STUDENT DISCOURSE OBSERVATION PROTOCOL

A Student Discourse Observation is a 20-40 minute classroom observation in which one or more observers document student actions and interactions that are examples of student mathematical discourse. The observer(s) could include a principal or other school administrator, mathematics coach, classroom teachers, and/or an outside consultant. The purpose here is not teacher evaluation or to "fix" a teacher or students. Rather, this process is intended for situations in which a teacher is actively working on the development of student discourse to promote mathematics learning, and the teacher has sought support for reflection and inquiry regarding that work. In addition to providing rich data about the observed classroom, the process is designed to provide the observers meaningful context for reflection about their own practices.

The Student Discourse Observation Protocol provides a structure that focuses the observation and the professional dialogue between the observer(s) and teacher on the important mathematics in the lesson, the students' thinking about the mathematics, and the key characteristics of productive mathematical discourse. This protocol supports collaborative inquiry by the teacher and the observer(s) regarding the students' mathematical thinking and ways to move student thinking and discourse along a continuum of cognitive levels – from short answers and explanations/demonstrations of mathematical processes to justifications, conjectures, and generalizations.

THE PROTOCOL

Phase 1 Predictions – Framing the Observation

Guided by the Pre-Observation Dialogue Questions, the teacher and observer(s) engage in dialogue about the lesson content and design, the mathematical ideas they predict students will understand and struggle with, the role of discourse during the lesson, and particular individuals/groups on whose discourse the observation should focus.

Phase 2 Observations – Collecting and Classifying the Data

The observer(s) record student discourse data on the Student Discourse Observation Tool. The students may use a variety of "discourse tools" for communicating their thinking – written and oral explanations; sketches, diagrams, charts, graphs, and models; gestures and physical demonstrations; calculator and computer simulations and demonstrations; and/or mathematical symbols and formal mathematical notation. All such interactions are appropriate for documentation. However, since the inquiry centers on student thinking and discourse, the observation focuses on interactions that are student to student, student to class/group, student to teacher, and/or student to self (e.g., journaling), but not teacher to student/class. The observer(s) record facts only – no inferences or judgments.

After the lesson, the observer(s) and teacher review the data recorded during the lesson and classify each piece of discourse data as PF (procedures/facts), J (justification), and/or G (generalization). If there are data entries that do not fit in one or more of these classifications, those should be classified as NA. The observer(s) and teacher dialogue about facts only – i.e., what students actually said and did and the types of discourse those interactions and actions represent. No inferences yet about students' mathematical understandings or needs, instructional implications, or inquiry possibilities. It is very important to first reveal as many facts as possible regarding the things that students actually said and did.

Phase 3 Inferences – Inquiry Dialogue and Action Steps

Guided by the Inference and Inquiry Dialogue Questions, the observer(s) and teacher discuss their curiosities and speculations about the mathematical understandings and learning needs revealed by the student discourse data. They design strategies for continued collaborative inquiry regarding students' mathematical thinking and ways to deepen students' mathematical understanding by "moving" discourse along a continuum of cognitive levels from explanations of mathematical processes to justifications, conjectures, and generalizations. At the conclusion of the 3-phase dialogue, all participants always report to each other one or more ways they intend to change/refine their individual practices as a consequence of the observation and dialogue, and they discuss ways to continue their collaboration.

Repeated use of this protocol by a group of educators can dramatically impact the ways in which they listen and respond to student thinking on an everyday basis, and ways in which they interact professionally about their practices. When first experiencing the process, it may feel a bit awkward or controlled and a group may be tempted to abandon the structure; however, to learn and maximize the benefits of the process, it is recommended that a facilitator keep the group interactions moving according to the protocol. On the other hand, it is important to remember that the purpose here is to promote deep and thoughtful dialogue and reflection, which should never be sacrificed for the sake of "following the protocol."

ABOUT STUDENT MATHEMATICAL DISCOURSE

The Student Discourse Observation Protocol provides a structure for documenting and characterizing students' discourse about mathematical concepts and procedures. While the teacher may initiate the discourse and may be involved in the interaction, only the students' mathematical thinking is documented. The following chart provides examples of typical classroom interactions that are and are not considered mathematical discourse for applications of this protocol.

WHAT IS AND IS NOT STUDENT MATHEMATICAL DISCOURSE

IS Considered Student Discourse

- A student asks another student or the teacher, "I don't understand how you got the answer. Could your show your reasoning again?"
- A student explains, "I first added 20 and 40 to get 60. Then I subtracted 2 and added 3 to get 61. This works because 18 + 43 is equal to (20 – 2) + (40 + 3) = (20 + 40) – 2 + 3."
- Students write in their journals about their mathematical reasoning or processes.
- A student states, "I see a pattern that I think will always work, because each number is 3 more than the one before it."
- A group of students discuss the mathematical conditions in which an idea will or won't always work.
- A students challenges an algorithm posed by another student by saying, "I don't think that will work with 37 x 98 because ..."
- A student answers a question in response to the teacher.
- A student provides a counterexample to illustrate why an idea doesn't work in all cases.

IS NOT Considered Student Discourse

- The teacher provides an explanation of a mathematical procedure to a student, a group, or the class.
- The teacher provides further explanation in response to a student's question or comment.
- Two students discuss the scores of last week's football game.
- The teacher provides instructions to the class about an activity they are about to engage in.
- The teacher provides a counter example to a method posed by a student.
- A student asks a question about non-mathematical procedures related to an assignment, such as when the assignment is due, whether students need to show their work, and the like.
- Students practice applying a rote procedure to solve problems of a specific type (seat work).

TOOLS FOR STUDENT MATHEMATICAL DISCOURSE

Verbal	A student communicates mathematical ideas or procedures verbally (orally).
Gesturing/Acting	A student makes gestures or other body movements to communicate mathematical ideas or procedures.
Written	A student writes a narrative of mathematical ideas or procedures.
Graphs, Charts, Sketches	A student uses tables, graphs, charts, sketches, or other visual aids to depict mathematical ideas or procedures.
Manipulative	A student uses physical objects to model mathematical ideas or procedures.
Invented Notation	A student uses informal, "nonmathematical" notation to communicate mathematical ideas or procedures.
Formal Notation	A student uses standard (formal) mathematical notation to communicate mathematical ideas or procedures.
Computers/Calculators	A student uses computers, calculators, the Internet, or other forms of technology to communicate mathematical ideas or procedures.
Other	A student uses tools other than those described above.

The above characterization of student discourse was developed to align with the Oregon Mathematics Leadership Institute Discourse Observation Protocol, a research tool developed by RMC Research Corporation, Portland, OR, for use in research and evaluation of the National Science Foundation funded Mathematics and Science Partnership, Oregon Mathematics Leadership Institute (OMLI). For additional information, contact the Project Director, Linda Foreman, linda@teachersdg.org.

STUDENT DISCOURSE PRE-OBSERVATION

PHASE 1 PREDICTIONS – FRAMING THE OBSERVATION
PRE-OBSERVATION QUESTIONS

The observer(s) and teacher meet to discuss the planned lesson. To provide the observer(s) context and focus for gathering evidence during the observation, it is important for the observer(s) to include the following questions in pre-observation dialogue with the classroom teacher. Depending on time allotted for the pre-observation dialogue, focusing on other questions from the Expanded Lesson Planning Framework may also be useful.

1. What is the primary mathematical idea that you and your students will be working on during this lesson? What other important math ideas are embedded in this lesson?

2. What idea(s) do you expect all learners will understand as a result of this lesson? How will you know that all learners understand?

3. With which mathematical concepts/processes do you expect students will struggle most? With which ideas do you predict they will work most successfully? What is your reasoning?

4. What conceptions and strategies (correct and incorrect) do you anticipate from students and how will you respond?

5. What role will students' discourse about their mathematical thinking play in this lesson? What specific instructional moves are planned to elicit and support this discourse?

6. Are there individuals or groups on whom it would be especially helpful to focus documentation during this Discourse Observation, and if so, what is your reasoning for choosing this focus? Some examples could be:
   a. language learners
   b. individuals who have previously struggled with the conceptual ideas on which the lesson focuses
   c. individuals/groups who are successfully carrying out procedures related to the mathematical topic, but you are unsure about the depth of their understanding of the concept or meanings of ideas
   d. particular individuals or small groups about whom you have a specific mathematics content- or discourse-related concern
7. When we get together after the lesson, we will have opportunity to dialogue about and classify the discourse-based evidence of student thinking collected on the Student Discourse Observation Tool. Are there other artifacts of student thinking/discourse that will be produced during the lesson? Which, if any, of these would also be useful for us to examine as supports for our collaborative inquiry about students' mathematical discourse and thinking?

8. If there are other instructional focuses on which you are working (e.g., from the Teacher Reflection Tools), in what ways do you anticipate evidence of progress will be revealed by the classroom discourse?

STUDENT DISCOURSE OBSERVATION TOOL

Teacher ______________________________Grade/Class________________Date______________Page_____of _____

PF PROCEDURES/FACTS	J JUSTIFICATION	G GENERALIZATION
• Short answer to a direct question • Restating facts/statements made by others • Showing work/methods to others • Explaining what and how • Questioning to clarify • Making observations/connections	• Explaining why by providing mathematical reasoning • Challenging the validity of an idea by providing mathematical reasoning • Giving mathematical defense for an idea that was challenged	Using *mathematical relationships as the basis for:* • Making conjectures/predictions about what might happen in the general case or in different contexts • Explaining and justifying what will happen in the general case

Discourse Type	Discourse-Based Evidence of Student Thinking * Indicates student thinking that I am especially curious about	Co-Inquiry Questions

STUDENT DISCOURSE TYPES SORTING TOOL

	PF PROCEDURES/FACTS	J JUSTIFICATION	G GENERALIZATION
	• Short answer to a direct question • Restating facts/statements made by others • Showing work/methods to others • Explaining what and how • Questioning to clarify • Making observations/connections	• Explaining why by providing mathematical reasoning • Challenging the validity of an idea by providing mathematical reasoning • Giving mathematical defense for an idea that was challenged	Using ***mathematical relation-ships as the basis*** *for:* • Making conjectures/predictions about what will happen in the general case or in different contexts • Explaining and justifying what will happen in the general case
Classroom instances *(e.g., verbatim quotes, sketches, paraphrasings)*			
What elicited this discourse *(e.g., student interactions, instructional moves, coaching moves)*			
Curiosities and conjectures *(related to student thinking and implications for instruction/coaching)*			
Classroom instances *(e.g., verbatim quotes, sketches, paraphrasings)*			
What elicited this discourse *(e.g., student interactions, instructional moves, coaching moves)*			
Curiosities and conjectures *(related to student thinking and implications for instruction/coaching)*			

INFERENCE AND INQUIRY DIALOGUE QUESTIONS

Before dialogue begins, the classroom teacher and observer(s) each spend a few minutes of private reflection about one or more of the following. All inferences, conjectures, and curiosities are based on evidence from the observation.

Inferences, Conjectures, and Curiosities	Evidence
1 What mathematical ideas do students understand? Conjectures and curiosities …	
2 What mathematical ideas are students struggling with? Conjectures and curiosities…	
3 What characterizes students' mathematical discourse? ___ Procedures & Facts ___ Justification ___ Generalization Conjectures and curiosities…	
4 How did the lesson design affect the character/quality of cognitive demand, mathematical discourse, trends in students' mathematical thinking, and/or strategies used by students? Lesson adaptations and/or next steps …	
5 How did the enactment of the lesson affect the character/quality of cognitive demand, mathematical discourse, trends in students' mathematical thinking, and/or strategies used by students? Lesson adaptations and/or next steps …	
6 What are implications for continued instructional work on today's/other specific Teacher Reflection Tool instructional focus question(s)?	

DIALOGUE FOR ACTION: NEXT STEPS

The purpose of a Student Discourse Observation is to provide the teacher rich information about her/his students' mathematical thinking, and to provide meaningful context for the teacher's and the observers' reflection about their own professional practices.
1 What are key elements of your professional learning from today's collaborative inquiry?
2 In what specific ways do you intend to change/refine your practice as a consequence of this learning and inquiry?
3 What will be specific student-based evidence of your success with these changes/refinements of your practice?
4 What is the best next step for our collaborative inquiry about students' mathematical thinking and discourse?