

## Appendix 12

### Physical Science and Chemistry Modeling Workshops Increased Understanding from the Workshops<sup>1</sup>

	End of Workshop			
	Physical Science Year 1 N=15	Physical Science Year 1 N=11	Chemistry N=18	TOTAL N=44
a) Effective applications of inquiry-based instruction in classrooms.	100.0	100.0	94.4	97.7
b) Strategies that can be used by teachers to improve students' science performance.	100.0	100.0	94.4	97.7
c) Application of Ohio's science standards.	80.0	80.0	44.4	65.1
d) The technology required for effective instruction in science.	93.3	80.0	77.8	83.7
e) Effective uses of alternative assessment.	86.7	100.0	50.0	74.4
f) Strategies for facilitating change in science instruction in my building.	73.3	80.0	50.0	65.1
g) Awareness of current research in science education.	93.3	100.0	83.3	90.7
h) Ability to utilize current research in science education in their classes.	100.0	100.0	83.3	93.0

<sup>1</sup>Percent of participants who indicated that they "Strongly Agree" or "Agree" with each statement. Percentages are based on those with valid response to item.

**Appendix 13**  
**Physical Science and Chemistry Modeling Workshops**  
**Workshop Activities Rated Worthwhile<sup>1</sup>**

	End of Workshop			
	Physical Science Year 1 N=15	Physical Science Year 1 N=11	Chemistry N=18	TOTAL N=44
a) Overall interaction with the other participants.	100.0	100.0	100.0	100.0
b) Overall interaction with workshop facilitators.	100.0	100.0	100.0	100.0
c) Overall interaction with teachers that previously participated in workshop.	64.3	88.9	81.3	76.9
d) Modeling of inquiry.	100.0	100.0	94.4	97.6
e) Examples on how to apply district standards.	63.6	88.9	37.5	58.3
f) Introduction to various sources of curriculum materials (books, websites, etc.).	86.7	100.0	88.9	90.7
g) Reading assignments (research articles).	86.7	100.0	72.2	83.7
h) Discussion of reading assignments.	80.0	90.0	88.9	86.0
i) Purchase of educational/classroom materials.	100.0	100.0	100.0	100.0
j) Large blocks of "free" time spent working on curriculum.	NA	100.0	NA	100.0

<sup>1</sup>Percent of participants who rated each aspect as "Very Worthwhile" or "Somewhat Worthwhile." Percentages are based on those with valid response to item.

**Appendix 14**  
**Physical Science and Chemistry Modeling Workshops**  
**Open-ended Question Responses**  
**Post-Survey**

**What kind of changes, if any, did you make in how you teach your science classes as a result of your Modeling Workshop experience this year?<sup>6</sup>**

<b>PS1</b>
<ul style="list-style-type: none"> <li>▪ I added more student-teacher dialogue and more open-ended questions.</li> </ul>
<ul style="list-style-type: none"> <li>▪ I have incorporated Modeling methods into my classroom teaching. I have become less of a distributor of information. I emphasize more inquiry and problem-solving strategies since attending the workshop.</li> </ul>
<ul style="list-style-type: none"> <li>▪ I have partially implemented modeling in my physics classes. I intend to continue the process next year. (Through cutbacks we have lost the position of department heads. I have been acting as department head without any release time. It has detracted from my ability to more fully implement modeling this year.</li> </ul>
<ul style="list-style-type: none"> <li>▪ I implemented a much more inquiry-based learning method. The students are using a more hands-on approach, and I have used an increased amount of cooperative learning.</li> </ul>
<ul style="list-style-type: none"> <li>▪ I included groups gathering data and presenting their findings to the class on whiteboards.</li> </ul>
<ul style="list-style-type: none"> <li>▪ I incorporated modeling from the beginning of school but found it very difficult in an environment with 35 students per class, most of whom did not want to be in class and many of whom were disruptive. I hope to either change positions or be assigned classes that are more manageable. Overall, I did not implement modeling to the full extent as I hoped.</li> </ul>
<ul style="list-style-type: none"> <li>▪ I spend considerably more time in inquiry-based labs, graphing, and graphical analysis. The level of scientific inquiry, analysis, and presentations/discussion by students increased substantially year to year.</li> </ul>
<ul style="list-style-type: none"> <li>▪ I teach with modeling instruction exclusive in Conceptual Physics. I have selected concepts, representations, and instructional techniques in chemistry and Earth science.</li> </ul>
<ul style="list-style-type: none"> <li>▪ I totally changed the way my course is taught. I do not lecture/lab/test anymore. Instead, I use the modeling approach. I am still uncertain about the process, but feel more comfortable as I continue through the year.</li> </ul>
<ul style="list-style-type: none"> <li>▪ More graphing, modeling, explain or defend.</li> </ul>
<ul style="list-style-type: none"> <li>▪ Particle model with written and draw explanations of how model supports observation. Focus constructing/interpreting graphs. Presenting/defending results. Use of deployment labs.</li> </ul>
<ul style="list-style-type: none"> <li>▪ Use white boarding. Present labs differently--more open ended, not too many cookbook labs. Better at questioning. Pacing is slower and that's okay.</li> </ul>
<b>CHEM</b>
<ul style="list-style-type: none"> <li>▪ I changed the types of questions I ask. I introduce new concepts by doing lab first and changed some of my labs to be more open.</li> </ul>
<ul style="list-style-type: none"> <li>▪ I have incorporated modeling into most all aspects of my classroom.</li> </ul>
<ul style="list-style-type: none"> <li>▪ I require students to explain their answers and put them in situations where they discover concepts and explain them to their peers.</li> </ul>
<ul style="list-style-type: none"> <li>▪ I used the white boards and questioning methods from the summer almost daily in chemistry. I use the methods for physics and integrated science, also (just not to the extent that I use them in chemistry).</li> </ul>
<ul style="list-style-type: none"> <li>▪ More use of inquiry methods. More use of student presentations. More student-centered learning. More use of cooperative groups.</li> </ul>
<ul style="list-style-type: none"> <li>▪ The changes that I have made to teach my science classes is a result of the Modeling workshop experience this year is to incorporate the methodology in all of my lab activities.</li> </ul>

<sup>6</sup> All the PS2 responses to this question item are incorporated in the report.

**Appendix 14**  
**Physical Science and Chemistry Modeling Workshops**  
**Open-ended Question Responses**  
**End of Workshop Survey**  
**—Continued—**

**What kinds of activities or other support would help you continue your Modeling development? Please specify whether these should occur during the school year or in subsequent summers.**

<b>PS1</b>
<ul style="list-style-type: none"> <li>▪ Develop physical science units next summer.</li> <li>▪ I follow the listserv and plan to mine the modeling website this summer.</li> <li>▪ Include more ways to encourage/motivate the challenged student.</li> <li>▪ More ideas, materials for units. Encouragement and sharing.</li> <li>▪ The current system meets my needs.</li> </ul>
<b>PS2</b>
<ul style="list-style-type: none"> <li>▪ I enjoy the relaxed mode of summer. I am involved in many after school and school weekend activities. Summer lets me focus the time.</li> </ul>
<ul style="list-style-type: none"> <li>▪ I need ideas for modeling in Life Sciences.</li> </ul>
<ul style="list-style-type: none"> <li>▪ I would like to have a one-week workshop each summer to refresh and reflect with other modelers.</li> </ul>
<ul style="list-style-type: none"> <li>▪ Receiving guidance/feedback in developing my own modeling style units.</li> </ul>
<b>CHEM</b>
<ul style="list-style-type: none"> <li>▪ In order to successfully learn or contribute to the modeling approach, a participant must be fully immersed, making summer an ideal time for development. I would find it beneficial to contribute in a second year modeling course that would allow me to create my own units for courses to the modeling method.</li> </ul>
<ul style="list-style-type: none"> <li>▪ More short workshops during the school year.</li> </ul>
<ul style="list-style-type: none"> <li>▪ Subsequent summer: A Chem II, very similar to a Chem I. Summer: A "General" physical science workshop covering OGT and physical science studies.</li> </ul>
<ul style="list-style-type: none"> <li>▪ The current Saturday sessions and seminars excellent. However, it is sometimes difficult to attend the Saturday sessions due to other obligations.</li> </ul>
<ul style="list-style-type: none"> <li>▪ Training on the rest of the units.</li> </ul>