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The Preaching and Practice of Inquiry in the Classroom

A Vexation ... or Two

I have multiple vexations related to the overarching question of how to facilitate the most relevant and productive science learning experiences for students in multilingual and multicultural urban school settings. Two related vexations have been particularly troubling to me over the past several years.

The Problem with Transfer. In the last two research projects I have worked on (one in New Orleans and the other in Miami), a large piece of the intervention has involved working with practicing elementary teachers with little prior background or experience in science teaching. In working with these teachers, one of my aims was to have them experience, from the student perspective as well as from the teacher perspective, what good inquiry-based science is like. I engaged them in a number of inquiry experiences, both facilitator-directed and participant-initiated, and tried to make the case that the process of inquiry and discovery is at the heart of worthwhile science learning. In both projects, teachers responded enthusiastically and positively to these experiences. Almost without exception, feedback, both formal and informal, discussed how these inquiry experiences fundamentally changed the teachers' perceptions both of science and of science learning. Typical responses focused on how the teachers found science to be both intimidating and boring, but that an inquiry-based approach to learning had made science both approachable and engaging. Pat myself on the back – job well done.

But wait. Does helping teachers see the value of inquiry-based science learning translate into their use of such an approach in their own classrooms? Teachers frequently said that because they previously viewed science as intimidating and boring, they tended to present science in this way to their students. Because science was intimidating, they relied on the textbook – which had all the answers – and created a classroom environment where students were discouraged from asking questions. Because science was boring, they were unconcerned that limiting science instruction to defining vocabulary words and answering end-of-chapter questions left students dreading science lessons. Additionally, teachers freely admitted that they were rarely encouraged to teach science by their school administrators.

Now that these teachers had experienced science learning as approachable and engaging, wouldn't they naturally wish to share that approach with their students? Alas, classroom observations, as well as formal and informal interviews showed that in both projects many of the teachers taught science only minimally more after the intervention than they did before. Even more vexing, many of the teachers claimed that they "couldn't" use the inquiry approach that they had personally found so valuable as learners with their own students. Perceived barriers to change ranged from the material ("I don't have supplies to do it"), to the logistical ("I don't have enough time in my schedule allocated to science instruction"), to the managerial ("My students aren't behaved well enough to work that way"), to the philosophical ("My students aren't intellectually prepared for that kind of learning"). How to help teachers simultaneously move beyond these perceived barriers continues to vex me.

The Problem with Accommodating Home Language and Culture. Enter my second vexation. The majority of teachers I have worked with seem to believe that students from minority linguistic and cultural backgrounds in urban school settings are not intellectually prepared to do the kinds of cognitively challenging work necessary for science inquiry. I have done a fair amount of research on the kinds of knowledge and skills that students acquire beyond the classroom setting, at home, in the community and playing with peers. While students with impoverished prior school experiences often do have academic gaps and weaknesses, I am firmly convinced that virtually all students can be successful at inquiry-based science when the proper structures and supports are in place. Still, many of the teachers who work with these students on a daily basis mainly see their students' weaknesses and don't look deeply enough to uncover the prior knowledge and skills that might be leveraged to help them succeed academically.

In a prior research project, we included a component of the intervention aimed at strengthening teachers' beliefs and practices for articulating students' linguistic and cultural experiences within science instruction. We used an integrated approach to professional development that simultaneously addressed science inquiry, English language and literacy, and students' home language and culture. We believed this would provide the greatest likelihood of success, since these three domains could mutually support each other. We found, however, that while the teachers did improve their use of inquiry-based science and support for English language and literacy development, they made hardly any changes in how they leveraged students' home language and culture in the science classroom. So, I remain vexed... I believe that attending to students' home language and culture is of

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critical importance to successfully teaching students from minority linguistic and cultural backgrounds, yet the teachers I have worked with rarely come to hold that view.

A Venture

My latest venture is underway. Along with several colleagues, I am engaged in a 5-year project entitled *Promoting Science among English Language Learners in a High Stakes Policy Context*. We work with all the 3rd–5th grade teachers in nine urban elementary schools that meet common criteria regarding student economic status, percentage of English language learners, and performance on state-wide school accountability measures. Teachers in these schools are facing multiple challenges, yet are also meeting with at least a modest degree of success. The intervention component of the project focuses on promoting inquiry-based science, development of English language, literacy and mathematics skills, and the importance of attending to student reasoning.

In terms of the first of my vexations, we have tried to design the intervention to proactively address the perceived barriers that we have encountered in our prior work. To address the materials barrier, we developed a complete 3rd–5th grade curriculum and provide teachers with all of the supplies and curriculum materials necessary to teach the inquiry-based lessons. Teachers also receive ongoing professional development around how to teach the lessons. This approach, though expensive and time consuming, has gone a long way towards getting the teachers to actually engage their students in inquiry-based science. Our participating teachers gladly teach our curriculum when they do teach science. We have had somewhat less success in overcoming the logistical barrier of time to teach science. This is largely a policy issue, as science has not been one of the academic subject areas tested as part of our state's high-stakes accountability program. Thus, teachers continue to hear from their administrators that science is not to be given a high priority in scheduling. That is likely to change as science is being added to the accountability measures for the first time in the coming year. We expect that teachers, at least in 5th grade, where the test will be given, will now be expected to teach more science. But will they be convinced that our inquiry-based curriculum will prepare their students for the test, or will they revert to a traditional fact-and-vocabulary driven teaching model? At the heart of this question are larger questions about the nature of "inquiry," what it is, what it ought to look like in the elementary science classroom, and why we put so much stock in it.

The managerial and philosophical barriers that teachers perceive as hindering their ability to teach inquiry-based science are connected to my second vexation regarding the importance of home language and culture. Attention to students' home language and culture is embedded in our curriculum in several fairly simplistic ways. Key vocabulary is always given in three languages (English, Spanish and Haitian Creole), and stories in the curriculum are presented using characters and scenarios that are culturally relevant. The professional development component of the project devotes some time to an explicit discussion of home language and culture including exploration of stereotypes, varying cultural norms around schooling, and first person accounts of the challenges immigrant students have in adapting to schooling in the U.S. Given the limited success of such approaches in our prior research, however, we also address home language and culture implicitly through our emphasis on student reasoning. We videotape selected students engaged in reasoning tasks that draw on experiences from the contexts of home, school and play. We then share these videos with the students' teachers and interview them about where the students' ideas are coming from. We hope that the teachers will both come to recognize the value of this prior knowledge and begin to ask the kinds of questions in their classes that elicit this cultural knowledge. Yet even if teachers do begin to gather this cultural knowledge from their students on a regular basis (admittedly a tall order in and of itself), can they learn to relate this knowledge to the context of science teaching? If they get that far, how would the resulting science instruction align with the standards and benchmarks to which both students and teachers are now being held accountable? Additionally, what if the students don't perform substantively better on the high-stakes assessments? If the students don't outperform their peers (and immediately – not after a few "false starts"), then efforts of this kind are dead in the water in the current high-stakes policy context. The struggling urban schools I am interacting with don't want to hear about "innovations" if they don't immediately impact the bottom line – standardized test scores. Thus, I'm left wondering what more I can do to support teachers' use of inquiry based science and students' home language and culture in their science teaching. Perhaps more importantly, I'm left to ponder whether either of these ideas that I've been committed to for years even has a place in today's educational debate.