

## ***The Journey Continues***

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### **VEXATION**

Being awarded a grant brings with it a great many benefits. You have money and a certain level of discretion about how to spend it, such as course buyouts, equipment, and you and your colleagues might even get paid for working in the summer. Your Dean and the institution might even celebrate your grant with you, not altogether altruistically, since that Indirect Cost can provide much of the hidden income of universities. With all that, though, I've always functioned from the belief that grants aren't worth the trouble if they don't move your goals forward. When I look at the list of grants I've worked on (conveniently listed on my CV) they all fit generally into the categories I wanted to work on when I left the classroom to go into academia. They were focused on improving K-12 science education, though the activities of individual grants approached this goal from various perspectives. Sometimes the target population was elementary, middle, or high school teachers, sometimes students (college mathematics and science majors, middle school students, elementary school), and sometimes even university faculty. There was often a sub-text of increasing the effectiveness of science instruction with groups that had sometimes been neglected in the science classroom by helping teachers teach science in a "better" way, figuring out how students processed science information, or improving retention of science teachers.

Another aspect of grant-writing and receiving funding that is critical for keeping a job at a research institution is using the grant to support research that can be published in peer-reviewed journals. This, of course, must be considered especially in cases where institutions' tenure and promotion criteria credit grants only in the "service" category. Otherwise, tenure-line faculty who are very active in grants may find themselves industriously making the world better vis-à-vis science education and unexpectedly out of a job!

During my higher ed career I've been directly involved, either as PI, Co-PI, or Project Manager, in almost \$7,000,000 of various grants. These grants would not have been possible without collaboration in many different contexts: among science educators, between education faculty and Arts & Science faculty, between college educators and school divisions, the list could go on... and this has been a very valuable aspect of the projects with which I've been involved. We theorized, wrote, grieved or rejoiced (sometimes both) at the outcomes of grant submissions, and, when funded, worked together to carry out the activities we had promised. These colleagues and I developed our social capital through the common goal of improving K-16 science education. As Dika and Singh (2002) described it, this social capital involved not only trust and sharing of information, but it also yielded efforts that promoted common goals over individual self-interest. Though the realities of highly competitive academia sometimes threatened the harmony of these collaborations, they endured because the players gained enough from the interactions and products to offset the discomfort of the individual and internal change inherent in the actions that lead to social capital (Coleman, 1988).

The most beneficial collaboration in my professional experience has been with a fellow science educator at a nearby institution with whom I have an extensive backstory. The strength of this relationship can be credited to the duration of experiences that allowed, encouraged, and probably required the development of a level of social capital defined not only in the general aspects laid out by Coleman (1988), Dika and Singh (2002), Field (2003), and others, but also defined by the specific qualities of the colleagues and the adjustments made throughout the duration of the relationship.

### **VENTURE**

Now, for the first time, we both have grants that are in the same program, and so do several other science education researchers who are Crossroads veterans. The program is the Robert Noyce Scholarship program, funded by the NSF, and it provides scholarships to mathematics and science education students, with the condition that students teach in high-needs schools. In addition to the Noyce grant, I am PI of a Teachers for a Competitive Tomorrow (TCT) grant from the USDOE. This grant supports course development and other activities to prepare students to teach in high need LEAs.

The social capital gained through Crossroads relationships promises an opportunity for a broad-based collaboration among several institutions involved in these federally-funded programs. Already, a small group of Noyce recipients have submitted a proposal to NARST for a special symposium on the Noyce program, with the NSF program officer as our discussant. It is a reality of all our situations that we need to make sure we produce credible research that responds to current thinking in the science education research community, and we need to publish that research. With the availability of Noyce scholars and of variations on science teacher preparation being sponsored through the NSF and other grants, there is a population readily available to provide data on aspects of science teacher preparation.

A potentially rich area for research is that of the effectiveness of various approaches in preparing these future science teachers to teach in high need schools. An aspect of research that seems particularly promising to me is an examination from various perspectives of the strategies employed to prepare students for the particular challenge of working in high need districts. An aspect of this research would be to measure the levels of success of the strategies.

A possible dilemma embedded in this research lies in the lack of specificity of what the targeted K-12 population is, exactly. High poverty is not a narrow category of need. In my geographic area, it encompasses rural schools, urban schools, high percentages of ELL students, of African-American students, of Native Americans, of students with special needs, and all the permutations possible with these characteristics. How can we prepare our students to teach all these variations?

As with most studies, a reasonable first step seems to be to establish the baseline. To do that, this project should be defined so that strategies and resources are recognized and clearly defined. It seems reasonable to also focus on the characteristics of incoming students. In addition, as the project progresses year by year, measures should document changes during and at the end of the program, as well as throughout the first several years of induction into the profession.

With the prospect of collaboration across institutions, there is an opportunity to do comparative studies of the various strategies employed. A reasonable research question to ask might be: What are the variations of approaches across Noyce projects? How successful were the approaches? Of the approaches that were more successful, what recommendations can be made in support of work done at other institutions, and of other, future grants?

Defining and assessing the characteristics of preservice teachers seems an obvious direction to take with research on this project. One could ask: What knowledge, skills, and attitudes do students have and exhibit upon entering these programs? At mid-point? At completion? After first and second years of teaching? How do the KSA exhibited vary across projects? In addition, there are several measures that could provide useful information about the students; some might even be used to support comparative studies across institutions. We plan to use the Science Teacher Efficacy Belief Instrument (Enochs & Riggs, 1990) and a Cultural Competency scale developed by Siwatu (2006), along with Praxis II scores, to better understand our preservice teachers' level of content knowledge and of self-efficacy. I will be interviewing selected Noyce scholars prior to the presenting of this Vexation and Venture at Crossroads.

An analysis of artifacts from Noyce Scholars at my institution has revealed some interesting characteristics. At the beginning of their program, these students revealed a great deal of confidence in their own content knowledge, showed a very low level of recognition of the importance of explicit classroom management strategies, and exhibited unrealistic expectations about the impact of their teaching on students.

It occurred to me during the analysis of the artifacts mentioned in the previous paragraph that what it is to teach involves even more than is defined by PCK; there is a social capital aspect to teaching that sings out loudly in the cultural competency literature. Boykin and Miller (1997) talk about the development of a sense of group-ness in effective minority classrooms. Though the ability to develop "group-ness" might be considered pedagogical, the use of the descriptive "pedagogical" seems to narrowly focus the responsibility and the action of this strategy on the teacher. In developing social capital in a classroom, the sharing of responsibilities and goals is essential.

Two aspects of the development of "group-ness" have emerged as areas of interest for me. First, there is the durable and highly documented approach known as cooperative learning. It is fascinating that the literature so clearly stipulates conditions needed to effectively employ cooperative learning (e.g., individual accountability, group goals, equitable division of responsibilities) and yet classroom teachers who believe they are using cooperative learning don't seem to apply these recommendations. All too often, cooperative learning is expected to occur as a result of placing students near each other, with little or no support for the development of social capital among those who are novices at employing social relationships in their classes. In 2009 Johnson & Johnson, two of the original experts in the use of cooperative learning in schools, reiterated the value of cooperative learning when carefully structured and supported.

The second area of interest that is related to "group-ness" involves an examination and broadening of our view of what we want to go on in a science classroom. We know we want our teacher education students to understand and explicate science content using effective pedagogical strategies, but I suspect we have somewhat neglected an emphasis of the development of social capital in the science classroom, to the detriment of those who would benefit from a social capital perspective to their science classes. This recognition and development of social capital seems another necessary component of science teaching in the culturally competent classroom. This is a much more complex undertaking that training our students in how to write an inquiry lesson plan, and it will probably require us to expand beyond biology, physics, chemistry, Earth science, etc. into areas of psychology that may make us feel a bit squeamish. Nonetheless, this may be exactly what is needed to truly grapple with the challenge of the teaching as a culturally responsive pursuit.

I've described several areas of possible research that could take advantage of the resources provided through our Noyce grants. My venture is: What research directions should my colleagues and I pursue and how should we pursue these directions?