Inquiring into Science Instruction Observation Protocol (ISIOP)

DATA COLLECTION INSTRUMENT

Daphne Minner, PhD
Jacqueline DeLisi, EdD
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For questions or comments regarding this EDC product, please visit http://isiop.edc.org or email Jackie DeLisi at jdelisi@edc.org. For communication with Daphne Minner, email daphne_minner@abtassoc.com.

Teacher ID: Observation Date: Observer:

SECTION 1—Background Information

1. Observation date:_____

2. Class scheduled start time:_____ **3.** Class scheduled end time:_____

4. Class ID:_____

5. Total number students at beginning of class: Males_____ Females_____

Total number of students at end of class: Males_____ Females_____

6. Did the students use instructional artifacts (e.g., handouts, worksheets, readings, etc.) in this lesson?
___Yes ___No

Was the observer able to obtain a copy of these artifacts to use in the coding process?
___Yes ___No

7. Additional notes (including physical characteristics of the room, a sketch of the layout):

SECTION 2—Classroom Observation Procedure

Collect the pre-observation questionnaire from the teacher and review it to orient yourself to the lesson. For the observation, have pages 2–6 with you to fill out. Take extra copies of the Classroom Observation Sheet and use as many as necessary for the observation. The entire lesson in real time will be captured on the Classroom Observation Sheet using the Verbal Practice and Lesson Event Codes. Each observer should be familiar with these codes prior to conducting an observation. Additional information will be captured post-observation using the Coding Rubrics for Investigation Experiences, Instructional Leadership, and Science Content. Refer to the User's Manual for further elaboration.

Teacher ID: Observation Date: Observer:

CLASSROOM OBSERVATION SHEET

	Lesson Event # ( )			Lesson Event # ( )			Lesson Event # ( )		
Start Time									
Lesson event information	Act	Org	Diseng	Act	Org	Diseng	Act	Org	Diseng
Teacher Verbal Practices Tallies									
To GAUGE or EXPAND students thinking or knowledge by:									
Solicit									
Facts									
Procedural									
Explain									
Apply									
Meta									
To provide SIGNPOSTS to students about the progression/order of the lesson by:									
New and old									
Directions									
Foreshadow									
Situate									
To provide FEEDBACK to students by:									
Acknowledge									
Rephrase									
Redirect									
Correct									
Praise									
To PROMPT THINKING and REDUCE COMPLEXITY of an idea by:									
Give Info									
Hint									
Think aloud									
Deflect									
Summarize									
Missed utterance									
Notes on lesson event content & activities									

OBSERVATION END TIME:_____

Teacher ID: Observation Date: Observer:

OBSERVATION NOTES

Throughout the lesson, please note, if you feel necessary:

- Any anomalous practices or unusual circumstances in this lesson
- Indicators of the observed teacher's style of teaching
- Indicators of the quality of the instruction
- Details of the context of the lesson which might inform your post-observation coding or future analysis

LESSON EVENT CODES

Class Activity Codes (Act)

CODE	Verbal Activities	CODE	Physical Activities
INST	Teacher provides information, activates prior knowledge from previous lesson, calls for "correct answer," student's take notes. The dialogue is between teacher and students.	MODL	Teacher uses a physical *model* of a phenomena.
DISC	Students share their *own ideas* with each other and respond to each other's input. Dialogue is predominately among students, with the teacher in a facilitator role.	DEMO	Teacher demonstrates actual *phenomena* for students.
READ	Assigned or student-selected silent reading or read-aloud text	SIM	Students use computer *simulations* to explore or model phenomena.
PRES	Students report out data or results of group work to whole class or make formal presentations.	REP	Students manipulate *representations* of phenomena (games, puzzles, models).
WRIT	Students do written exercises or tasks, drawing, graphing—can be done by hand or on computer.	HANDS	Students independently manipulate *phenomena in class* or manipulate *scientific instruments.*
LIT	Students do literature searches on Web, library, or class books.	FIELD	Students collect data or explore *phenomena outside.*
ASMT	Assessment activity, test preparation, homework review	SEC	Students collect, manipulate, download, or access raw data from existing scientific databases.
VID	Viewing a video or film	STN	Students rotate through stations with *different* kinds of activities at each station.

Class Organization for Students Codes (Org)

I	Individual	G	Small Group (between 3 and 7 students)
P	Interactive Pair	W	Whole class

Student Disengagement Codes (Diseng)

Record the percent of students that are not engaged in the class (see codebook for definition of disengaged behaviors to note)

NONE	All students were engaged for the majority of the task	MOST	Between 50- 75% of students off-task
FEW	At least 1, but less than 25% of students off-task	ALL	Between 75- 100% of students off-task
HALF	Between 25- 50% of students off-task	NA	Students can't be seen well enough to rate (for video only)

TEACHER VERBAL PRACTICES CODES

To **GAUGE** or **EXPAND** students' thinking by asking questions that:		
	Solicit	Solicit volunteers for activity; call on students to take a turn; tally students' votes/ choices; check on students' progress
	Fact	Require students to recall facts, terms, or observations; or require students to provide short, specific answers (knowing that…)
	Procedural	Require students to recall steps, actions, or procedures in observing phenomena or conducting investigations (knowing how…)
	Explain	Require students to recall theories, models, or evidence to explain natural phenomena (knowing why….)
	Apply	Encourage students to apply learning to new conditions, scenarios or problems (what if…)
	Meta	Prompt students to *evaluate* the reasoning, explanations, or use of evidence in argument by themselves or others
To provide **SIGNPOSTS** to students about the progression/order of the lesson by:		
	New and old	Making connections between previously covered material and what is currently being discussed
	Directions	Providing directions to students for how to complete a specific task or the itinerary for the current lesson
	Foreshadow	Foreshadowing what will come later in the instructional experience (logistical information)
	Situate	Providing a *conceptual rationale* for a given class activity—"content storyline"
To provide **FEEDBACK** to students by:		
	Acknowledge	Repeating close to verbatim what a student said for the whole class to hear
	Rephrase	Articulating a student response more clearly/logically/succinctly, often using more precise, scientific language
	Redirect	Indicating that some part of a student response is not accurate or on target and push for more information from the students
	Correct	Correcting a student's answer by providing correct answer OR stating the answer was incorrect
	Praise	Reinforcing or encouraging creative answers, participation, persistence
To **PROMPT** thinking by:		
	Give Info	Providing conceptual information including vocabulary
	Hint	Using specific hints, cues, or suggestions to guide students' thinking about an idea or task
	Think aloud	Demonstrating how he/she (the teacher) would approach a problem or think about a topic
	Deflect	Not providing an answer to a direct student question but, rather, encouraging the student to find the answer for him/herself
	Summarize	Reinforcing the main points of a lesson by reiterating or tying together multiple pieces of information
Missed utterance		Could not hear what the teacher said

Teacher ID: Observation Date: Observer:

SECTION 3—Post-Observation Coding Rubrics

CODING RUBRIC FOR INVESTIGATION-RELATED EXPERIENCES

Please place a check √ next to the item number if the teacher provided these types of INVESTIGATION-RELATED learning experiences in the lesson. Then provide an Emphasis Rating for each category by circling the number that corresponds to the amount of instructional time that was spent on each category of investigation experiences.

Part A: Student-Directed Activities

Questioning/Exploration	YES
Students research what is already known from existing resources to generate ideas to investigate.	**8.**
Students generate investigation questions.	**9.**
Teacher helps students figure out what will make a good investigation question (i.e., testable, empirical).	**10.**
Students make their own predictions or formulate hypotheses as part of an investigation.	**11.**
12. Emphasis Rating: How much of the instructional time was spent on these questioning/exploration activities? *0 = None 1 = (a little/ about 1-10% of instructional time) 2 = (some/ 11-50%) 3= (a lot/ 51-100%)*	

Design	YES
Students design ways to investigate research questions including choosing appropriate variables, techniques, and tools to gather, record, and analyze data.	**13.**
Teacher discusses with students the role of variables and controls in investigation designs.	**14.**
Students identify treatment and control variables.	**15.**
16. Emphasis Rating: How much of the instructional time was spent on these design activities? *0 = None 1 = (a little/ about 1-10% of instructional time) 2 = (some/ 11-50%) 3= (a lot/ 51-100%)*	

Data collection and Organization	YES
Students make descriptive observations.	**17.**
Students make accurate measurements using scientific tools and instruments.	**18.**
Students access and record secondary data (existing datasets or databases) using computers.	**19.**
Students devise and use their own organizational scheme for recording data.	**20.**
21. Emphasis Rating: How much of the instructional time was spent on these data collection and organization activities? *0 = None 1 = (a little/ about 1-10% of instructional time) 2 = (some/ 11-50%) 3= (a lot/ 51-100%)*	

Analysis	YES
Students use mathematics to transform, organize, or interpret data.	**22.**
Students use physical models to assist with the analysis and interpretation of data/evidence.	**23.**
Students assess the reliability and/or validity of the knowledge generated in an investigation by critiquing methodological flaws and how well procedures were followed.	**24.**
25. Emphasis Rating: How much of the instructional time was spent on these analysis activities? *0 = None 1 = (a little/ about 1-10% of instructional time) 2 = (some/ 11-50%) 3= (a lot/ 51-100%)*	

Conclusions/Communication/Evaluation	YES
Students build logical arguments about the cause-and-effect relationships between variables.	**26.**
Students share investigation results *and their own thinking*/conclusions/interpretations about the meaning of those results.	**27.**
Students plan and/or deliver a *presentation* of results to the class.	**28.**
Students evaluate and revise their explanations/predictions in light of alternative explanations posed by the teacher, other students' investigations, or other sources of existing scientific knowledge.	**29.**
30. Emphasis Rating: How much of the instructional time was spent on conclusion/communication/evaluation activities? *0 = None 1 = (a little/ about 1-10% of instructional time) 2 = (some/ 11-50%) 3= (a lot/ 51-100%)*	

Part B: Teacher-Directed Activities

Questioning/Exploration	YES
Teacher tells the students the questions they will investigate.	**31.**
32. Emphasis Rating: How much of the instructional time was spent on teacher-directed questioning activities? *0 = None 1 = (a little/ about 1-10% of instructional time) 2 = (some/ 11-50%) 3= (a lot/ 51-100%)*	

Design	YES
Teacher provides the variables to investigate.	**33.**
Teacher provides the procedures to follow in the investigation.	**34.**
35. Emphasis Rating: How much of the instructional time was spent on teacher-directed design activities? *0 = None 1 = (a little/ about 1-10% of instructional time) 2 = (some/ 11-50%) 3= (a lot/ 51-100%)*	

Data collection and Organization	YES
Students record data on worksheets or in science notebooks with a format prescribed by the teacher.	**36.**
Teacher provides data for students.	**37.**
38. Emphasis Rating: How much of the instructional time was spent on teacher-directed data collection and organization activities? *0 = None 1 = (a little/about 1-10% of instructional time) 2 = (some/ 11-50%) 3= (a lot/ 51-100%)*	

Analysis and Conclusion	YES
Teacher tells students the analysis procedures.	**39.**
Teacher provides data analysis for students.	**40.**
Teacher tells the students what to conclude from an investigation.	**41.**
42. Emphasis Rating: How much of the instructional time was spent on teacher-directed analysis and conclusion activities? *0 = None 1 = (a little/ about 1-10% of instructional time) 2 = (some/ 11-50%) 3= (a lot/ 51-100%)*	

Teacher ID: Observation Date: Observer:

CODING RUBRIC FOR CLASSROOM INSTRUCTIONAL LEADERSHIP PRACTICES

Please rate the items according to the extent to which they describe the observed lesson.	Does not Describe the lesson	Slightly characteristic of the lesson	Somewhat characteristic of the lesson	Very characteristic of the lesson
43. The teacher facilitated a learning-conducive physical environment for the majority of the students.	0	1	2	3
44. The teacher projected a welcoming and engaging teaching style.	0	1	2	3
45. The teacher utilized teaching approaches to push students' thinking farther and encourage flexibility in their thinking.	0	1	2	3
46. The teacher stated the learning goals (i.e., the science content students would learn).	0	1	2	3
47. The teacher provided an overview of the activities in the lesson.	0	1	2	3
48. The teacher stated the performance expectations for the lesson (e.g., products, time frame).	0	1	2	3
49. The teacher situated the lesson within the context of previous lessons' science content.	0	1	2	3
50. The teacher clearly and explicitly connected the lesson's key science ideas to one another.	0	1	2	3
51. Two or more students exhibited distracting behavior that made it difficult for the offender or others to focus attention.	0	1	2	3
52. The teacher encouraged students to work together to develop collective understandings.	0	1	2	3
53. The teacher used adequate wait time (5 seconds or more) to allow students to formulate a response to questions.	0	1	2	3
54. The teacher encouraged students to respond to their classmates' thoughts and questions.	0	1	2	3
55. Students remained on task even when teacher's attention was focused elsewhere.	0	1	2	3
56. Transitions into the lesson and/or between lesson events were short in duration and did not interrupt instructional flow.	0	1	2	3
57. The teacher actively monitored individual and group progress (e.g., walking around the room to look at student work, asking for student verbal updates).	0	1	2	3
58. The teacher encouraged students to take responsibility for their learning by allowing them to make decisions about some aspect(s) of the class activity.	0	1	2	3
59. Interruptions derailed the learning goals and flow of the lesson.	0	1	2	3
60. The teacher used formative assessment strategies to responsively pace the lesson.	0	1	2	3
61. The teacher facilitated student self-pacing of learning activities, when appropriate.	0	1	2	3
62. The teacher exhibited enthusiasm, curiosity, and interest in science.	0	1	2	3
63. The teachers' discourse and comments utilized students' thoughts, ideas, opinions, or questions as contributions to the class learning experience.	0	1	2	3
64. The teacher solicited from students what they know or believe about a topic in order to understand their prior conceptions.	0	1	2	3

Please rate the items according to the extent to which they describe the observed lesson.	Does not Describe the lesson	Slightly characteristic of the lesson	Somewhat characteristic of the lesson	Very characteristic of the lesson
65. Students asked irrelevant questions of the teacher (e.g., personal, opinion, non-science or non-lesson related).	0	1	2	3
66. Students worked cooperatively.	0	1	2	3
67. Students were attentive when the teacher was speaking.	0	1	2	3
68. The teacher asked students to expand on or clarify an idea previously offered by themselves, a peer, or other source of information.	0	1	2	3
69. Students asked their own substantive/relevant questions of the teacher.	0	1	2	3
70. The teacher exhibited openness to new ideas, approaches, and/or data.	0	1	2	3

Teacher ID: Observation Date: Observer:

CODING RUBRIC FOR SCIENCE CONTENT — MIDDLE SCHOOL

Please check YES if the teacher addressed these content standards in the lesson. Then rate the extent that each science domain (e.g., life science, science and technology, etc.) was the focus of the lesson compared to other things covered, such as assignment directions or other administrative tasks.

Life Science	YES
Structure and function in living systems: e.g., the cells, organs and human systems	**71.**
Reproduction and heredity: e.g., types of reproduction, genes and chromosomes role	**72.**
Regulation and behavior: e.g., biological relationship of internal processes to changing environmental stimuli	**73.**
Populations and ecosystems: e.g., definitions of and basic functioning of ecosystems	**74.**
Diversity and adaptations of organisms: e.g., role of biological evolution	**75.**
76. Overall Rating: Extent that the lesson addressed these, **or other**, Life Science concepts: *Not at all = 0 a little = 1 some = 2 a lot = 3*	

Earth Science	YES
Structure and processes of the earth system: e.g., plate motion, rock and water cycles, atmosphere, weather patterns	**77.**
Earth's history: e.g., same processes produced different conditions on earth over time, fossil record	**78.**
Earth in the solar system: e.g., gravity's role, seasonality, sun's influence on earth systems	**79.**
80. Overall Rating: Extent that the lesson addressed these, **or other**, Earth Science concepts: *Not at all = 0 a little = 1 some = 2 a lot = 3*	

Physical Science	YES
Properties and changes of properties in matter, properties of substances	**81.**
Motions and forces: e.g., motion can be described by position, direction and speed	**82.**
Transfer of energy: e.g., heat, light, electrical, sound, chemical, atomic, mechanical	**83.**
84. Overall Rating: Extent that the lesson addressed these, **or other**, Physical Science concepts: *Not at all = 0 a little = 1 some = 2 a lot = 3*	

Science and Technology	YES
Technological design cycle: e.g., identify problem, design solution, implement design, evaluate, communicate the process	**85.**
Understanding about science & technology: e.g., not the same as scientific inquiry, technological solutions have trade-offs	**86.**
87. Overall Rating: Extent that the lesson addressed these, **or other**, Science and Technology concepts: *Not at all = 0 a little = 1 some = 2 a lot = 3*	

Describe any "other" concepts you included in your Overall Ratings because they were not part of the listed content:

Teacher ID: Observation Date: Observer:

CODING RUBRIC FOR SCIENCE CONTENT — HIGH SCHOOL

Please check YES if the teacher addressed these content standards in the lesson. Then rate the extent that each science domain (e.g., life science, science and technology, etc.) was the focus of the lesson compared to other things covered, such as assignment directions or other administrative tasks.

Life Science	YES
The cell: e.g., structure, functions (especially DNA, photosynthesis), cellular growth and differentiation	**88.**
Molecular basis of heredity: e.g., role of chromosomes in reproduction, mutations	**89.**
Biological evolution: e.g., factors influencing it, role of natural selection, classification schemes	**90.**
The interdependence of organisms in ecosystems and energy flow in ecosystems	**91.**
Matter, energy, and organization in living systems	**92.**
Biological governance of organism behavior: e.g., nervous system, role of internal and external stimuli	**93.**
94. Overall Rating: Extent that the lesson addressed these, or other, Life Science concepts: *Not at all = 0 a little = 1 some = 2 a lot = 3*	

Earth Science	YES
Energy in the earth system: e.g., convection circulation, global climate	**95.**
Geochemical cycles: e.g., the water or carbon cycle	**96.**
The origin and evolution of the earth system: e.g., techniques to estimate geologic time	**97.**
The origin and evolution of the universe: e.g., big bang theory, formation of elements	**98.**
99. Overall Rating: Extent that the lesson addressed these, or other, Earth Science concepts: *Not at all = 0 a little = 1 some = 2 a lot = 3*	

Physical Science	YES
Structure of atoms, nuclear forces, and radioactive isotopes	**100.**
Structure and properties of matter: e.g., atomic bonds, elements, compounds, molecules	**101.**
The nature of chemical reactions: e.g., reaction rates, types of reactions, catalysts	**102.**
Motions and forces: e.g., relationships between force and acceleration, gravitational force, electrical force	**103.**
Conservation of energy and the increase in disorder: e.g., kinetic and potential energy transfer	**104.**
Interactions of energy and matter: e.g., waves (seismic, light, electromagnetic) effect on material properties	**105.**
106. Overall Rating: Extent that the lesson addressed these, or other, Physical Science concepts: *Not at all = 0 a little = 1 some = 2 a lot = 3*	

Science and Technology	YES
Technological design cycle: e.g., identify problem, design solution, implement design, evaluate, communicate the process	**107.**
Understanding about science and technology: e.g., differences between purposes and practices of scientific inquiry and developing technological knowledge	**108.**
109. Overall Rating: Extent that the lesson addressed these, or other, Science and Technology concepts: *Not at all = 0 a little = 1 some = 2 a lot = 3*	

Describe any "other" concepts you included in your Overall Ratings because they were not part of the listed content: