Policy Implications for Virginia Initiative for Science Teaching and Achievement: Investing in Innovation (i3) Grant

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Abstract

This paper introduces *Virginia Initiative for Science Teaching and Achievement* (VISTA), a new United States Department of Education Investing in Innovation (i3) grant and discusses the policy implications and challenges. VISTA is a partnership among 47 school districts, six universities, and the Virginia Department of Education to build an infrastructure to provide sustained, intensive science teacher professional development to increase student performance. Funded by the United States Department of Education (Investing in Innovation Fund – i3), the goal of VISTA is to improve science teaching and student learning throughout Virginia especially in high-need (high-poverty, high minority) schools through a validation study of previous targeted efforts in the state. In conjunction with validating prior program research efforts, the funded project has been designed to shape state- and local-level policy and practice in three areas.

- Upper elementary (grades 4-6) teachers experience scientific, problem-based learning and student-centered inquiry as they work in teams to conduct inquiry-based science for children.
- Uncertified or provisionally licensed secondary (grades 6-12) science teachers are provided just-in-time coaching and "big picture" research-based teaching coursework for two years.
- State leadership infrastructure builds support needed to extend quality inquiry-based science teaching to limited English proficient students, rural students, and students with disabilities.

Discussed is the preparatory work that was required and challenges faced for this project in order to ensure that the project's impact on policy at the state- and local-levels is maximized.

Keywords: grant planning, teacher professional development, science education, policy

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Challenge

As programs are expanded to new audiences, they face new challenges. This paper describes a science program when extended statewide in one state and shares the challenges encountered. The paper follows the funding/award process and initial progress for one new grant to improve science teacher effectiveness and student achievement in the 2010 round of U.S. Department of Education, Investing in Innovation (i3) funding.

Science teaching continues to be hindered by two fundamental, unmet needs. Elementary school faculty members very often have teaching degrees but lack a solid grounding in science or the inquiry-based nature of science (Akerson & Abd-El-Khalick, 2003; NRC, 2007; NCMSTTC, 2000). In addition, as a result of the increased focus on language arts and mathematics, there is often a lack of science teaching and in particular, inquiry-based teaching, as called for in the *Virginia Science Standards of Learning* (2010) and *National Science Education Standards* (1996). On the secondary school level, teacher shortages have led to the hiring of many uncertified teachers who have science degrees but little or no teaching experience or training (NCMSTTC, 2000; NRC, 2007). Research shows that 66 percent of these new teachers will quit the profession within three years (Darling-Hammond, 2000, 2003) creating a revolving door of unqualified teachers rotating through our schools (Ingersoll, 2000; Ingersoll & Perda, 2009; Marvel, et al, 2006). These distinctly different problems in teacher preparation by grade level lead to a common result: Student achievement in science suffers.

High costs are associated with continually hiring, training, and losing teachers, not only in dollars but also in school morale and student achievement. Well-prepared teachers have the greatest impact on increasing student achievement (Darling-Hammond, 2000, 2003). Teacher preparation and on-going professional development play a strong role in students' science performance. The Educational Testing Service found in its study, *How Teaching Matters* (Wenglinsky, 2000), that student achievement increases when teachers are well versed in effective teaching strategies. For new science teachers to have the potential to produce high-achieving science students, they need to know their science content and also be skilled in how to effectively plan, teach, assess, and motivate students for learning. Based on these findings, the Virginia Initiative for Science Teaching and Achievement (VISTA) was created to build an infrastructure to provide elementary teachers and new uncertified secondary school science teachers with intensive support and effective interventions to help teachers learn science content and develop the experience and confidence needed to teach inquiry-based science (U.S. Department of Education, 2010). Though the purpose of schools is to help students learn, in some cases the best way to help students is to help teachers.

Theoretical Framework

The VISTA professional development program is grounded in the theoretical framework of a community of practice (CoP) for continuous improvement of teaching and program development. Continuous improvement assumes that with collaborative planning, thoughtful reflection, and data collection and analysis that program leaders can become more effective at helping teachers investigate their teaching and teachers can become more effective at helping their students learn science.

Community of Practice

Communities of practice are based on a social theory of learning where the learner is an active participant in the social community (Wenger, 1998). Engaging in a community of practice is important for fostering personal growth (van Driel, Beijaard, & Verloop, 2001; Wenger, 1998) as opposed to struggling on your own. Collaborative reflection empowers teachers and program development leaders to "examine their beliefs and make changes in their practice" (Keys & Bryan, 2001, p. 636). In their CoP, teachers become aware of the changes in their views about teaching and professional development as they struggle with teaching and discuss their struggles with the members of their community (Akerson, Cullen, & Hanson, 2009).

A CoP draws on situated learning theory which involves a community of participants with a wide range of expertise who work collaboratively on a real problem in a specific context for the benefit of all (Lave, 1988; Lave & Wenger, 1990). According to Anderson and Helms (2001), "Teachers working together in collaboration towards similar goals represent the most effective path to change" (p. 9). A CoP for teaching also is supported by social cognitive theory that stresses effective professional development, addresses social needs, and develops self-motivated and self-regulated teachers (Bandura, 1997; Zimmerman, 2000). As new practices are developed, they are shared.

Communities of practice support the conceptual change process, whether it is new information or confronting alternative conceptions. Research suggests that in order for conceptual change to take place, deep restructuring in ways of reasoning is crucial as new associations and knowledge are connected with existing structures and knowledge (Furio, Catatayud, Barcenus, & Padilla, 2000; Hewson & Hewson, 1983; She & Liao, 2010). To create new reasoning patterns an individual responds to inadequacy using present reasoning patterns (Karplus, 2003). According to Karplus, during exploration learners gain experience with new

situations, while concept introduction provides opportunity for learners to socially exchange and define new information, and concept application supports learners' abilities to apply the new concept or reasoning pattern to a new situation.

Conceptual change is also based on Piaget's (1964) work of construct disequilibrium where people become dissatisfied with their current conception. This dissatisfaction is a cause for disequilibrium. Disequilibrium exists until the person strikes a balance between assimilation and accommodation of new ideas. A CoP provides a venue for discussing situations and practices that do not seem to be working as efficiently as the CoP would like.

Through the long term commitment of a CoP, a variety of needs can be addressed by multiple kinds of support over an extended time period. Professional development that takes place over an extended period of time is more successful at producing intended change (Supovitz & Turner, 2000, van Driel, Beijaard, & Verloop, 2001, Yoon, Duncan, Lee, Scarloss, Shapley, 2007). The extended time allows for collaboration to take place and action research to be conducted and analyzed (van Driel, Beijaard, & Verloop, 2001).

Common features of CoP and collaborative action research are ownership of specific problems that members of the CoP want to collaboratively explore, the research they conduct, the data they collect, and the actions they take (van Driel, Beijaard, &Verloop, 2001). Best practices research on effective teaching and professional development programs indicates the importance of a collective sense of commitment and responsibility for serving children (Guskey, 1995; Ruskus, Luczak, & SRI International, 1995; Sterling, 1997, 2000; Sterling, Olkin, Calinger, Howe, & Bell, 1999; U.S. Department of Education, 1999).

Continuous Improvement

Continuous improvement can be defined as “an unwavering commitment to progress” (Zmuda, Kuklis, & Kline, 2004, p. 17). Through a continuous improvement model of quality management, programs and services are greatly improved through more effective program management and testing. “Every job is part of a process … At every stage there will be … continual improvement of methods and procedures” (Deming, 1986, p. 87).

Schmoker (1996) advocates that the key to continuous school improvement is “meaningful teamwork; clear, measureable goals; and the regular collection and analysis of performance data” (p. 2). The importance of teamwork for productive change is echoed by business leaders Tom Peters (1987) and W. Edward Deming (1986). According to Schmoker (1987), “teamwork is perhaps the most effective form of staff development” (p. 12). In contrast Zmuda, Kuklis, and Kline (2004) describe “for staff development to be effective, it must be an integral part of a deliberately developed continuous improvement effort” (p. 5). This is also harmonious with collaboration in a CoP (Akerson, Cullen, & Hanson, 2009; Keys & Bryan, 2001; Wenger, 1998). Schmoker’s (1986) research indicates that teamwork and goals are both essential to performance, each depending on the other to build cohesion.

Through teamwork, the collaborative support provided within a CoP can assist teachers with ideas and feedback through the change process (Marzano, 2003; Marzano, Pickering, & Pollock, 2001). Additionally, Reeves (2009) notes that sustainable change depends “upon the pursuit for the greater good” (p. 125) focused on student, teacher, and overall school success. With a commitment to sustainable change to support teachers’ and students’ success, VISTA established instructional support for elementary and secondary science teachers to foster their continuous improvement within a CoP based on (1) inquiry-based learning as outlined in the science standards (American Association for the Advancement of Science, 1993; Kahle, Meece,

& Scantlebury, 2000; National Research Council, 1996; VDOE, 2010), (2) teaching for understanding (Hiebert, et. al., 1997; Sterling, 2001; Wiggins & McTighe, 1998), and (3) in depth study of real science problems studied over extended periods of time (Delisle, 1997; Hmelo-Silver, 2004; Krynock & Krynock, 1999; Shack, 1993; Stepien & Gallagher, 1993).

Purpose and Research Questions

Any time a new program is implemented, challenges are faced by the project developers. The purpose of the study was to determine: What were the project developers' perceptions of the challenges in designing and implementing a statewide professional development program? This case study documents the challenges faced by one validation-level grant recipient during the new 2010 U.S. Department of Education Investing in Innovation (i3) grant program. This paper is based on the perspectives of the program developers/implementers for challenges they encountered in the initial stages of program concept development and planning at various program delivery sites and the overall program. The study includes the proposal writing process, contract processing, and initial implementation planning of the program. The study highlights the issues the program developers encountered and how the program developers grappled with implementing the new program which was based on previous programs that had a record of success. The research questions were:

1. What challenges did the project developers face in designing and implementing the project?
2. How did the developers overcome these challenges?

Methods

This case study was designed to understand the initial grant process for recipients of one U.S. Department of Education i3 validation-level grant, VISTA.

Participants

This study chronicled the experiences of nine program implementers from six universities and one nonprofit evaluation company. The paper is based on the perspectives of the program implementers for challenges they encountered for the overall program as it was being created and implemented and at the three program delivery sites for validation purposes. The strategically-selected participants included the nine people involved with the proposal, acceptance, and implementation of the VISTA grant. These participants include the principal investigator (PI), four co-principal investigators (co-PI), three other investigators, and the outside evaluator.

Research Design

In this descriptive case study, the researchers collected qualitative data concurrently from key program implementers throughout the state as the program was initially being created and implemented. Survey and interview data were collected three times over the first six months of the project. Through research questions such as: What challenges did you have to work around? and How did you overcome these challenges?, the study highlights the issues the program implementers encountered and how they grappled with implementing the new extended program which was based on previous programs that had a record of success.

The survey was administered three times for three time periods – grant proposal writing, contract processing, and initial program implementation (See Appendix). Open-ended interviews provided clarification, different perspectives, and a multifaceted picture of the complexity of the expanded program.

Data Analysis

Qualitative data were analyzed using the constant comparative process of grounded theory (Glaser, 1978; Glaser & Strauss, 1967; Strauss & Corbin, 1998) and cross-case synthesis

(Yin, 2003). As responses were examined, they were coded, tallied, ranked, and analyzed for emergent themes (Creswell, 2008). They were serial coded by explicit category (Gibbs, 2002) and open coded for content (Glaser, 1992; Strauss & Corbin, 1998). As a result, information categories were created with specific properties and dimensions that arose from the data.

The emergent themes were further analyzed using Microsoft Excel spreadsheets to analyze sequential data for patterns in change over time. This comparison between cases over time relied on both quantification of category results due to the number of cases included in the study as well as "argumentative interpretation" (Yin, 2003, p. 137).

Axial coding (Strauss & Corbin, 1998) was used to further define broader categories of meaning based on the properties and dimensions of ideas within the data as well as relationships and connections among categories. All analyses were reviewed by the research team in order to reach consensus. The result is that processes such as collection, coding, and writing were occurring simultaneously and were continuously revisited (Glaser & Strauss, 1967).

Data Analysis Procedures

The initial grant process was divided into three parts based on deadlines dates. Part one was grant proposal writing from concept development through submission (March 8 - May 10, 2010). Part two was processing acceptance from announcing the highest rated applications through receiving the grant/contract (August 4 – October 31, 2010). Part three was initial implementation planning (October 1, 2010-February 2011).

Using a qualitative methods design, this study examined the principal investigator, co-principal investigators, investigators, and outside evaluator perceptions of the grant process. The survey responses from the principal investigator, seven investigators, and the outside evaluator were analyzed as a group and as sub-groups. All of part one for all participants was coded

before proceeding to coding part two, etc. The grounded theory constant comparative process was followed and memos were used as ideas occurred. Frequency counts to determine occurrence of codes was conducted first, followed by identifying the similarities and differences in related codes across responses and looking for patterns. The relationships among codes were examined so that the data could be reduced as needed. Trends were compared by analyzing the similarities and differences among codes and their frequencies over time.

VISTA Program Design

Of the 1698 applications received by the U.S. Department of Education, 49 were funded. According to U.S. Secretary of Education Arne Duncan., i3 grants "support creative thinkers who test good ideas and take proven approaches to scale so that more children can benefit." There are three categories of grants: up to $50 million per "scale-up" grant for programs with a strong track record of success; up to $30 million per "validation" grant for growing programs with emerging evidence of success; and up to $5 million per "development" grant for promising ideas. Of the 49 highest rated applications, four are Scale Up, 15 are Validation, and 30 are Development. The i3 fund, established under the American Recovery and Reinvestment Act (ARRA), supports local efforts to start or expand research-based innovative programs that help close the achievement gap and improve outcomes for high-need students.

This paper is about the validation grant: Virginia Initiative for Science Teaching and Achievement (VISTA) (U.S. Department of Education, 2010) and the challenges they faced during proposal writing, contract processing, and program implementation planning. VISTA addresses Absolute Priority 1: Innovations that Support Effective Teachers and Principals as specified in the Federal Register Notice Inviting Applications.

Primary objectives for VISTA are to:

- Increase student learning in science including students with special needs and limited English proficiency
- Enhance quality of elementary science teaching by including inquiry-based teaching
- Enhance the quality of teaching by new, underprepared secondary science teachers, including having students conduct inquiry-based laboratory activities
- Increase the number of certified middle school and high school science teachers
- Increase access for rural teachers to professional development
- Build the state infrastructure to support effective science teaching and learning
- Conduct research to determine what makes the most significant difference in helping teachers to help students learn

The *Virginia Initiative for Science Teaching and Achievement* (VISTA) is a partnership among 47 school districts, six universities, and the Virginia Department of Education to build an infrastructure to provide sustained, intensive science teacher professional development to increase student performance. The goal of VISTA is to improve science teaching and student learning of science throughout Virginia via policy and its implementation. This program is based on the statistically significant improvement in science instruction and student performance of two teacher professional development programs.

VISTA is a validation-level program that seeks to build a comprehensive, state-wide professional development model to improve K-12 science teaching. Our Learn, Try, Implement with Feedback and Research model with a focus on continuous improvement was incorporated into two programs that have produced statistically significant gains in teacher instruction and student achievement in three large school districts. VISTA continues research on these programs

and this model as they are validated and adapted for wider distribution in Virginia via state- and local-level policy efforts. The programs target teacher needs by grade.

- Upper elementary (grades 4-6) teachers receive professional development in scientific, problem-based learning (Delisle, 1997; Hmelo-Silver, 2004; Krynock & Krynock, 1999; Shack, 1993; Stepien & Gallagher, 1993) as well as student-centered inquiry (Brooks & Brooks, 1993). These teachers work in teams as they *learn* about problem-based learning and receive *feedback* as they *try* inquiry-based science teaching in a summer enrichment camp for children. Follow-up professional development helps them *implement* science-based approaches in traditional classroom settings and conduct *research* on their students' learning.
- Uncertified or provisionally licensed secondary (grades 6-12) science teachers have degrees in science but little or no training in teaching. They *learn, try,* and *implement* how to teach on the job. For two years, VISTA provides just-in-time support and "big picture" *research*-based teaching coursework. A unique aspect of this program is the community of practice support, including an in-class coach, a retired science teacher, who provides *feedback* and helps the new teacher plan, teach, and problem-solve about teaching.
- VISTA also builds a state infrastructure involving the State Department of Education, K-12 school district science coordinators, specialists, principals, and science and science education professors. They provide the leadership, resources, and support needed to extend quality teaching to all students, including students from rural areas and students with limited English proficiency and with disabilities and other special needs.

VISTA has been designed to shape state- and local-level policy and practice with respect to:

- the development and support of effective teachers, with a focus on improving the effectiveness of teaching in high-need (high-poverty, high minority) schools to support college readiness;
- professional development and classroom coaching to provisionally licensed teachers so "learning on the job" is more rewarding and successful, and teachers are more likely to stay in the profession; and
- K-12 students' access to college and careers, addressing the learning needs of K-12 students with disabilities and limited English proficiency, and serving schools in rural school divisions.

Findings

This paper shares the challenges being encountered in the initial stages of the validation process as the programs are ratcheted up to statewide proportion and the policies that have helped or hindered this implementation. VISTA is attempting to replicate and expand two programs whose efficacy in improving both teacher quality and student learning have been documented. The findings are divided among three sequential tasks (1) grant proposal writing, (2) processing acceptance, and (3) implementation planning.

Grant Proposal Writing

In March of 2010, the U.S. Department of Education (US/ED) announced a competition in the Federal Register for the new Investing in Innovation (i3) program. The Federal Register Notice included details on the extensive requirements for the program and stated the validation grants could be as high as $30 million each, with an average award of $17.5 million. The

deadline for applications was two months after the notice was published. This section identifies the importance of establishing a team with a common vision, challenges encountered by the investigators, and overcoming challenges.

Establishing a team. The Principal Investigator, a professor of science education, put together a team including the Virginia Department of Education, six Virginia universities, and the independent evaluator. The team members created a vision of science teaching and learning throughout Virginia. The team members have extensive program development and grant writing experience, with an average of 15 grants per member, and two members had over 20 years of experience. According to the principal investigator, "The networking that was established before the project enabled us to work quickly to create a vision for a viable statewide project" and to add team members as needs were identified.

The team members brought complementary strengths and experience to the proposal writing, which was required to build a complex project in a short turnaround. The strengths were utilized to flesh out various aspects of the project such as the different institutions writing their own statements of work and budget narrative. Whereas the principal investigator wrote the main proposal and budget which included the research that the project was based on and how the project would be extended throughout the state. Another investigator wrote the research plan for secondary teachers, and another wrote the section dealing with rural education. The contributions from all were closely aligned with the priorities the US/ED announced for the i3 competition and when pulled together into the proposal, provided a comprehensive plan for teacher professional development across the state of Virginia.

Challenges. Putting together this complex of an application in such a short time and involving six institutions did present challenges. The 60 day window impacted several of the

proposal authors in that they had to make time on top of the already scheduled responsibilities to work on this collaboratively. According to one faculty member, "Faculty involved with grants who also hold tenure-line or tenured positions know that grants are only one aspect of their responsibilities and the areas of research and teaching as well as other aspects of service must not be neglected. This was a factor not only in making time to write the proposal but also in designing the implementation of the project so that the proposal included enough support staff to carry out the activities of the project."

An additional challenge that six respondents stated was that there initially was a lack of clarity in the mission of the project as well as the roles of the partners. This lack of clarity was also stated by partners who raised concern about making sure the activities were in sync across sites and that partners were in agreement. Another challenge was the delineation of roles between the independent evaluator and the inside evaluator as the research team in the proposal. The independent evaluator also indicated they struggled with designing evaluation activities that would validate the measured impact of previously evaluated activities during state-wide implementation.

Many of the challenges were not expected by the participants in the study, all of whom are experienced working with grants. For example, the short time frame was unexpected. Several of the challenges were also surprising, including the lack of timely responsiveness from a few of the partners and having to adjust writing styles so that findings would be meaningful to the reviewers and catch their interest.

Overcoming challenges. The challenges were overcome largely through open, regular, and frequent communications. Conference calls, regular meetings, emails, and extensive

discussions were all utilized to keep the proposal writing and development on track for a timely submission. Additionally long hours were put in to meet the deadline.

The office most frequently cited for support during the process was the Office of Sponsored Programs on each campus. They provided technical assistance in putting the pieces of the application together, with the most common help being in the budget and finance area. Additionally deans and department chairs provided assistance in the process including providing personnel to assist with paperwork and support letter gathering as well as playing a role in gaining institutional acceptance.

The project team also had a high level of trust with each other and the four co-PIs responsible for running the sites also had an established relationship prior to forming this team. One co-PI stated that it was critical that the team “already had a relationship of trust and mutual respect. We were able to move forward quickly and resolve issues more amicably than might otherwise have occurred had we not had much experience already working with each other." The leadership team knew of the potential for change and improvement that would result from the project, based on past experiences that were highly motivating.

Processing Acceptance

The processing acceptance phase included the issuance of the grant from the U.S Department of Education to George Mason University (Mason). Prior to the issuance of the grant, minor budget changes needed to be made with explanations and the commitment from the private sector for the 20% matching funds needed to be secured. Once the grant was issued to Mason, contracts were then issued to the partner institutions and the independent evaluator.

Challenges. The most challenging issue during this phase concerned the 20% match required by US/ED. Not only was ambiguity evident nationally, but also within VISTA. Initial

information regarding matching funds was part of the Federal Register notice. However, confusion was evident as the webinars involved questions about what constituted matching funds and what evidence was required for matching funds. The confusion about the match was exacerbated by the haste with which the proposal had to be assembled, and also by ambiguous information. As a result of on-going confusion, more information was provided online at ed.gov with examples of adequate evidence. The confusion and ambiguity was also evident within VISTA as some of the partners did not fully understand the requirement and their roles. One partner indicated not knowing until after the award that there was a match. The short turn around time of the proposal could have been a contributing factor to this. Another partner thought that US/ED was going to form a separate group to work with grantees to secure the match. According to the Principal Investigator, the partners were informed of the match prior to applying for the grant and they all had access to the Federal Register. They were also informed that Mason would apply for matching funds through US/ED. The application for matching funds was submitted, but no private sector offer for matching funds was forthcoming. Therefore, fund raising fell on the partners in the grant proposal. The expectations about each institution's role in raising the match then needed to be established. This presented challenges working with each institution's Development Office and helping them to understand their role in securing the 20% match.

An additional challenge was the issuance of a contract rather than a sub-grant. The US/ED decided that none of the partner institutions were "official" partners but all were "other" partners. This initially caused confusion regarding indirect costs which in the end were unaffected by the change. Also the timing of issuing of the contracts to partners was a concern, which some partners felt was delayed and resulted in a delay to access funds. The contracts were issued by the end of the first month of the grant. Furthermore, the challenge identified in the

Grant Proposal Writing section of the delineation of duties between the independent evaluator and one of the institutional evaluation partners continued during the Grant Acceptance phase. This resulted in a delay issuing their contracts.

One institution experienced delays by their institution in accessing the funds once the contract was awarded which impeded the partner's ability to begin implementation as well as make adjustments to spring courses. Another indicated on-going struggles with the process of hiring staff needed to begin planning for the project and the requirements to work through both the School and College was an.

Overcoming challenges. The Mason Foundation communicated with the partner institutions to discuss strategies to raise matching funds. Partner institutions were asked to help raise part of the match, up to 20% if possible of what the institution is to receive. One partner was emphatic that the support of the Dean and the institution's Foundation Office were critical to overcoming this challenge. This partner also had the support of the senior administrators which contributed to the success with the match. "I couldn't have done it without the support of my Dean and the Foundations Office in the School of Education. Also, I had the support of senior administrators at the College. I think they supported this because of the Dean." It is interesting to note that though the partners are no longer panicked about raising funds, only one partner has raised funds to date from the private sector.

Given confusion over the funding vehicle (i.e., contract versus sub-grant), the Principal Investigator arranged individual meetings of the Mason Office of Sponsored Programs (OSP) staff with the partners' OSP staff along with the co-PIs. During each individual meeting the OSP staff discussed the funding structure and assured the co-PI that this was "business as usual".

These meetings allayed the concerns of the co-PIs and provided them with a better understanding of the nuances of the funding vehicle.

The level of trust, teamwork, as well as belief in the potential of the activities to lead to change and improvement of science teaching within Virginia continued from the proposal writing phase into this phase as crucial elements to overcoming some of the challenges. Finalizing budgets and contracts are often an area of concern. Though raising matching funds was a concern, it is noteworthy that no partners expressed concerns about their individual budget or contract.

Implementation Planning

The magnitude of the implementation planning for this validation grant was very large scale given that the grant awarded was $28.5 million; involved six institutions of higher education, an outside evaluator, and the Virginia Department of Education; 47 Virginia school divisions; and laid a foundation for state-wide implementation. While the team of co-PIs had extensive and varied grant experience, no one had experience with a project this size.

Compounding the implementation planning, the grant was issued by US/ED on September 24th, with a start date of October 1st. The i3 grants are fully funded with fiscal year 2010 funds and since the Mason award is for five years, a time extension at the end of the grant will not be possible. So the lateness of the award with a quick start date has created additional pressure to implement the activities promptly, curtailing planning time.

Staff challenges. The staff encountered challenges in time management which compounded personnel hiring and the Human Subjects Review Board process.

Time management. The team members from the institutions of higher education worked on the grant proposal in addition to regular duties, so the activities required at the start of the

grant became their responsibilities too since new staff hadn't been hired. These activities included working with the outside evaluator on instrumentation development; submitting instruments to the Human Subjects Review Board; recruiting high quality staff; learning the procedures to hire staff; obtaining office space; negotiating buy out time; continuing attempts to delineate the role of the outside and inside evaluators; developing a communications plan and marketing materials; working with the foundation on raising matching funds; and responding to US/ED multiple requests for additional documentation.

Personnel. As a result of the grant, the PI and co-PIs had to take steps to implement changes to their schedules and also to begin hiring staff for the project. This included developing appropriate job descriptions to solicit applications from people with the desired skill sets. Roadblocks such as salary negotiation disruption and hiring delays stalled the process. The paperwork for hiring was tedious as were the regulations. In some cases, when new staff was hired, there was a learning curve for duties and processes. Coordination of personnel across sites presented challenges as did office moves and external accreditation reviews. The hiring process at all sites is on-going.

Human Subjects Review Board approval. All instruments developed for this project must be approved by the Human Subjects Review Board at Mason as well as partner institutions (unless they opt to be covered under Mason's approval). Preparing the instruments and documentation for this process was extremely time consuming and laborious. Complicating the submission process were two factors. One, the independent evaluator was unable to produce instruments that targeted key aspects of research within a time frame that made prompt Human Subjects approval likely. Further, an issue with the instruments was the lack of coherence with

school culture and current best practices in science. Two, Mason hired new project staff to work on this process and they were unfamiliar with the requirements for human subject clearance.

Relationship challenges. Building new relationships takes time and not all relationships are equally productive. Three especially challenging relationships were the independent evaluator, communications with US/ED, and fund raising.

***Independent evaluator situation*.** During the development of the proposal for this validation grant, the independent evaluator approached the PI about working on the grant and the PI agreed. The independent evaluator submitted an evaluation plan that was included in the proposal that was consistent with the previous efforts selected for validation. After the grant was awarded, the independent evaluator made changes to the original plan several times. The internal evaluator was concerned about the lack of clarity in the delineation of duties between them and the independent evaluator. Furthermore, as mentioned above, the independent evaluator's instruments were not congruent with current best practices in science so the initial submission to the HSRB had to be withdrawn in order to increase the coherence of the instruments with the needs of the field. Critical reporting deadlines were missed. Eventually, the relationship with the independent evaluator was terminated and we are pursuing a new independent evaluator with knowledge of inquiry-based science teaching and learning.

***Communication with US/ED*.** The i3 program is an initiative of the Obama Administration and is highly visible. Therefore the grants awarded under this program have been and continue to be scrutinized very carefully. During this phase, the US/ED program officer repeatedly asked for additional documents after any conversation or meeting, including many that are extra-regulatory. This additional work has resulted in additional time management issues.

Mason Foundation. The Mason Foundation agreed to raise the 20% match for the grant. Post award, the Mason Foundation met with the PI and partner Foundations to discuss raising matching funds. Though the Foundations have shared ideas and strategies, the fund raising progress made to date has been very slow. Though professional marketing materials may be helpful, the Mason Foundation has not developed any yet though they have been provided data and metrics.

Overcoming challenges and continuing challenges. The implementation planning is ongoing so some implementation planning challenges have been overcome while some are still being addressed. VISTA components will take place over a 12 month period and then repeat for the four remaining years of the grant. Planning is currently underway for future activities.

Staff challenges. A number of new staff members have been hired and others are currently being recruited. The additional staff has been instrumental in moving the project along, especially in the HSRB process, as well as providing the co-PIs with more time to focus on upcoming project implementation. The new staff has been welcomed fully to the team and included in the weekly conference calls and meetings. Also the new staff has brought new networks to the project to facilitate relationship building with the school divisions in Virginia and with US/ED. The co-PIs are working on hiring project directors at two of the training sites as well as training staff on managing the project and running the office. The leadership team has begun identifying potential individuals to fill roles during the project such as Summer Camp Director at two of the sites.

Having additional staff has facilitated the HSRB submission but the process has a number of additional steps before approval is received. Applications cannot be posted on the web until approval has been received so the PI and co-PIs are very concerned about the effect the delay

will have on the recruitment of elementary and secondary teachers to the professional development opportunities as well as school division science coordinators and university faculty professional development academies. There is also concern about the recruitment and training of coaches.

***Relationship challenges*.** The original independent evaluator was replaced. The internal evaluator's role has been expanded to encompass the independent evaluation components. This change resulted in the integration of deep science education knowledge more fully into the evaluation plan and duties. The complications with communication and delineation of duties in the previous structure seem to have been removed. There is regular open communication with the evaluator and a revised evaluation plan has been developed and submitted to US/ED. However, there is a concern that the change in evaluators may negatively impact the ability to collect good data the first year.

Because the communication with US/ED has regularly resulted in additional, unscheduled work for VISTA staff, there is caution being applied when deciding to contact US/ED. Grantees should have open communication with US/ED program staff so this challenge needs to be addressed directly with the program officer. It would not be in anyone's interest to mitigate communication based on concern about additional work. The relationship between a grantee and US/ED should be fruitful for all stakeholders so a conversation about clear expectations as well as an understanding of what is required versus what is desired should take place as soon as possible.

VISTA staff and Mason senior administrators have been meeting with Foundation staff since the proposal development phase. These meetings will continue to be an omnipresent challenge until all the matching funds are raised.

Discussion

As programs are expanded to new audiences, they face new challenges. This paper describes a multifaceted program and shares the challenges being encountered in one state when a science program received a grant to extend the program statewide. Improving teacher effectiveness is an intermediate but very important variable strongly correlated with improving student outcomes. The program also called for developing a state infrastructure for the design and implementation of research-supported policy to support effective science teaching and learning. Prior research provided evidence that a partnership with particular characteristics with school districts and a university improved science teaching and student learning and has the potential to positively shape policy in this area.

This paper introduces *Virginia Initiative for Science Teaching and Achievement* (VISTA), which is a partnership among 47 school districts, six universities, and the Virginia Department of Education to build an infrastructure to provide sustained, intensive science teacher professional development to increase student performance. Funded by the United States Department of Education (*Investing in Innovation Fund – I3*), the goal of VISTA is to improve science teaching and student learning throughout Virginia especially in high-need (high-poverty, high minority) schools. In conjunction with validating prior efforts, the funded project has been designed to shape state- and local-level policy and practice in three areas: upper elementary school science, uncertified or provisionally licensed secondary science teachers, and state infrastructure for leadership in science teaching and learning.

VISTA is dedicated to transparency throughout its design and implementation. Therefore we share our successes and challenges. We believe that this transparency will ultimately enhance the potential to shape policy and practice in science teacher development and support, as well as

students' science learning experiences and achievement. With attention to transparency, the investigators in this paper share the challenges they faced as the project's proposal was designed, awarded, and initial phases of implementation. At four and a half months into the project, no professional development has been given, but initial implementation has started. The investigators are trying to ensure that the project will ultimately result in policy implications and institutionalization of project components shown to be effective based on the project's validation efforts. There are policies and procedures at every level of program implementation – some work and some are questionable.

Communication

Though not a policy, open communication across all aspects of the program is key to its success. This is a hidden policy for the VISTA program that may eventually be evident to program participants but is key now to program implementers. These program implementers are the first part of the state infrastructure resulting from VISTA to be developed to a more cohesive level and with a focus on science teaching and learning.

Prior network. Though no one person knew everyone in the VISTA program, the principal investigator knew most everyone and provided continuity across the different elements of the program. This prior working relationship was key to getting past roadblocks as they appeared and to maintain a positive attitude. Examples of hurdles are in the next section of this paper.

Weekly meetings. To maintain communication, open weekly conference call meetings were set up with the leadership team. In addition, a monthly conference call was scheduled with the entire team. Being proactive about communication was crucial to solving small problems as they occurred before they became big problems.

Organizational Policy and Procedures

Some organizational policies and procedures were helpful and some were impediments. Below are examples of both. Also how communication was part of each situation is highlighted.

Private sector matching funds. Raising 20% private sector matching funds in addition to establishing a statewide professional development program for science teachers has a been an extra challenge that takes time away from program planning and management. Though potentially a good idea, raising funds from the private sector is not in the skill set of the program investigators. The matching funds part of the program needs to be rethought to avoid unnecessary duplicative work. For example, the US/ED set up a website to assist applicants with fundraising but it required a completely separate and different application than the US/ED proposal. Also in the case of VISTA, not only are the VISTA staff implementing the program, they are also being tasked to raise funds. This was an unintended consequence of unclear communications and policy expectations with a new program.

Office of sponsored programs. Colleges and universities have Offices of Sponsored Programs (OSP) to assist in proposal budget development and proposal submission. Also all contracts with the University which involve sponsored projects are reviewed, negotiated, and executed by OSP. As fiscal concerns were raised by the program investigators, individual conference calls were scheduled with each institution's OSP and the Mason OSP which included the investigators. Within Virginia colleges and universities, these offices appear to be operating from a common script. Though some of the program investigators did not understand the nuances of the fiscal procedures and contract types that needed to be implemented with the US/ED grant, the OSPs were all able to communicate with each other and agree that this was business as usual. Thus the investigators were relieved of their initial concerns, many of which

were the result of missing information on this level of detail. Common policies and procedures in the Virginia OSP were facilitative in initiating the VISTA program.

Human subjects review board. All colleges and universities that conduct research have Human Subjects Review Board (HSRB) to assure that the rights and welfare of human research subjects recruited to participate in research activities are adequately protected. Because review is a long and involved legal set of procedures and VISTA is a large program with many parts, this was and continues to be a stumbling block to get professional development activities started in a timely manner. We can not advertise for participation in the programs without having prior HSRB approval. Since the professional development for teachers is mostly in the summer they need to apply long before summer so they can schedule personal vacation plans as well as professional development plans. In addition, some of the universities wanted to conduct their own HSRB review as opposed to deferring to the lead institution. Though the protection of human subjects is of prime concern, an unintended consequence is that practical aspects of running research programs involving minimal risk are compromised. HSRB policies may have unintended consequences.

United States Department of Education i3. The i3 program is a high visibility program with extensive oversight. Thus US/ED program officers are requiring/requesting many additional reports so that they can document and monitor program progress. While the necessity for scheduled documentation of program progress is an integral component of program accountability, this additional report writing is tangential to running the program and documenting its progress. We need to determine if requests for additional, unscheduled reports beyond existing published reporting requirements are recommended or required. We also need to establish a trusting relationship so that every question does not result in a request for another

report. Since we had no prior relationship with the assigned program officer, this is an example of how time is needed to build a trusting relationship. It is also an example of how shifting policy within US/ED may be perceived differently.

VISTA was built on previous research findings on teacher professional development and increased student achievement, and the next program will build on the enhanced infrastructure in science education in Virginia from VISTA. Some new policies and procedures will result from the VISTA program, but at the initial stages of the program we are operating with existing procedures that were already developed.

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Appendix

VISTA Implementation Research Questions

Successful Grant Process, from Start to Implementation

Policy Implications for Virginia Initiative for Science Teaching and Achievement: Investing in Innovation (i3) Grant

Your Name: _____ College: _____

Part 1. Grant proposal writing – concept development through submission (March 8 - May 10, 2010)

1. What is your previous grant writing experience?
2. How did you become involved with the VISTA grant?
3. What was your most significant contribution to the proposal writing?
4. What institutional support did you have?
5. Challenges
    a. What challenges did you have to work around?
    a. Which of these challenges did you expect?
    b. Which of these challenges surprised you?
    c. How did you overcome these challenges?
    d. What about the project enabled you to overcome the challenges?

Part 2. Processing acceptance (August 4 – October 31) acceptance through receiving grant/contract

1. Previous grant experience
    a. What is your previous grant processing experience?

   b. What experience have you had securing private sector matching funds for previous grants?

2. Challenges
   a. What challenges did you have to work around?
   b. Which of these challenges did you expect?
   c. Which of these challenges surprised you?
   d. How did you overcome these challenges?
   e. What about the project enabled you to overcome the challenges?
3. What was your most significant contribution to processing the grant acceptance?
4. With what challenges do you continue to struggle?

Part 3. Implementation Planning (October 1, 2010-February 2011)

1. What is your previous grant implementation experience?
2. Challenges
   a. What challenges did you have to work around?
   b. Which of these challenges did you expect?
   c. Which of these challenges surprised you?
   d. How did you overcome these challenges?
   e. What about the project enabled you to overcome the challenges?
3. What was your most significant contribution to the grant implementation?
4. With what challenges do you continue to struggle?
5. What are new challenges you foresee?
   a. In general?
   b. Site specific?