Improving practice with target inquiry: high school chemistry teacher professional development that works

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Supplementary Data

Reformed Teaching Observation Protocol (RTOP)

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I. BACKGROUND INFORMATION

Name of teacher _____ Announced Observation? _____
(yes, no, or explain)

Location of class_____
(district, school, room)

Years of Teaching _____ Teaching Certification_____
(K-8 or 7-12)

Subject observed _____ Grade level_____

Observer _____ Date of observation_____

Start time _____ End time_____

II. CONTEXTUAL BACKGROUND AND ACTIVITIES

In the space provided below please give a brief description of the lesson observed, the classroom setting in which the lesson took place (space, seating arrangements, etc.), and any relevant details about the students (number, gender, ethnicity) and teacher that you think are important. Use diagrams if they seem appropriate.

Category	Score
Lesson Design and Implementation	
Content	
Classroom Culture	
Total	

III. LESSON DESIGN AND IMPLEMENTATION

	Never Occurred				Very Descriptive
1. The instructional strategies and activities respected students' prior knowledge and the preconceptions inherent therein.	**0**	**1**	**2**	**3**	**4**

1 = teacher refers to prior knowledge
4 = teacher solicits prior knowledge (pre-test, question, etc.) or lesson is developed to build on prior knowledge (from other lessons)

2. The lesson was designed to engage students as members of a learning community.	**0**	**1**	**2**	**3**	**4**

4 = must have student-student, teacher-student, and students present answers before teacher discusses
3 = not enough student-student development of ideas/teacher presents answers/some student-student interactions
2 = good teacher-student interactions but no student-student
0/1 all teacher centered

3. In this lesson, student exploration preceded formal presentation.	**0**	**1**	**2**	**3**	**4**

4= students explore without teacher telling them what to expect
2 = teacher gives away what will happen
0 = students watch demo and then instructor explains

4. This lesson encouraged students to seek and value alternative modes of investigation or of problem solving.	**0**	**1**	**2**	**3**	**4**

4 = students told to investigate but not told how
2 = students told to investigate but encouraged/told to do things in a certain way

5. The focus and direction of the lesson was often determined by ideas originating with students.	**0**	**1**	**2**	**3**	**4**

4 = students generate problem and how to solve it
3 = instructor defines problem but does not tell students how to solve
2 = teacher sets agenda and directs observations

IV. CONTENT

Propositional Knowledge

	Never Occurred				Very Descriptive
6. The lesson involved fundamental concepts of the subject.	**0**	**1**	**2**	**3**	**4**

4 = based on the benchmarks

7. The lesson promoted strongly coherent conceptual understanding.	**0**	**1**	**2**	**3**	**4**

4 = students must connect to previous content or define patterns, must develop concept, there must be student-student, student-teacher and whole group interactions
3 = missing one of the above types of interactions
2 = focus on phenomena description and little concept building
1 = teacher makes connections to previous topics for students

8. The teacher had a solid grasp of the subject matter content inherent in the lesson.	**0**	**1**	**2**	**3**	**4**

4 = no misconceptions/able to answer most questions

9. Elements of abstraction(i.e., symbolic representations, theory building) were encouraged when it was important to do so.	**0**	**1**	**2**	**3**	**4**

4 = good use of diagrams, particulate representation, diagrams; focuses attention on key elements; makes generalization or works towards theory development
3 = same as the above without theory development or generalizations
2 = some use of diagrams etc.; no theory development

10. Connections with other content disciplines and/or real world phenomena were explored and valued.	**0**	**1**	**2**	**3**	**4**

4 = working with everyday materials and explicit and significant connections to other disciplines or everyday phenomena
3 = explicit and significant connections to other disciplines or everyday phenomena
2 = some connections to other disciplines or everyday phenomena
1 = passing mention of connection to other disciplines or everyday phenomena

Procedural Knowledge

	Never Occurred				Very Descriptive
11. Students used a variety of means (models, drawings, graphs, concrete materials, manipulatives, etc.) to represent phenomena.	**0**	**1**	**2**	**3**	**4**

4 = students articulate findings and/or make connections to everyday phenomena and students use multiple representations
3 = students use multiple representations but teacher summarizes findings or students use multiple representations but do not develop concepts or make connections

12. Students made predictions, estimations and/or hypotheses and devised means for testing them.	**0**	**1**	**2**	**3**	**4**

4 = students state what they think will happen before they collect data
0 = students make observations without making predictions/developing hypothesis first

13. Students were actively engaged in thought-provoking activity that often involved the critical assessment of procedures.	**0**	**1**	**2**	**3**	**4**

4 = students develop procedure for investigation and students make refinements to procedure based on observations/results or design further studies to clarify questions generated by observations/results
3 = students develop procedure for investigation
1 = students actively involved in activity but no thought about how to conduct investigation or why
0 = students not actively engaged

14. Students were reflective about their learning.	**0**	**1**	**2**	**3**	**4**

4 = Students must develop concept/theory and provide rationale for their conclusions; most students participate. A debate/discussion of different theories would indicate this level.
3 = students involved in development of concept/theory but do not provide rationale or answer questions like: How do you know this? How can we be sure?
1 = no theory development and few students express findings/explanation.

15. Intellectual rigor, constructive criticism, and the challenging of ideas were valued.	**0**	**1**	**2**	**3**	**4**

4 = Students must negotiate ideas as a whole group; majority of students involved in discussion.
3 = Students negotiate ideas in small groups but no full group discussion.
1 = Some ideas presented but no competing ideas offered.
0 = No student ideas presented

V. CLASSROOM CULTURE

Communicative Interactions

	Never Occurred				Very Descriptive
16. Students were involved in the communication of their ideas to others using a variety of means and media.	**0**	**1**	**2**	**3**	**4**

4 = Communication involves student-student, student-teacher, and whole group discussions.
3 = Communication within small groups and student-teacher but no whole group discussions; or some in group and some between group but significant teacher explanation.

17. The teacher's questions triggered divergent modes of thinking.	**0**	**1**	**2**	**3**	**4**

4 = Divergent set up – allows students to explore multiple solutions/options; teacher does not guide towards answer but asks questions to make students think about options.
3 = Divergent set up; teacher poses questions to group as whole but not to individuals or small groups.
2 = Divergent set up but instructor encourages/directs towards one answer.
1 = Any questions posed to students must score a 1

18. There was a high proportion of student talk and a significant amount of it occurred between and among students.	**0**	**1**	**2**	**3**	**4**

4 = most of the lesson was student talk
2 = significant amount of teacher talk in development of key ideas

19. Student questions and comments often determined the focus and direction of classroom discourse.	**0**	**1**	**2**	**3**	**4**

4 = student driven design and students decide what question/problem to investigate or how to investigate a question/problem.
3 = instructor sets question/problem to investigate and materials but students decide how to use materials; teacher allows student questions to direct class discussion but instructor sets agenda

20. There was a climate of respect for what others had to say.	**0**	**1**	**2**	**3**	**4**

4 = substantial exchange between individual students, group of students as a whole and between student and instructor; students display comfort in offering ideas or debating ideas; many students involved in discussion
3 = exchanges in small groups with little/no whole group discussion; teacher closes down some student investigations by explicitly pointing them in another direction
2 = teacher solicits student ideas and accepts comments but no debate about ideas

Student/Teacher Relationships

	Never Occurred				Very Descriptive
21. Active participation of students was encouraged and valued.	**0**	**1**	**2**	**3**	**4**

4 = students involved in constructing concept/theory and final construction of key ideas
3 = students involved in constructing concept/theory but teacher presents final construction of key ideas
2 = students encouraged to describe phenomena but no theory development; teacher presents key ideas first before asking for student input
1 = if students were asked to answer questions/participate you must score 1

22. Students were encouraged to generate conjectures, alternative solution strategies, and ways of interpreting evidence.	**0**	**1**	**2**	**3**	**4**

4 = students directed their investigations and discussed results as a group
3 = students directed their investigations but did not discuss results as a whole group
1 = answer was student derived but teacher directed towards one correct answer

23. In general the teacher was patient with students.	**0**	**1**	**2**	**3**	**4**

4 = students are allowed to explore
2 = teacher explicitly redirects some of the direction students choose to explore
1 = teachers allows some wait time after questions

24. The teacher acted as a resource person, working to support and enhance student investigations.	**0**	**1**	**2**	**3**	**4**

4 = teacher supports student discussions but does not direct
2 = teacher interacts with students but does a lot of directing and answers questions rather than helping students find answers on their own

25. The metaphor "teacher as listener" was very characteristic of this classroom.	**0**	**1**	**2**	**3**	**4**

4 = teacher does not dominate group interactions
3 = teacher interacts with groups but provides too much direction