Case Study III

The University of Washington and Bellevue School District Partnership

Supplement to the white paper:

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THE UNIVERSITY OF WASHINGTON AND BELLEVUE SCHOOL DISTRICT PARTNERSHIP

This design-research partnership involves learning scientists, design researchers, and graduate students from the Learning in Informal and Formal Environments (LIFE) Center and the College of Education at the University of Washington (UW), and district staff, teachers, and students from the Bellevue School District (BSD). The goal of their work is to improve curriculum, increase student achievement, and test design and learning science principles.

The partnership has several projects underway. Here, we will discuss "Agency in Sustained Problem-Based Inquiry: Learning Science Through and As Innovation." Additional work includes a Knowledge in Action project revising high school AP environmental and government curriculum using project-based learning, and an Investing in Innovation (I3) grant to redesign a high school with a STEM (Science, Technology, Engineering, and Mathematics) focus.

History

The partnership began in the mid-2000s, when the superintendent of Bellevue School District contacted a professor at the University of Washington who had co-authored a National Research Council (NRC) volume synthesizing current science on teaching and learning school subjects.[1] The superintendent asked the author and his team to analyze how well the district's curriculum aligned with the principles in the volume.

That curriculum review led to joint design work beginning with elementary school science. The team decided to "repurpose" an instructional unit for fifth graders. The unit came from a curriculum known as the Full Option Science System (FOSS), which had already been adopted by the district. The redesigned unit, called the Isopod Habitat Challenge, focused on creating student-centered curriculum that was also "authentic." Students were invited to engage in tasks that were relevant both to the science topic under study and to their own lives and interests. The redesign drew on the concepts outlined in the NRC volume and the idea of a "challenge-based learning cycle."[2] Students were asked to work on a complex problem or challenge—in this case, to design an ideal habitat for the isopod (i.e., a roly poly or pill bug)—learning new skills and concepts as they worked toward a solution. Over a period of two school years, the team of district curriculum staff, coaches, teachers, and UW researchers engaged in an iterative process of design, testing, and interpreting results from student-learning assessments and data on teacher implementation.[3] They ultimately produced a much-changed unit that provided more opportunities for students to generate questions and plan investigations.

At the same time, another team at the University of Washington-LIFE Center was focused on how to connect students' culturally based knowledge-acquisition methods to the conventional science learning of the classroom. For a different school district, they redesigned a unit called Micros and Me, which focused on health practices at home and in the community to create a bridge between what kids already knew and what they were expected to learn. The unit engaged students in authentic scientific practices and addressed real-life health issues so learning about microorganisms became personally resonant.

The emphasis on redesigning elementary science units by incorporating culturally relevant teaching strategies dovetailed nicely with the focus on student agency of the *Isopod Habitat Challenge* team.[4] The two groups of researchers and staff from the Bellevue School District together applied for and received a grant from the National Science Foundation's Discovery Research K–12 (DRK–12) program to redesign and test additional units that incorporated both student agency and relevance. Over the course of the grant, the partnership will redesign three 5th grade science units and two 2nd grade science units; test them in schools; redesign them based upon feedback; and collect data on students, teachers, and schools. They also intend to test whether their design principles translate across science domains (physical earth science and environmental science) as well as across different developmental levels (2nd grade and 5th grade).

Nature of the Partnership

The partnership is long-term, maintaining its work through the dissolution of grants and fallow periods—when no official collaboration is in place—of up to a year. It is also place-based, with an overall focus of improving practice in the

Bellevue School District while also contributing to research on learning.

The DRK–12 project was intentionally structured to be a partnership between researchers at the UW and practitioners from BSD. The district science curriculum director from BSD is a co-principal investigator (Co-PI). The elementary science curriculum developer is also deeply involved in the work, and explained:

> *We collaborate with UW to redesign or enrich the curriculum we have. I see that as a partnership. It's not as though the University is saying, "Oh, this is the research. You need to do this." We come together, share ideas, and talk about what parameters we have to work around and what students are currently doing. It's very equal.*

There are systems in place to make sure the design process incorporates diverse perspectives and expertise. A weekly steering committee with representation from the district and the university works through all issues related to the grant. One researcher described how district staff keep the design attuned to the district's needs:

> *Either the science or curriculum folks from the district sit at the research group table two or three times a week helping shape decisions and answering questions that come up. A lot of it is tuning the design to the priorities and infrastructure and strategy of the district, while also trying to make sure we're collaborating and figuring out how to develop material that will be useful to the entire system.*

A subset of the leadership team is charged to redesign each unit, and each sub-team includes at least one district representative, a teacher, and one or two researchers from the LIFE Center. All participants agree that having different perspectives and expertise in the redesign teams makes the final products better. One elementary science specialist explained:

> *I worked with [one of the researchers] on My Pollution Solution. We were given an investigation to write together… We were a neat partnership because she was thinking about it from her researcher point of view, and I was thinking, "But what are the kids going to do?" And it worked.*

The sub-teams also include teachers and experts on science and learning, as needed. For example, the partnership consulted with a representative from the Environmental Protection Agency on pollution issues specific to the area. It also has a close association with the City of Bellevue Public Utilities, which has provided information on local water quality, maps, and videos of their staff at work, giving a real-life context to the redesigned units.

While only a few teachers are involved with the design process and writing curriculum materials, all those who teach the units provide feedback through the professional development process, which is then used to improve the units. Teachers volunteer to implement the redesigned units in their classrooms, and they receive eight hours of professional development, web-based resources, and "on call" help from research assistants who are in the classroom observing and videotaping.

The team engages in research throughout the design process, using it to fine-tune its questions about student learning and professional development and to inform the redesign process. Initial research focused on students' inquiry skills and content knowledge, using a combination of district- and researcher-developed assessments. (An ongoing concern is how to make use of data from the district's assessment to evaluate student learning, since teachers are held accountable for their results on the assessment.) The researchers also seek to capture outcomes related to the principle of relevance, including the degree to which students identify more with science as a result of participating in the units. Finally, the researchers are investigating teacher learning and the role of professional development and curriculum in supporting implementation of more student-centered teaching in science.

Challenges

One challenge that the partnership has faced is lack of formal agreements, infrastructure, and funding outside of the specific grants and projects to support the partnership. The partners have worked together to identify and apply for new grants to keep the work going, but they have also experienced critical gaps in funding that has halted work for up to a year at a time.

Another challenge is managing different expectations regarding the time necessary to accomplish particular tasks. Practitioners repeatedly mentioned their surprise at research timelines. One practitioner elaborated:

> *We're expected to do things really quickly in our context, and we don't get a lot of time to process and develop. Designing new units and getting the proper context for the design of a unit seems to take a long time. It's a valuable process and one that has yielded some great ideas and responses, but it's a different level of urgency for us in the district than it is for our university partners.*

Conversely, the researchers have had trouble balancing practitioner expectations and their own desire to do high-quality research. Many hours of videotape, student and teacher interviews, and student assessments and survey data have been collected, and the analysis process has begun in earnest. However, redesigning units and collecting data for the design process has left little time for comprehensive data analysis.

Finally, finding teachers in the district to participate in studies on the redesigned units has been difficult. A new literacy curriculum was recently introduced and teachers felt overwhelmed by its requirements. A new teacher contract mandated school- and district-based professional development, and teachers were reluctant to take on a redesigned unit that required more professional development. And, several schools in the district were facing potential reorganization and were more focused on math and literacy than science. Teachers in these schools, even those doing the traditional FOSS unit, were reluctant to have their classes videotaped. A district administrator explained what researchers faced:

> *Since we've had so few teachers giving the regular content assessments, it's been hard to compare the scores, even on the common content assessments, to see if our redesign students performed better than the regular FOSS students.*

Benefits

The project has primarily focused on the development and redesign of curriculum and data collection. Two 5th grade units and one 2nd grade unit have been redesigned, and one more unit for each grade is in process. Teachers in the district can now choose between the traditional FOSS unit or the redesigned options.

While research evidence of student learning is still forthcoming, anecdotally, the practitioners report that students in redesigned units are exhibiting behaviors not seen from students in the traditional FOSS units. For example, the Landforms unit requires students to learn about erosion and flooding, research three possible tracts of land in the region upon which a low-income housing project could be built, and make a case for which site (if any) to choose at a public presentation. Students were very excited to share their results and were able to provide evidence and defenses for their decisions. District leaders also noted that teachers have benefited from participating in the project:

> *I've seen it change one of our teachers. ...[She's] leading the way to improve instruction for the whole district. She spoke at our group meeting and said, "This has really changed me, and not just science, but how I approach other subjects, like math." I see it as really helping teachers think about their practice, why they do things, how to incorporate agency, and keep people engaged.*

District representatives feel they have gained a way to refresh their curriculum, keep up with current standards, and deepen teachers' understanding of the content. They also see a model for how the work can continue in the future. One leader explained:

> *I've gained knowledge. Our grant is up next year, and [the other district representative] and I have talked a lot about it, so in the future, when we go to redesign materials, we can use this model in the same way. We've talked about how we should document that so we have a lasting artifact of this work. The idea is if you learn how, then you can apply it to anything.*

For information on the University of Washington-Bellevue School District partnership, see the Institute for Science and Math Education at the University of Washington (http://sciencemathpartnerships.org/), the Learning in Informal and Formal Environments Center at the University of Washington (http://life-slc.org/), and the Bellevue School District (http://www.bsd405.org/).

Endnotes

1. John D. Bransford, Ann L. Brown, and Rodney R. Cocking, *How People Learn: Brain, Mind, Experience, and School* (Washington, DC: National Academy Press, 1999)

2. Daniel L. Schwartz, Xiaodong Lin, Sean Brophy, and John D. Bransford, "Toward the Development of Flexibly Adaptive Instructional Designs," in I*nstructional Design Theories and Models: A New Paradigm of Instruction Theory*, ed. Charles M. Reigeluth (Mahwah, NJ: Erlbaum, 1999), 183-213

3. Kari Shutt, Rachel S. Phillips, Nancy Vye, Katie Van Horne, and John D. Bransford, "Developing Science Inquiry Skills with Challenge-Based, Student-Directed Learning" (paper presented at the Annual Meeting of the American Educational Research Association, Denver, CO, April 2010); Christopher J. Harris, Rachel S. Phillips, and William R. Penuel, "Examining Teachers' Instructional Moves Aimed at Developing Students' Ideas and Questions in Learner-Centered Science Classrooms," *Journal of Science Teacher Education* (in press).

4. Nancy Vye, Philip Bell, Carrie T. Tzou, and John D. Bransford, "Instructional Design Principles for Blending and Bridging Science Learning across Formal and Informal Environments" (paper presented at the National Association for Research in Science Teaching Annual International Conference, Philadelphia, PA, March 2010).

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Vye, Nancy, Philip Bell, Carrie T. Tzou, and John D. Bransford. "Instructional Design Principles for Blending and Bridging Science Learning across Formal and Informal Environments." Paper presented at the National Association for Research in Science Teaching Annual International Conference, Philadelphia, PA, March 2010.