you lined this car up bumper to bumper with other cars of the same size, about how many car lengths would equal the size of a blue whale?" After solving the problem in groups, the teacher asks the groups to show how they got their answer. She highlights the fact that they came up with several different and creative strategies for solving the problem.

Example: During a unit on ratio and proportion, students solve problems such as: "A baseball team won 48 of its first 80 games. How many of its next 50 games must the team win in order to maintain the ratio of wins to losses? Justify your answer." The teacher gives the right answer and students present their strategies.

*Low:* Problem-solving activities typically occur only at the end of instructional units or chapters, or not at all. The mathematical problems that students solve address a single mathematical topic, have a single correct answer, and provide minimal opportunities for application of multiple solution strategies.

Example: During a unit on measurement, the teacher presents problems such as: “A car is exactly 3.5 meters long. If you lined this car up bumper to bumper with four other cars of the same size, how long would the cars be all together?” Before the students begin to solve the problem, the teacher uses a diagram to model the strategy for solving the problem. After the students solve the problem in groups, the teacher makes sure they all got the correct answer.

Example: At the end of a textbook chapter on ratio and proportion, students solve problems such as: “A baseball team won 48 of its first 80 games. What percent of the 80 games did it win?”

**9. Assessment.** The extent to which the series of lessons includes a variety of formal and informal assessment strategies that measure student understanding of important mathematical ideas and furnish useful information to both teachers and students (e.g., to inform instructional decision-making).

[Often the observer will need to make inferences about how the teacher is using the information, or plans to use the information, especially on a daily observation.]

*High:* Assessment takes multiple forms, occurs throughout the unit, and taps a variety of mathematical thinking processes. Assessment is used to provide substantive feedback to students about their mathematical understanding, and to inform instructional practice.

Example: Students in an algebra class are asked to represent graphically a race in which two contestants begin at different starting points. The students are also required to write a paragraph explaining their choice of graph and their justification for it. The teacher discovers that only two students have been able to justify their responses adequately, and that most graphs are flawed. She changes her plan for the lesson and engages the class in a discussion of the various representations focusing on several specific examples from the students’ work. As a follow-up, she gives students a homework assignment or quiz in which they are asked to explain the meaning of a graph which she provides for them.

*Medium:* Assessment has some but not all of the features mentioned above. There is a limited variety of assessment strategies, only some indication that assessment drives instructional decision-making, or limited evidence of substantive feedback to students.

Example: Students are asked to graph the same race as in the high example, but are not asked to explain their mathematical thinking. When the teacher looks at the graphs, she sees that most students were not able to do the assignment. In response, she talks aloud as she constructs a correct version of the graph on the overhead. She tells the students they will have a quiz the next day, in which they will be asked to explain the meaning of a graph which she provides for them. She then begins a new lesson on another aspect of graphing linear equations.

*Low:* Assessment has few of the features mentioned above. There is little indication of a variety of formal and informal assessment strategies. There is little evidence that assessment drives instructional decision-making or is used to provide substantive feedback to students.

*Example:* At the end of a unit on linear equations, the teacher gives the student a multiple-choice test. Students get their Scantron answer forms back with their grades written on the top. The teacher goes over two or three problems that were missed by the greatest number of students.

**10. Connections/Applications.** The extent to which the series of lessons helps students connect mathematics to their own experience, to the world around them, and to other disciplines. The extent to which series of lessons helps students to apply mathematics to real world contexts and to problems in other disciplines.

NOTE: The experiences may be teacher-generated or student-generated, but they should relate to the students' actual life situations.

*High:* Students are regularly asked to make connections between the math they are learning in class and their own experiences, the world around them, and other academic disciplines. Students learn to apply classroom math in contexts that are relevant to their own lives. Explicit connections are made between the mathematics and the students' personal experiences.

Example: In a lesson on percentages, students are engaged in a discussion about where they have seen or used percentages before. Students give the example of sales tax. The next day, a student brings to class a newspaper article discussing the sales tax. Teacher uses this article to engage students in an activity demonstrating how taxes are decided upon and how they are computed. During the lesson, one student comments that sometimes the article shows the sales tax as a percentage and at other times as a decimal. The teacher poses a final question asking students when each of the differing representations would be used and why.

Example: In a lesson on representing data with tables and graphs, the students discuss ways in which they have displayed data in lab exercises in their science class. Several students bring in examples of data tables from their science class and they work in groups to display these data using graphs.

*Medium:* Students have some opportunities to connect math to their own experience, the world around them, and other disciplines, and to apply the mathematics they are learning to real-world settings. However, these opportunities

occur only occasionally, or the examples are potentially relevant to the students' own lives but not explicitly connected to their experiences.

Example: In a lesson on computing percentages, the teacher shares a newspaper article about the fact that the income tax has risen. The teacher discusses that the new tax will mean that higher income families will pay an extra 3% on earning over \$100,000. The teacher demonstrates how the new income tax will be computed. Lesson culminates with an activity where students compute the new income tax on different household incomes.

*Low:* Students are rarely asked to make connections between the math learned in the classroom and their own experience, the world around them, and other disciplines, or to apply the mathematics they learn to the world around them. When connections/applications are made, they are through happenstance and are not a planned effort on the part of the instructor.

Example: In a lesson on calculating percentages, students are told to convert their percentage into a decimal and then to multiply. Students are given a worksheet of problems that require the use of this procedure. While working on the worksheet, one student shouts out that he has seen percentages before on the back of cereal boxes. The teacher confirms that percentages can be found on cereal boxes and then tells student to proceed with their worksheet.

**11. Overall.** How well the series of lessons reflects a model of instruction consistent with dimensions previously described. This dimension takes into account both the curriculum and the instructional practices.

NOTE: The rating on this dimension is implicitly a weighted average of the ratings on the first ten dimensions, with greater weight being given to Problem Solving, Cognitive depth, Mathematics Discourse Community, and Explanation/Justification.

# Mathematics SCOOP Rating Reporting Form

Teacher: \_\_\_\_\_

Date: \_\_\_\_\_

Rater: \_\_\_\_\_

## 1. Grouping

(Circle one) 1 2 3 4 5

Justification

## 2. Structure of Lessons

(Circle one) 1 2 3 4 5

Justification

Note: Scoring sheets continue in this manner for the rest of the dimensions.

**APPENDIX D:  
SCIENCE SCOOP RATING GUIDE  
CRESST ARTIFACT PROJECT**

The Rating Guide is designed to be used for rating the Scoop Notebook as well as classroom observations. In general, the language applies equally well in both cases. However, in some cases, we modified language or added examples to reflect differences between the two types of ratings. [Comments that apply just to observation or notebooks are noted in brackets.]

The Rating Guide consists of three parts: a quick reference guide; a description of all the rating levels with examples; and a reporting form for recording ratings and justifications/evidence.

*For all dimensions (unless otherwise specified)...*

- *Rate each dimension based on the highest level you found in the notebook or observed during the lesson. (Guiding principle: "When in doubt, be nice." i.e., give the higher of the 2 ratings.)*
- *The rating should take into account teacher, students, and materials that are used.*
- *Remember, a rating of "5" does not mean perfection; it means that the lesson or series of lessons meets the description of a 5.*
- *One characteristic (limitation) of the Scoop rating scale is that there are many different ways a classroom can be a "medium" on each dimension.*
- *A rating of "medium" may be based on the frequency of multiple features of a dimension (e.g., assessment) and/or different levels of enactment by teachers and students (e.g., explanation/justification). In particular:*
  - *frequent occurrence of some features and limited occurrence of others*
  - *medium occurrence of all features*
  - *medium levels of enactment by both teacher and students*
  - *high level of enactment by one and low level by the other*

**Specific Notes for Observation Ratings:**

1. Take notes during the observation of each lesson.
2. Complete an observation rating each day and then a “summary rating” at the end of the series of observations (after all days of observation).
3. The summary rating completed at the end of the series of observations is a holistic rating (rather than mathematical average).

It is sometimes difficult to rate a dimension based on the observation of one lesson, especially when the dimension description includes a “series of lessons.”

## Quick Reference Guide for CRESST SCOOP Ratings

**1. Grouping.** The extent to which the teacher organizes the series of lessons to use groups to work on scientific tasks that are directly related to the scientific goals of the lesson, and to enable students to together to complete these activities. Active teacher role in facilitating groups is not necessary.

[The focus for observation of a single lesson is on the nature of the activities, and how integral the group activity is to the substance of the lesson (and not necessarily the amount of time spent in groups).]

**2. Structure of Lessons.** The extent to which the series of lessons is organized to be conceptually coherent such that activities are related scientifically and build on one another in a logical manner.

NOTE: The focus of this dimension is on design, rather than enactment. [Ratings of observations should take into account interruptions for procedural activities that are not part of the instructional unit, when these interruptions consume a non-trivial amount of time.]

**3. Use of Scientific Resources.** The extent to which a variety of scientific resources (e.g., computer software, internet resources, video materials, laboratory equipment and supplies, scientific tools, print materials,) permeate the learning environment and are integral to the series of lessons. These resources could be handled by the teacher and/or the students, but the lesson is meant to engage all students. By variety we mean different types of resources OR variety within a type of scientific resource.

**4. “Hands-On”.** The extent to which students participate in activities that allow them to physically engage with scientific phenomena by handling materials and scientific equipment.

NOTE: The emphasis is on direct observation and interaction with scientific equipment and physical objects, to address the substance of the science lesson. Acting out a scientific phenomenon does count. Computers don’t unless use involves equipment such as probes.

**5. Inquiry.** The extent to which the series of lessons involves the students actively engaged in posing scientifically oriented questions, designing investigations, collecting evidence, analyzing data, and answering questions based on evidence.



NOTE: There is a “high bar” on this one. The focus is on the enactment of the lesson and student engagement. A key question is whether the unit/activity is designed so that all phases of inquiry are part of the unit, not whether we observe all phases during the Scoop days. To be true to the intent of this dimension, we should make inferences about the features of inquiry that are incorporated into the entire investigation.

**6. Cognitive Depth.** Cognitive depth refers to a focus on the central concepts or “big ideas” of the discipline, generalization from specific instances to larger concepts, and connections and relationships among science concepts. This dimension considers two aspects of cognitive depth: lesson design and teacher enactment. That is, it considers the extent to which lesson design focuses on achieving cognitive depth and the extent to which the teacher consistently promotes cognitive depth.

**7. Scientific Discourse Community.** The extent to which the classroom social norms foster a sense of community in which students feel free to express their scientific ideas honestly and openly. The extent to which the teacher and students “talk science,” and students are expected to communicate their scientific thinking clearly to their peers and teacher, both orally and in writing, using the language of science.

NOTE: There is a “high bar” on this one, because there is an expectation for student active role in promoting discourse; this should not be only the teacher’s role. This is in contrast to Explanation/Justification. The rating does take into account whether discourse focuses on science content but not the cognitive depth of that content.

**8. Explanation/Justification.** The extent to which the teacher expects and students provide explanations/justifications, both orally and on written assignments.

NOTE: This one is different from “cognitive depth” because it is not dependent on “big ideas” in the discipline.

**9. Assessment.** The extent to which the series of lessons includes a variety of formal and informal assessment strategies that measure student understanding of important scientific ideas and furnish useful information to both teachers and students (e.g., to inform instructional decision-making).

[Often the observer will need to make inferences about how the teacher is using the information, or plans to use the information, especially on a daily observation.]

**10. Connections/Applications.** The extent to which the series of lessons helps students: connect science to their own experience and the world around them; apply science to real world contexts; or understand the role of science in society (e.g., how science can be used to inform social policy).

NOTE: The experiences may be teacher-generated or student-generated, but they should relate to the students' actual life situations or social issue relevant to their lives.

**11. Overall.** How well the series of lessons reflects a model of instruction consistent with dimensions previously described. This dimension takes into account both the curriculum and the instructional practices.

NOTE: The rating on this dimension is implicitly a weighted average of the ratings on the first ten dimensions, with greater weight being given to Inquiry, Cognitive Depth, Scientific Discourse Community, and Explanation/Justification to the extent that the rater felt he/she could rate these dimensions accurately.

## Description of CRESST SCOOP Rating Levels

**1. Grouping.** The extent to which the teacher organizes the series of lessons to use groups to work on scientific tasks that are directly related to the scientific goals of the lesson, and to enable students to together to complete these activities. Active teacher role in facilitating groups is not necessary.

[The focus for observation of a single lesson is on the nature of the activities, and how integral the group activity is to the substance of the lesson (and not necessarily the amount of time spent in groups).]

*High:* Teacher designs activities to be done in groups that are directly related to the scientific goals of the lesson. The majority of students work on these activities in groups.

Example: The class is divided into groups, with each group focusing on a different planet. Students conduct research to design a travel brochure, describing the environment of their planet. Students are then reorganized into groups, with one student from each planet group in each of the new groups, to explore how the distance from the Sun affects characteristics of planetary environments such as the length of a day, the length of a year, temperature, weather, and surface composition.

Example: Students are divided into small groups to brainstorm how animals in different habitats are adapted to the unique features of their environments. Each group is considering a different environment (desert, mountain, woodland, etc). The class reconvenes to consider what characteristics of animals are important to examine when thinking about how an animal is adapted to its environment. Armed with the class list, students work in pairs to examine a spider and hypothesize about where this animal might live.

*Medium:* Teacher designs activities to be done in groups, but some students work independently on the activities, without interacting with other students OR students occasionally work in groups doing activities that are directly related to the scientific goals of the lesson OR students regularly work in groups doing rote or routine activities (e.g. checking each other's homework for accuracy and completeness, quiz each other on scientific terminology).

Example: In a unit on the solar system, each day the teacher delivers a lecture on the solar system, students read about it in their textbooks, and then work in groups of 3-4 to complete a worksheet.

Example: Students read about spiders in their textbook, and then they break into groups of 3-4 to study real spiders in terrariums. They return to their desks to complete a worksheet about their observations.

*Low:* Students do not work in groups OR group activities do not involve science.

Example: The teacher delivers a lecture on the solar system, students read about it in their textbooks, and complete an individual worksheet.

Example: Students watch a video about the anatomy of spiders. They form into groups to practice for the upcoming state test by bubbling in answer sheets.

**2. Structure of Lessons.** The extent to which the series of lessons is organized to be conceptually coherent such that activities are related scientifically and build on one another in a logical manner.

NOTE: The focus of this dimension is on design, rather than enactment. [Ratings of observations should take into account interruptions for procedural activities that are not part of the instructional unit, when these interruptions consume a non-trivial amount of time.]

*High:* The series of lessons is conceptually coherent throughout; activities are related scientifically and build on one another in a logical manner.

Example: A unit of instruction on air pressure begins by engaging students through a provocative event in which they experience the effects of air pressure (trying to drink orange juice out of a cup through two straws in which one straw is placed outside of the cup). This activity includes opportunities for students to explore and raise questions about their experiences with the orange juice. The teacher then involves students in a logical sequence of experiments and class discussions about air pressure. Lessons culminate in conclusions or generalizations made through evidence gained during students' exploration of the effects of air pressure, current scientific explanations provided, and opportunities to apply their developing understanding of air pressure to new phenomena, events or activities.

*Medium:* The series of lessons is conceptually coherent to some extent, but some activities appear to not be related to one another, OR some activities do not appear to follow in a logical order.

Example: A unit of instruction on air pressure begins with the teacher explaining air pressure and its effect on our lives. The next day the teacher hands back a test on force and motion and the class discusses the results. Following that, the teacher involves students in a series of disjointed activities in which they experience or witness the effects of air pressure. Lessons culminate in opportunities for students to demonstrate what they have learned about air pressure.

*Low:* The series of lessons does not appear to be logically organized and connected.

Example: In a unit on air pressure, students see a video on scuba diving one day, review homework from a previous unit on force and motion the next day, listen to a lecture on the ideal gas law the third day, practice identifying scientific apparatus in preparation for the state test on the next day, and participate in the orange juice/straw experiment described above on the final day.

**3. Use of Scientific Resources.** The extent to which a variety of scientific resources (e.g., computer software, internet resources, video materials, laboratory equipment and supplies, scientific tools, print materials,) permeate the learning environment and are integral to the series of lessons. These resources could be handled by the teacher and/or the students, but the lesson is meant to engage all students. By variety we mean different types of resources OR variety within a type of scientific resource.

*High:* The use of a variety of scientific resources forms a regular and integral part of instruction throughout the lesson/series of lessons. The lesson is meant to engage all students (e.g. teacher demonstration in which all students are watching).

NOTE: there are at least two categories of resources – scientific lab resources and print-based resources. Variety could be variety within each category or across the two categories.

Example: On the first day of an ecosystem unit, the students work in pairs in the computer lab on a predator/prey simulation activity from a science cd-rom. The next day, the teacher leads a discussion on ecosystems and uses clips from a video throughout the lesson. The following day, the students are assigned an ecosystem to research in the library. After gathering their information, the students create posters about each of their ecosystems.

Example: As an introduction to a unit on Newton's Laws, the teacher begins with a free fall demonstration using a variety of objects (e.g. bowling ball, tennis ball, feather,) and a stopwatch. The students all watch the demonstration and individually write predictions, observations, and explanations. The next day the teacher shows the students how to access data from the NASA website and asks them to use the data to discover the rate of falling objects. On the following day, a professional skydiver comes to talk about her own experience with free falling.

*Medium:* The series of lessons has some but not all of the features mentioned above. A limited variety of resources are used, OR a variety of resources are used, but only occasionally, OR some but not all students have access.

Example: Throughout the Scoop timeframe, the class is divided into groups of students, each assigned to a different ecosystem. Their task is to create a poster that represents the interactions of the organisms in their ecosystem. For three days, the groups work on their posters drawing information from their textbook and a science cd-rom.

Example: As an introduction to a unit on Newton's Laws, the teacher begins with a free fall demonstration using a variety of objects (e.g. bowling ball, tennis ball, feather,) and a stopwatch. The students watch the demonstration and individually write predictions, observations, and explanations. The next day the teacher lectures and uses video clips about free fall. For the remaining time in the Scoop, the students work on questions from the textbook.

*Low:* Scientific resources are rarely used in class other than textbooks and worksheets.

Example: Throughout the Scoop timeframe, the class is divided into groups of students, each assigned to a different ecosystem. Their task is to create a poster that represents the interactions of the organisms in their ecosystem. The students use their science textbooks as resources.

Example: As an introduction to a unit on Newton's Laws, the teacher conducts a lesson using power point and the students copy notes from the presentation. To conclude the lesson, the students work on questions from the textbook.

**4. "Hands-On".** The extent to which students participate in activities that allow them to physically engage with scientific phenomena by handling materials and scientific equipment.

NOTE: The emphasis is on direct observation and interaction with scientific equipment and physical objects, to address the substance of the science lesson. Acting out a scientific phenomenon does count. Computers don't unless use involves equipment such as probes.

*High:* During a series of lessons, all students have regular opportunities to work with materials and scientific equipment.

Example: As part of an investigation of water quality in their community, students bring water samples into class. They set up the appropriate equipment and measure the pH levels of the samples. In class the next day, students discuss how pH is related to water quality. The following day, they perform the same tests at a local stream and observe aquatic life in the stream.

Example: As part of a discussion of plate tectonics, students model plate boundaries by acting them out with their bodies. The next day students cut out pictures of different types of plate boundaries, assemble them on a separate sheet of paper, and label and define each one. Later in the unit, students perform a lab on convection currents using a variety of laboratory equipment (e.g. beakers, hot plate, food coloring) to further their understanding of the mechanics of plate

movement.

*Medium:* During a series of lessons, some of the students work regularly with materials or scientific equipment OR all students work with materials or scientific equipment but only occasionally.

Example: As part of an investigation of water quality in their community, the teacher brings water samples into class and sets up equipment to measure its pH. The teacher selects several students who then measure the pH levels of these water samples while the others observe. The following day, the teacher takes them outside to watch a few students test the pH of water in a local stream.

Example: As part of a discussion of plate tectonics, students model plate boundaries by acting them out with their bodies. Later in the unit, students supplement their reading about faults by using wooden blocks to represent different fault types.

*Low:* There are no activities that require students to handle or work with materials or scientific equipment (other than pencil and paper).

Example: As part of a unit on water quality, the teacher brings water samples into class, sets up equipment to measure its pH, and performs the measurements while students observe.

Example: During a series of lessons on plate tectonics, the students take notes while the teacher lectures. The students read the textbook to supplement the lectures.

**5. Inquiry.** The extent to which the series of lessons involves the students actively engaged in posing scientifically oriented questions, designing investigations, collecting evidence, analyzing data, and answering questions based on evidence.

NOTE: There is a “high bar” on this one. The focus is on the enactment of the lesson and student engagement. A key question is whether the unit/activity is designed so that all phases of inquiry are part of the unit, not whether we observe all phases during the Scoop days. To be true to the intent of this dimension, we should make inferences about the features of inquiry that are incorporated into the entire investigation.

*High:* Over a series of lessons, students are engaged in all features of inquiry including posing scientifically oriented questions, designing investigations, collecting evidence, analyzing data, and answering questions based on evidence.

Example: As part of a unit on motion, students are designing an amusement park. One group has chosen to work on a swinging Viking ship ride, and they are worried that the number of people on the ride (and their weight) will affect how fast the ride swings. They construct a simple

pendulum and design an experiment to answer the question, “How does the weight at the end of a pendulum affect the amount of time it takes to complete ten swings?” They conduct the investigation and use the results to inform their design.

Example: The class has been discussing global warming. As a class, they decide to investigate how the temperature in their city has changed over the past 100 years. Students debate about what data they should gather, and different groups of students end up approaching the problem in different ways. The groups collect the data, analyze them, and present their results

*Medium:* The series of lessons has some but not all of the features mentioned above. Students are occasionally engaged in designing investigations and finding answers to scientific questions OR engagement occurs regularly but does not include all components of the inquiry process.

Example: Students are asked, “What is the relationship between the length of a pendulum and the period of its swing? Between the weight at the end of the pendulum and the period?” To answer the questions, students follow a carefully scripted lab manual, taking measurements and graphing the data. They use their results to formulate an answer to the question.

Example: As part of a series of lessons on global warming, the teacher asks the students to show how the temperature of different cities has changed over the past 100 years. They select cities, gather data from the library, graph the information and report what they found.

EXAMPLE OF A “2” RATING:

Example: Students follow a carefully scripted lab manual to verify the formula for the period of a pendulum’s swing given in a lecture the day before. They follow a carefully scripted lab manual, taking specific measurements and making specific graphs of their data. They conclude with answering factual questions in the lab manual.

NOTE: Another situation that would receive a lower rating is one in which the teacher does one thing well and richly (e.g., have students pose questions), but doesn’t carry it through, and the rater sees no evidence that the class is on a trajectory to carry it through.

*Low:* During a series of lessons, students are rarely or never engaged in scientific inquiry.

Example: Students read in their textbook that the temperature of the Earth is rising  $x$  degrees per decade. At the back of the book, there is a table of data on which this statement was based. Following specific instructions, students graph this data to verify the statement in their book.

**6. Cognitive Depth.** Cognitive depth refers to a focus on the central concepts or “big



ideas” of the discipline, generalization from specific instances to larger concepts, and connections and relationships among science concepts. This dimension considers two aspects of cognitive depth: lesson design and teacher enactment. That is, it considers the extent to which lesson design focuses on achieving cognitive depth and the extent to which the teacher consistently promotes cognitive depth.

NOTE: If you are unfamiliar with the content area for the unit studied during the Scoop period, refer to the state or national Science standards to better understand the “big ideas.”

*High:* Lessons focus on central concepts or “big ideas” and promote generalization from specific instances to larger concepts or relationships. The teacher consistently promotes student conceptual understanding. The teacher regularly attempts to engage students in discussions or activities that address central scientific ideas and principles.

Example: The teacher designs a series of lessons in which students are asked to use their understandings of the relative motions of the Earth, sun, and moon and how light is reflected between these celestial bodies to demonstrate and explain the phases of the moon. Students work in groups to develop a kinesthetic model and verbal explanation of their understanding of this concept, and then present their ideas to their classmates and teacher. After the group demonstrations, the teacher facilitates a discussion in which students compare and contrast the different groups’ portrayals of the concept.

*Medium:* The series of lessons has some but not all of the features mentioned above. Lessons may focus on mastery of isolated concepts, but not on connections among them, (e.g. lessons may require students to explain or describe the concept but not to use it or apply it). OR, the teacher sometimes attempts to engage students in discussions about connections between scientific concepts and sometimes responds to students in ways that promote student conceptual understanding.

Example: During a class discussion, the teacher asks students to explain the phases of the moon. They respond with a description of the experiment from the day before on reflection of light. They also describe that light from the sun reflects off the moon, however they do not discuss the relationship between the reflection of light and the location of the sun, Earth, and moon as the key to the phases of the moon.

*Low:* The series of lessons focuses on discrete pieces of scientific information, e.g., disconnected vocabulary, definitions, formulas, and procedural steps. These are elements of science that can be memorized without requiring an understanding of

the larger concepts. The teacher rarely attempts to engage students in instructional activities that demonstrate the connectedness of scientific concepts and principles. The teacher's interactions with students focus on correctness of their answers rather than on conceptual understanding.

Example: Over a series of lessons, the students learn the orbit of the moon and Earth, and the names for each phase of the moon. As a culminating activity, students complete a fill-in-the-blank worksheet of the phases of the moon.

**7. Scientific Discourse Community.** The extent to which the classroom social norms foster a sense of community in which students feel free to express their scientific ideas honestly and openly. The extent to which the teacher and students "talk science," and students are expected to communicate their scientific thinking clearly to their peers and teacher, both orally and in writing, using the language of science.

NOTE: There is a "high bar" on this one, because there is an expectation for student active role in promoting discourse, this should not be only the teacher's role. This is in contrast to Explanation/Justification. The rating does take into account whether discourse focuses on science content but not the cognitive depth of that content.

[The kind of indirect evidence we might find in the notebook includes:

- teacher reflections, such as:
  - I had students compare their solution strategies with one another;
  - I consciously try to get students to voice their ideas;
  - I walked around and listened to students' conversations
  - I encourage students to ask each other questions when they present their solutions to the class.
- peer reflections on student written work
- lesson plans showing discussion of scientific topics]

*High*: Students consistently are encouraged to express their scientific reasoning to other students and the teacher, and they are supported by the teacher and other students in their efforts to do so. Students' ideas are solicited, explored, and attended to throughout the lesson, and students consistently use appropriate scientific language. Emphasis is placed on making scientific reasoning public, raising questions and challenging ideas presented by classmates.

Example: Students work in groups, investigating plant growth. The teacher moves around the

room listening to their discussions and, at times, joining them. In answer to student questions, the teacher responds with suggestions or her own questions, keeping the focus on thinking and reasoning. Following the group work, students present their findings to the class. Classmates actively engage in a critique of each presentation by raising questions, challenging assumptions, and verbally reflecting on their reactions to the findings presented. The teacher asks probing questions, and pushes the scientific thinking of both presenters and peers. These discourse patterns appear to be the norm.

Example: In a class discussion on the behavior of gases, the teacher asks students to share their thinking about why the diameter of a balloon increases when placed in hot water and decreases when placed in cold water. The teacher uses wait time to allow students to formulate their thinking. When students share their ideas, the teacher listens carefully and asks other students to reflect on, build on, or challenge the ideas presented by their classmates. The teacher may offer suggestions or alternative ways of thinking about the question when gaps in student thinking are evident, but does not engage in correcting students' ideas, or in giving the "real/right" answer.

Example: During a lesson on cell structure and function, the teacher asks students to work in pairs on a lab activity. Their task is to determine the effect of a salt solution on green plant cells. Prior to the activity, each pair creates a hypothesis statement. They prepare their microscope slide and write down observations; describing the effects of salt and identifying various cell structures, and discuss the lab directed questions challenging each other's scientific reasoning and formulating their conclusions together.

*Medium:* Students are expected to communicate about science in the classroom with other students and the teacher, but communication is typically teacher-initiated (e.g., the teacher attempts to foster student-to-student communication but students don't communicate with each other without teacher mediation) OR, student communication is directed to the teacher. The use of appropriate scientific language may or may not be consistent.

Example: Students work in groups, investigating plant growth. The teacher moves around the room listening to their discussions. When students stop her and ask questions, the teacher responds by providing suggestions or answers. Following the group work, students present their findings to the class. Their classmates listen to presentations, but do not ask questions, challenge results or react to the findings. The teacher tends to ask questions to elicit both procedural and conceptual understanding from the presenters. The teacher supplements students' answers with content if it is missing from the presentations, or asks leading questions trying to prompt presenters into filling in the missing content.

Example: In a class discussion on the behavior of gases, the teacher asks students to reflect on how air particles might be affecting the diameter of a balloon when it is moved from a bowl of hot water to a bowl of cold water. One student suggests that it has something to do with the air particles slowing down in the cold. The teacher responds to the student by saying "yes, and when the air particles slow down, they don't push against the balloon as much." Teacher follows

this statement with a question like, “and how would that affect the diameter of the balloon... if the air isn’t pushing as hard, would the diameter of the balloon increase or decrease?” When most of the class responds with “decreases,” the teacher goes on to ask, “So why then do you think the diameter of the balloon increases when we place it in a bowl of hot water?”

Example: During a lesson on cell structure and function, the teacher has the students sitting in groups of four, sharing a microscope and prepared slides. Their task is to determine the effect of a salt solution on green plant cells. Prior to the activity, each student creates a hypothesis statement. Throughout the lab activity, the students ask questions to each other, but are not necessarily challenging each other’s scientific reasoning.

*Low:* The teacher transmits knowledge to the students primarily through lecture or direct instruction. Those discussions that occur are typically characterized by IRE (initiation, response, evaluation) or “guess-what’s-in-my-head” discourse patterns. Students rarely use appropriate scientific language. Student-to-student communication, when it occurs, is typically procedural and not about science.

Example: Following an investigation on plant growth, the teacher holds a whole class discussion in which she asks students to recall important facts about plant growth that they learned in the process of their investigations. All of the teacher’s questions have known answers, and teacher evaluates the “correctness” of each student response as it is given. If “correct” answers are not given, the teacher asks the question again or provides the answer.

Example: The teacher gives a lecture on the behavior of gases, explaining that all things (including air) are made up of particles; those particles move more quickly and with greater energy when they are heated up and they move more slowly when they are cooled down. The teacher follows this lecture with a demonstration of how the diameter of a balloon decreases when moved from a bowl of hot water to a bowl of cold water. She then asks the class to use the information that they learned in her lecture to complete a worksheet on which they explain why the diameter of the balloon decreased.

Example: During a lesson on cell structure and function, the teacher has students individually work through a microscope lab activity on their own. The students are asked to state a hypothesis, follow the directions of the lab and complete concluding questions.

**8. Explanation/Justification.** The extent to which the teacher expects and students provide explanations/justifications, both orally and on written assignments.

NOTE: This one is different from “cognitive depth” because it is not dependent on “big ideas” in the discipline.

*High:* Teacher consistently asks students to explain/justify their scientific reasoning, both orally and on written assignments. Students’ explanations show their use of concepts or scientific evidence to support their claims. NOTE: We need to see

evidence not only of teacher expectations, but also of a variety of students giving explanations/justifications.

Example: Following a whole class discussion on plate boundaries, the teacher poses a question for students to begin in class and complete for homework. The teacher asks the students to explain how the geologic features found near Nepal were created. Using maps in the classroom one student indicates that there is a mountain range present in this region. The student compares a map of plate boundaries with a world map and points out that Nepal is located along a plate boundary. For homework, she uses data found from the Internet about the recent tectonic activity and is able to further her argument of converging plates with the data. The next day, she explains to the class, using her evidence from the maps and Internet search that two continental plate boundaries are converging to create mountains. In the discussion that follows, several other students also share their explanations and supporting evidence. It appears that this type of discussion following a homework assignment is the norm.

Example: Throughout a unit on plant anatomy and physiology, the teacher incorporates a series of experiments with plants. On the first day of the Scoop, the students are analyzing their data from the most recent plant experiment. The teacher asks each lab group to explain whether their data support their hypotheses and then to justify their conclusions. After writing these explanations and justifications in their lab reports, the teacher asks them to find textual evidence to support or refute their explanations. The following day, the groups take turns presenting their explanations and justifications to the class.

*Medium:* Teacher sometimes asks students to explain/justify their scientific reasoning and students sometimes provide explanations/justifications that use concepts and scientific evidence to support their claims OR teacher consistently asks students to explain their scientific reasoning, but students rarely provide such explanations.

Example: Following a whole class discussion on plate boundaries, the teacher poses a question for students to begin in class and complete for homework. The teacher asks the students to explain how the geologic features found near Nepal were created. One student looks in her textbook and on the Internet to help answer the question. She compares a map of plate boundaries with a world map and notes that Nepal is located on a plate boundary. The next day she shows the maps to the class, and uses the information to explain that two continental plate boundaries are converging to create mountains. One other student also shares her explanation and evidence. The teacher poses similar questions at the end of some lessons and some students respond with similar concrete explanations.

Example: As one component of a unit on plant anatomy and physiology, the students perform a series of experiments with plants in which they collect and record data. At the conclusion of these experiments, the teacher asks each lab group to explain whether their data support their hypotheses and then to justify their conclusions. The teacher continues the following day with a lecture on plant growth, during which the students take notes. The next day there is a fill-in-the-blank and multiple choice quiz.

*One possibility for a “2” rating:*

Teacher sometimes asks students to explain/justify their scientific reasoning, but students rarely provide such explanations.

*Low:* Teacher rarely asks students to explain/justify their scientific reasoning, and students rarely provide explanations/justifications. When they do, they are typically concrete or copied from text or notes.

Example: A teacher uses a world map to show the class where the Himalayas are located and points out that they are along a plate boundary. She asks the students to explain how the mountains could have been created. A student responds by reading from the notes from the previous class: “Mountains are created by two converging continental plates.”

Example: For a unit on plant anatomy and physiology, the teacher begins with an experiment. The students follow the procedures and use their data to answer multiple-choice questions at the end of the lab handout. The following day the teacher gives a lecture on plant growth. The students are given a worksheet to start in class, which has fill-in-the-blank questions. The teacher encourages the students to use their notes and text to find the answers.

**9. Assessment.** The extent to which the series of lessons includes a variety of formal and informal assessment strategies that measure student understanding of important scientific ideas and furnish useful information to both teachers and students (e.g., to inform instructional decision-making).

[Often the observer will need to make inferences about how the teacher is using the information, or plans to use the information, especially on a daily observation.]

*High:* Assessment takes multiple forms, occurs throughout the unit, and includes measures of students’ understanding of important scientific ideas. Assessment is used to provide feedback to students about their understanding of science (not just whether or not their answers are correct), and to inform instructional practice.

Example: The first assignment in the lesson on plate tectonics reveals that students did not learn the concepts well from the book, so the teacher adds an additional lesson to the unit. He sets up four different plate simulations, using a variety of materials. Students are divided into four groups and assigned one activity to work on. They present their activity and description of their observations to the full class. During this time, the teacher asks probing questions to “get at their conceptual understanding.” Students receive a group grade for their presentation. The class concludes with each student writing what they understand about each demonstration on plate tectonics and what they find confusing.

Example: The lesson on chemical changes begins with a lab activity, and students' written lab observations are reviewed by the teacher who writes questions and gives suggestions for clarification. The next day, students use their textbook and library materials to prepare a short paper using information derived from their lab notebook and responding to the teacher's comments. A test at the end of the unit asks factual and reasoning questions.

*Medium*: Assessment has some but not all of the features mentioned above. There is a limited variety of assessment strategies, limited focus on important scientific ideas, only some indication that assessment drives instructional decision-making or limited evidence of substantive feedback to students.

Example: In the lesson on plate tectonics, the students turn in a homework assignment that is graded by the teacher. The students work with a partner to make corrections (get the right answers). The teacher decides to postpone the test until the next day because he sees that the students need more time to work on the corrections with their partners.

Example: A week-long unit on chemical change involves three activities that are graded with teacher comments: a homework assignment, an in-class writing assignment, and an exam consisting of multiple choice items and one essay. Results count toward grades but are not otherwise used. There is no evidence that the students were asked to revise any of the work based on the teacher's comments.

*Low*: Assessment has few of the features mentioned above. There is little indication of a variety of formal and informal assessment strategies. The assessments focus on a recall of facts rather than understanding of important scientific ideas. There is little evidence that assessment drives instructional decision-making or is used to provide substantive feedback to students.

Example: The class is studying plate tectonics and they take a multiple-choice test when the unit is completed.

Example: A series of lessons on chemical change ends with a worksheet scored by the teacher

**10. Connections/Applications.** The extent to which the series of lessons helps students: connect science to their own experience and the world around them; apply science to real world contexts; or understand the role of science in society (e.g., how science can be used to inform social policy).

NOTE: The experiences may be teacher-generated or student-generated, but they should relate to the students' actual life situations or social issue relevant to their lives.

*High:* Teacher or students regularly make connections between the science they are learning in class and their own experiences and the world around them. Students learn to apply classroom science in contexts that are relevant to their own lives or to consider the role of science in society (For example: how science can be used to inform social policy).

Example: As a conclusion to an ecology unit, the students are asked to help the school address the problem of fish dying in the pond behind the school. The students divide into groups and pick individual topics to research (pond life, water chemistry, pond floor composition). After sharing their findings with each other, the class creates a summative report for the principal and school board that include recommendations for action.

Example: The class is learning about Newton's Laws of Motion. After learning about each law and doing simple demonstrations in the class, the teacher asks the students to work in groups to design and perform a demonstration of the law. They are required to collect and analyze data using one form of motion from their own lives (e.g., biking, riding a rollercoaster, skateboarding, skiing) and to comment about the safety of one activity from a scientific perspective.

*Medium:* Teacher or students sometimes make connections between the science they are learning in class and their own experiences, or the world around them. Students have some opportunities to learn to apply classroom science in contexts that are relevant to their own lives or to consider the role of science in society (For example: how science can be used to inform social policy). However, these opportunities occur only occasionally, or the examples are potentially relevant to the students' own lives or to the role of science in society, but these connections are not made explicit.

Example: As a conclusion to an ecology unit, the students work in groups, each studying a different lake, assigned by the teacher that has been identified as having an unstable ecosystem. They locate data on the water chemistry and fish life of the lake using library-based resources and write a report to share with the class.

Example: After completing a month-long unit on Newton's Laws, the teacher asks the students to work in groups to design and perform a demonstration of one of Newton's laws. They are required to collect and analyze data using one form of motion from their own lives (e.g., biking, riding a rollercoaster, skateboarding, skiing).

*Low:* Students are rarely asked to make connections between the science learned in the classroom and their own experience, the world around them, and other disciplines, or to apply the science they learn to social policy issues. When connections/applications are made, they are through happenstance, are not a



planned effort on the part of the instructor and not elaborated upon by the teacher or integrated into the lesson.

Example: As a conclusion to an ecology unit, the students work in groups, each studying an ecosystem from the textbook (tundra, rainforest, and ocean). Each group writes a report and makes a poster to share with the class.

Example: During a unit on Newton's Laws, the teacher uses demonstrations and lab activities from the lab manual (i.e. ramps with rolling objects, pendulum).

**11. Overall.** How well the series of lessons reflects a model of instruction consistent with dimensions previously described. This dimension takes into account both the curriculum and the instructional practices.

NOTE: The rating on this dimension is implicitly a weighted average of the ratings on the first ten dimensions, with greater weight being given to Inquiry, Cognitive Depth, Scientific Discourse Community, and Explanation/Justification to the extent that the rater felt he/she could rate these dimensions accurately.

## Science SCOOP Rating Reporting Form

Teacher: \_\_\_\_\_

Date: \_\_\_\_\_

Rater: \_\_\_\_\_

### 1. Grouping

(Circle one) 1 2 3 4 5

Justification

### 2. Structure of Lessons

(Circle one) 1 2 3 4 5

Justification

Note: Scoring sheets continue in this manner for the rest of the dimensions.