

Supporting Pre-Service Teachers with Learning to Teach Urban Elementary Science

Over the past two years, in collaborations among the Geology and Biology departments within the School of Arts and Science we have been developing a science sequence for our elementary pre-service teachers. The sequence consists of an educational oriented geology and a biology/physics based science course, where labs were specifically designed by a team consisting of a geophysicist, biologist, and science educators to promote student inquiry. The final course in the sequence is the elementary science methods course that pre-service teachers typically take in their last semester before student teaching.

Every pre-service teacher in our science methods course is placed in one of two urban elementary schools for their last field placement before student teaching. Both urban elementary schools have 250 - 350 kindergarten through fifth grade students and at least 30 different languages spoken. Like many urban schools, these schools have large populations of low income and minority students. (Sixty-four percent of the BPS students are African-American or Hispanic with sixty-two percent eligible for the free lunch program, and nine percent for reduced price meals.) Our university has built a strong relationship with one school, where our professional development has supported their focus on science literacy. There several teachers incorporated science into their instruction for at least 40 minutes a week, giving the pre-service teachers freedom to incorporate science in many ways. In the second urban elementary urban school, the science specialists primarily teach science so that classroom teachers can prepare their students for the state literacy and math assessments. We had met only briefly with the teachers at a large meeting to explain our science education program and the pre-service teacher expectation of teaching at least one elementary science lesson. Our professional development for these regular education teachers was to occur the following year.

As part of their coursework for the elementary science methods course, pre-service teachers are expected to teach at least one science lesson in an urban school and observe science being taught. They typically wait to take science methods as their last methods course. Field placements are primarily the pre-service teachers first experience with urban schools. Many pre-service teachers in our course have had at least three science courses in high school where lecture was the primary source of instruction. The majority of pre-service teachers do their field placement alone although we are working to place more as pairs in the classroom.

Observations, interviews, and pre-service teacher journal entries have informed our work.

Success

Over the past two years, our pre-service teachers have experienced success related to our inquiry approach in our science education course sequence and to a portion of our field placement sites. Many pre-service teachers demonstrate success in science courses where explicit instructions are either presented in a traditional lecture based classroom and/or through “cookbook” laboratory exercises. Our pre-service teachers experienced tension, however, when presented with science instruction that was more nontraditional and open-ended. Yet, once the course sequence was completed many pre-service teachers grew to appreciate the tension they experienced in their inquiry-based geology, biology, and science method core courses. They also commented on the high level of knowledge they gained through the experience.

Additionally, schools of education, generally, want to provide fruitful field experiences for their students. The tension for our science methods program is that we want to prepare pre-service teachers to teach in the urban setting, yet find it difficult to locate the large number of student placements with teachers who can provide the role modeling desired to support our science methods

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course. In our work we found the pre-service teachers' experiences at the two schools to be vastly different. The teachers in our strong partnership school were more open and willing to take on the responsibility to incorporate science into their curriculum. Having worked with us in our science professional development, the cooperating teachers appreciated the opportunity to brainstorm with a pre-service teacher to develop and implement a science unit. Pre-service teachers in these classrooms were encouraged by their positive science experience. Finally, our pre-service teachers are beginning to recognize the value in the National Science Education Standards and the Benchmarks in providing a framework from which to build their instructional units.

Vexations

I have three vexations related to field placements, content knowledge, and inquiry-based experiences. Many of the pre-service teachers placed in the school where our university driven partnership was currently in name only were unable to teach science unless placed with me, the science methods teaching assistant, as their pre-service teaching supervisor. The administrative push for science at this school had yet to reach the regular education classroom. Teachers there focus on math and literacy placing all responsibility for science on the science specialist. Yet, the time with the science specialists only meets a portion of the district mandated science minutes. In fact, pre-service teachers placed in a school where only the science specialists taught science, questioned the necessity of regular education classroom teachers learning to teach science.

This raises many questions. Should the role of the pre-service teacher supervisor be more explicitly focused on science in an effort to gain access for pre-service teachers to teach science at an urban school? What would such training incorporate?

Second, many of our pre-service teachers have had at least three years of high school science courses, two college inquiry-based lab courses, and our science methods course, yet they feel they lack the necessary knowledge to teach science. Additionally, they struggle to relate the science content to the students in a grade level appropriate manner. While our pre-service teachers appreciated the tension they experienced in the inquiry based labs, they dismissed the idea of incorporating such methods into their own instruction for elementary students stating that students lacked the necessary background knowledge and experience. Furthermore, how do we help both pre-service and in-service teachers grow beyond the impression that in science there is always a correct answer and to teach science, one must possess all science knowledge? What steps can be taken to overcome these misconceptions?

And finally, despite our efforts to expose pre-service teachers to inquiry-based science in our science methods course sequence we understand that beginning teachers often struggle with what real experiment and inquiry is. It is difficult for someone to understand the nature of science until they personally design an experiment to carry out to its completion. We understand that it can be daunting for pre-service teachers incorporate inquiry into their instruction, and that with some experience it could become more comfortable them. We are looking to integrate this experience into our sequence of courses.