

Appendix G: Teaching Observation Data and Related Discussion

To assess the degree to which the interns' science lessons were inquiry-focused, our project TIRs (and project PIs, occasionally) conducted two observations per section of the field experience course. For each observation, the observer would choose an intern at random and then observe that intern's entire science lesson, during which time she would make notes about the intern's lesson and the elementary students' responses. A day or two within observing each lesson, the observer coded her observations with a standards-based observation protocol that had been developed by the project team. This method of observation and data coding was used to collect baseline data during Fall 2004 (the semester immediately before course reforms were introduced), and to collect follow-up data during subsequent semesters. Because the field experience interns are novices at science teaching, the observations were coded for intent toward inquiry as well as for success at implementation.

Tables 1-3 contain the "lesson intent" data that resulted from the observations of the interns' science lessons. Originally, each lesson characteristic was rated on a 0 (very traditional) to 5 (very inquiry-oriented) scale for each lesson. Ratings at the 0 or 1 level were relabeled as "traditional", denoting that the particular lesson characteristic was aligned with traditional teaching methods. Ratings at the 2 or 3 level were relabeled as "mixed", denoting that the particular lesson characteristic contained aspects of both traditional and inquiry teaching methods. Ratings at the 4 or 5 level were relabeled as "inquiry", denoting that the particular lesson characteristic was aligned with inquiry teaching methods.

Table 1

Number of Interns' Lessons Demonstrating Science Content (Traditional) vs. Investigating Science Content (Inquiry)

	Baseline (11 lessons)	Spring 2005 (14 lessons)	Fall 2005 (10 lessons)	Spring 2006 (14 lessons)	Fall 2006 (6 lessons)	Spring 2007 (16 lessons)
Traditional	9	4	2	4	0	0
Mixture of Traditional and Inquiry	0	5	4	7	2	6
Inquiry	2	5	4	3	4	10

Table 2

Number of Interns' Lessons Focused on Getting an Answer (Traditional) vs. Developing an Explanation (Inquiry)

	Baseline (11 lessons)	Spring 2005 (14 lessons)	Fall 2005 (10 lessons)	Spring 2006 (14 lessons)	Fall 2006 (6 lessons)	Spring 2007 (16 lessons)
Traditional	8	5	4	1	1	0
Mixture of Traditional and Inquiry	1	0	2	10	1	6
Inquiry	2	9	4	3	3	10

Note: This category of analysis did not apply to one lesson in Fall 2006, which is why the total number of lessons does not match the number of observations for that semester.

Table 3

Number of Interns' Lessons Focus on Providing Answers (Traditional) vs. Communicating Science Ideas (Inquiry)

	Baseline (11 lessons)	Spring 2005 (14 lessons)	Fall 2005 (10 lessons)	Spring 2006 (14 lessons)	Fall 2006 (6 lessons)	Spring 2007 (16 lessons)
Traditional	8	3	3	2	0	1
Mixture of Traditional and Inquiry	1	5	3	9	4	2
Inquiry	2	5	4	3	1	13

Note: This category of analysis did not apply to certain lessons in Spring 2005 and Fall 2006, which is why the total number of lessons does not match the number of observations for those semesters.

In our baseline semester (Fall 2004), as illustrated in Tables 4-6, observations of the interns' science lessons revealed that, in most cases, the lessons tended to be activities that focused on verifying science content and obtaining answers through the use of text, demonstrations, or lecture. Very little about these lessons approached evidence-based inquiry into scientific ideas and scientific phenomena. In contrast, the teaching in later semesters focused much more

frequently on the investigation and analysis of science content, public communication of science ideas, and scientific discussion and explanation.

For example, setting a minimum acceptable threshold of “mixed” (a mixture of traditional and inquiry-oriented methods) for each lesson characteristic, we see that only 2 out of 11 lessons in Fall 2004 (the baseline semester) focused on investigation and analysis – whereas 10 out of 14 lessons in Spring 2005 ($\chi^2(1) = 7.0, p < 0.01$, when compared to baseline), 8 out of 10 lessons in Fall 2005 ($\chi^2(1) = 8.0, p < 0.01$), 10 out of 14 lessons in Spring 2006 ($\chi^2(1) = 7.0, p < 0.01$), and 16 out of 16 lessons in Spring 2007 ($\chi^2(1) = 19.6, p < 0.001$) focused on investigation and analysis. Similarly, only 3 out of 11 lessons in Fall 2004 (the baseline semester) focused on communicating science explanations – whereas 10 out of 13 lessons in Spring 2005 (one N/A lesson omitted; $\chi^2(1) = 8.3, p < 0.01$, when compared to baseline), 7 out of 10 lessons in Fall 2005 (not statistically significant), 12 out of 14 lessons in Spring 2006 ($\chi^2(1) = 8.8, p < 0.01$), and 15 out of 16 lessons in Spring 2007 ($\chi^2(1) = 13.0, p < 0.001$) focused on communicating science explanations.

A few other things are worth mentioning about the various survey results.

- **Natural Talent for Science:** This item showed that interns generally think of students as being good at science or not, inherently. This is a well-known result, and has shown to be anti-correlated with sophisticated learning approaches. Although this issue is not being addressed head-on in the course, this shift may have been due to the way that inquiry allows students’ varied talents and many wonderful ideas to be utilized much better than in traditional classrooms.
- **Fear of Teaching Science:** This item showed encouraging results, although the question was unable to get at the nature of the fear. Someone who is not afraid because they think science teaching is trivial and just involves telling is very different from someone who is afraid because she has a strong understanding of the inherent challenges and flexibility needed to teach inquiry. The shift we found is a good sign, but a difficult one to interpret.