Building Community-School Collaborations to Plan Meaningful Science Tasks

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Introduction

We have been thinking, at a network/district and school level, about the shifts that need to happen to make science accessible and engaging to high school students. Our presentation will highlight how a network-wide initiative around literacy in all content areas has evolved over the last three years in one small high school, and how that evolution has played out particularly in science. In looking at one school's work we explore tensions that arise with the simultaneous implementation of Next Generation and Common Core standards, and in working with students who are coming to high school with little background or engagement in science.

Background on Network and School-Level Literacy Initiatives

The New Visions Charter High Schools network opened its first pair of schools in the 2011-2012 school year, and now manages six schools across New York City – four in the Bronx and two in Brooklyn. Many aspects of the design of these charter schools emerge from what we have learned supporting 75 district middle and high schools across the city. These district schools serve demographically similar students – in terms of special needs, English language ability, family income, and ethnic background (see Table 1 below), and in fact there are several areas where the challenge to bring students up to grade level is felt more acutely in the charter schools. Because of the similarities, the charters serve as a lab for innovative work that can be shared with district schools.

Table 1: District and Charter School Demographics – New Visions for Public Schools

	District Schools (75 middle and high schools)	**Charter Schools** (6 high schools)
Special Ed	17%	18%
English Language Learners	10%	10%
Latino	41%	47%
Black	30%	48%
White	12%	4%
Other	17%	1%
Lowest third (based on 8th grade test data in ELA/math)	33%	42%

The work we are presenting comes specifically from the New Visions Charter High School for Advanced Math and Science (AMS), which opened in 2011. From the beginning, AMS's school design included a cross-disciplinary "writing cascade": a set of reading and writing tasks, using the

Literacy Design Collaborative (LDC) framework, a New Visions initiative supported in part by the Gates Foundation. Following the work of Stock (1986) and others, the writing cascade allows teachers across content areas to spiral their skill instruction in reading and writing, and to create space for students to focus on one intense piece of content-area writing at a time. LDC modules are aligned to specific reading, writing, and speaking standards from CCLS, thus providing scaffolding for transitioning to Common Core. Students complete one LDC module per trimester in each core content area.

Additionally, since the publication of the NGSS framework and standards , we have been integrating the Science/Engineering Practices and Cross-Cutting Concepts into each science module, in order to anchor the literacy work to science-specific expectations. For example, last spring as a part of the Living Environment (Biology) curriculum, students completed a task in which they read about a keystone species (such as coral) that is endangered due to climate change, then wrote a species survival plan. In addition to being aligned to CCLS standards as all LDC tasks are, we aligned this module to the Practice of Engaging in Argument from Evidence (#7), and the Cross-Cutting Concepts of Cause and Effect: Mechanism and Prediction (#2) and Stability and Change (#7).

The LDC module design work is supported by a cross-disciplinary approach to inquiry, in which teachers look at student work together, identify skill gaps, and make decisions based on their findings. The inquiry approach follows, among others', Love's (2009) model of "collaborative inquiry" and Talbert and Scharff's (2008) findings about meeting the needs of students who are "outside the sphere of success." The inquiry work, then, is a built-in mechanism for evaluating the success of the LDC work and for suggesting changes to our practice.

Year One Findings

In the first year of the initiative described above, two major findings surfaced and influenced our subsequent work. First, we learned how difficult cross-disciplinary inquiry into student literacy is for teachers unfamiliar with the science content and practices. We found we needed to ignore disciplinary differences for the sake of teaching a general set of reading and writing skills, because the option -- investing significant teacher time to establish a cross-disciplinary understanding of these differences -- was not possible within the time we had set aside for inquiry. The problem with this approach is that doing science is not simply about completing a piece of writing; it is, rather, the enactment of a set of discourses specific to science (Lemke, 1990). In fact, even the practice of writing scientific explanations itself is most successful when supported by context-specific scaffolds (McNeill & Krajcik, 2006). Assuming that writing claims, evidence, and reasoning looks the same in history as it does in science -- that the differences are trivial -- we unwittingly teach a set of misconceptions about the nature of science itself. This finding made us question the cross-disciplinary inquiry approach.

Another major finding was around student engagement in LDC tasks. Although students, overall, improved in reading and writing, the least significant gains were among the students who were in the lowest third of incoming students. In 2011-12, on average, 39% of students -- roughly the same number of students who came in placed in the bottom third of incoming 9th graders -- did not complete all or part of the LDC reading/writing modules. This was a major concern, especially given that these were the students whose success in science is our biggest priority. What is missing if we are not consistently reaching those students?

Year Two and Three Findings

Based on the findings from this first year of implementing the writing cascade, we launched a focus on increasing student engagement in science through community engagement. We looked at two aspects of instruction that, according to City, *et al* (2009) are among the most important points of change as they form the "Instructional Core" in any school -- "teachers' skill and knowledge," and the "quality of tasks." We sought to shift the work in science by first focusing on teacher planning, and then on the way teachers could improve the quality of tasks for students.

Last year (Year Two; see Table 2) we focused on teacher expertise. We collaborated with scientists whose work aligns with specific topics in teachers' science courses, and community members familiar with the real-world applications of these topics. Although we still used the LDC framework for planning, we started by asking which applications of the science students were learning would be most relevant and would connect students to their communities meaningfully. For instance, we planned an LDC module on "Pests in the City" through collaboration with an entomologist, an educator from a Harlem-based CBO, and a public health researcher who were all involved in a cross-agency bed bug working group in NYC. They were familiar with the re-emergence of bed bugs in New York, each from a different perspective, and they shared their experiences and current work with teachers on a planning day.

Table 2: Set of Findings and Next Steps from the LDC Cascade at AMS

Yearly Focus	**Year One:** LDC Cascade	**Year Two:** Teacher capacity	**Year Three:** Student engagement
Work Implemented	- LDC cascade across content areas - literacy work supported by teacher inquiry	- focus on analyzing student work with grade teams to implement specific reading strategies - focus on building teachers' instructional skills for science planning	- focus on student engagement, through the lens of science motivation - studying the effect of relevant science literacy work, grounded in community needs, on student engagement
Findings and Next Steps	- least progress and participation with students in lowest ⅓ - some confusion around discipline-specific expectations for science writing	- deep community partnerships key for teacher planning and development of context-specific tasks	- considering questions about how this approach to planning with community partners can be used elsewhere

The collaboration increased teachers' familiarity and excitement around the topic, enabling them to make novel connections with other pest species -- mosquitoes, roaches, and lice. One researcher also shared the concept of urban homes as mini-ecosystems, and pest control as a process of making the ecosystem as unfriendly as possible to pests. This approach to the content helped us connect work students were doing around ecosystem models -- work we had imagined was not connected to "Pests in the City" -- to the reading and writing students ultimately conducted. In turn, the community partners helped us understand the authentic audience for whom students could write, by providing us context on the community that we would not have had. In this way, the experiences and perspectives of community partners working with teachers helped us create a rich LDC module with thoughtful integration of science literacies to meet real needs. Moreover, we suspect that teachers' additional sense of investment in the larger science context and community relevance enabled them to provide "framing" for their students around the science (Berland & Hammer, 2012).

This year (Year Three in Table 2, above), we are investigating the implications of this community-based curriculum design for student engagement. By administering the Science Motivation Questionnaire (Glynn & Koballa, 2006; Glynn, Taasoobshirazi & Brickman, 2009) periodically throughout the year, and exploring the results with students through loosely-structured interviews, we are learning about how students perceive their work in science, and how they understand the work with community partners. While not every unit of study in the science curriculum is tied to a community collaboration in the way "Pests in the City" is, many units were at least planned with input from community members. Our aim is to see if this approach does indeed provide the context that struggling science students need to see the relevance of challenging literacy work in science.

Next Steps

We hope to develop, over the course of this year, a clearer picture of the connections between community engagement in AMS's science curriculum and the development of specific Science/Engineering Practices through the LDC work. We believe that LDC and other Common Core-aligned frameworks like it can be useful, but that for science a clearly-articulated perspective on the relevant Practices and the application of content must be a part of the planning as well.

We also hope to get a better understanding of the kinds of community collaboration that are most essential and meaningful. We recognize that the types of partnerships high schools can develop vary widely, and are highly contextual. In a way, this is the point: the science issues students can affect the most are those happening in their own communities. At the same time, we hope to gain a better understanding of what makes these partnerships most effective, both for teachers' ability to frame the content, and for students' motivation to engage with the discourse of science.

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