Session Title:
Midlife Reflections on Success and Change: The Pennsylvania Earth and Space Partnership

MSP Project Name:
Middle Grades Earth and Space Science Education Partnership

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Project Session

Strand 1

Summary:
The Earth and Space Science Partnership is at the midpoint of our 5-year funding cycle In this presentation we reflect on the successes and challenges - anticipated and unforeseen - around which the group has come together. ESSP has successfully maintained and implemented a shared vision around supporting and engaging middle grades teachers of earth and space science within public school districts that are rife with struggles of their own. We will structure discussion around leadership and management practices, engagement with district personnel, and developing ways to achieve respectful accountability across diverse individuals and groups. Findings, best practices and advice from the community will be disseminated by the MSP network and may inform or prepare personnel in new projects.

Section 1: Questions framing the session:
1. How does a diverse group of colleagues come together around a common vision?
2. How does that group continue to thrive in an environment characterized by dynamic changes in roles, responsibilities, priorities and personnel?
3. What are the hallmarks of good leadership and good management in a long-term project?
4. How does a project best balance past, present and future?

Section 2: Conceptual framework:
Two aspects of the Earth and Space Science Partnership (ESSP) are fundamental to our philosophy and thus influence both the accomplishments and challenges that will be the legacy of our project. First, the project was conceived and is run by a small group of individuals who manage jointly all aspects of the work through frequent close interactions. Second, we base our engagement with districts primarily on grassroots efforts with teachers rather than relying on administrators to drive change at the school and district level. Our theory of action is that improvements in the status, teaching and learning of earth and space science will follow from shared efforts that build teachers' capacity to be effective teachers and leaders. Both of these features have characterized our project from its inception, and have resulted in both strengths and challenges as we conduct our work. In this session we hope to share our perspective and what we have learned with other, particularly new, projects and to learn from our MSP peers about how they have faced and overcome challenges similar to ours.

Part 1: Relationships Within the Project
Each member of the ESSP Leadership Team is highly committed to one or more aspect of the project, and takes pride in moving that key area(s) forward. Within our own domain, we each have the ability to focus on both the big picture forest and the minutia of the individual trees. On the scale of the entire project, we respect one another's expertise and need for accountability, and remain broadly aware of the interactions between our individual elements. We found it initially quite easy to develop a shared vision, and we maintain that clarity through the strength of our convictions and the guiding feedback of our WestEd evaluation team and our Advisory Boards. We maintain our mutual dedication to the project's vision and work through weekly 90-minute meetings where ideas are presented for discussion and decisions are made by consensus; this task is challenging because of the physical separation of Leadership Team members on different campuses, but we use technology successfully to maintain networking and communication.

Over the past two and a half years, several personnel challenges have affected all areas of the project. These challenges fall into two main categories: life changes and commitment struggles. As examples of life changes, core project personnel will have had four babies born in the space of 15 months, one co-PI on sabbatical in another country, and faculty members have been hired and have departed. As examples of commitment struggles, the faculty co-PIs all wrestle with the many competing demands of our entire professional lives and endeavor to maintain productivity for the future, while graduate students and workshop team faculty members have different levels of engagement consistent with their lower degree of responsibility for project success. One critical commitment struggle has been the inclusion of representatives in our leadership team from our school partners. While teachers can commit in principle to participation, engaging them in regular dialogue about project decisions has been challenging. Managing the project itself in addition to moving forward through these changes takes a degree of reflection, integrity, team building and leadership that pushes each of us beyond our previous comfort levels.

Part 2: Relationships with Districts

We have been successful in building relationships with individual teachers and teacher teams from almost every district, noting that in our urban partner districts many of these teachers have changed schools and/or grade level assignments more than once already. As a project, we have made a commitment to a grassroots approach of developing and empowering Earth Science teachers. We continue to struggle with the goal of ensuring lasting district change against a backdrop of temporary teaching assignments and shifting district leadership, as our partner districts are characterized by fluidity in administrative leadership. Seven of our nine partner districts have hired new superintendents since the project began, and at least two of the districts are under external governance after numerous years of failure to meet annual yearly progress targets. Further, the Philadelphia City School District fired over 1500 teachers and curriculum coordinators in our first project year and is currently planning to close up to 40 schools, some of which are longstanding workplaces of our partner teachers. We have successfully made a connection with the Science Education Advisor for the Pennsylvania Department of Education, a position that was vacant for the first one and a half years of the project and filled only recently. We struggle with the goal of ensuring lasting district change against this backdrop of temporary assignments and shifting landscapes. As a project, however, we remain committed to this grassroots approach of individual empowerment.

Part 3: Research Plan

Our initial research plan involved development of four distinct learning progressions, which we have now reduced to two in an effort to be more focused in gathering and interpreting data. For each learning progression, we planned conservatively around the amount of data we would need to collect in order to make a viable scientific contribution. As part of this plan we proposed video interviews with students across grades 4-9 in partner districts, accompanied by pre- and post-instruction interviews as well as videos of exemplary instruction by partner teachers. The actual data collection process has required us to adapt to challenges in working with administrators and school boards for IRB approval and to the geographically decentralized nature of our partner districts. In order to construct a learning progression we must capture a range of student conceptions from naïve through normative scientific ideas, and explore how instruction informed by our workshops can affect students' progress. Identifying students that span the full spectrum of ideas and teachers who have made sufficient modifications to their instruction proves challenging as well. Despite these challenges, our team has collected and analyzed a large number of interviews and has made excellent progress towards our research goals.

Section 3: Explanatory framework:

Most of our findings in the area of project management and district engagement are related to the interpersonal contexts in which we all operate. We have worked closely with our external evaluation team to wrestle with our challenges, to recognize our own strengths and weaknesses, and to focus on the success of the project activities in productive ways that depersonalize the criticisms and corrections we must make. We have chosen consistently to tighten our group to include only individuals who share the vision of the Leadership Team. This approach does enable us to pursue the important work of "expanding the choir" at Penn State and in our partner districts in a very focused

way, which forces us to choose new collaborators in a purposeful manner that will be effective in making and sustaining changes in the long run.

We have attempted to manage the challenges we face in our partner districts in the same way, by identifying key individual teacher leaders and supporting and empowering them to engage their colleagues and administrators. All university members of the project have a deep and profound respect for our partner teachers who are committed to their own professional development as well as that of their students. We recognize that the changes we are poised to support at the district level are not all priorities for the superintendents and principals who are faced with more immediate needs to respond to state and national pressure in numeracy and literacy. Rather than backing away, we have repositioned many of our activities with teachers to focus on (a) the natural relationships between science, particularly earth and space science, and both numeracy and literacy, and (b) pedagogic approaches that have been shown to help students approach content learning and scientific practices as scientists would themselves. These connections are highlighted in the Common Core State Standards and the Next Generation Science Framework and now form a cornerstone of our approach. We have also made opportunities available for teachers to give professional presentations and share their good work locally, state-wide and nationally, in talks and publications as well as through web-based resources. These efforts have been appreciated by teachers, many of whom are reassigned between grade levels and content areas often without notice or time for preparation, and who seek both general professional development as well as deep content understanding.

We are not alone in our need to be flexible in pursuit of the project research agenda. We have relied on many of our districts contacts to help identify the best opportunities for data collection, and some of our teacher leaders have been extremely helpful and engaged in this effort. Our evaluation team has encouraged us to find additional ways in which our district-level teacher leaders can contribute to the partnership and their increased involvement with our research team has helped us meet that goal as well.

The sustainability of ESSP efforts remains uncertain, and we suspect that the same concern exists for many MSP projects. Within Penn State University, our efforts dovetail with broad efforts across the STEM disciplines to improve teaching and learning at the introductory level. ESSP personnel are engaged in these efforts, and play important roles in moving the institution forward. For our partner districts, structured sustainability of project-led changes is not guaranteed. We hope to empower individual teachers and teacher teams, but we are aware of the difficult roads that these individuals face regardless of the level of support we can provide. We have chosen to invest a portion of our energy at the state level in two ways: (a) working with the state Department of Education to prepare for implementation of the Next Generation Science Standards and (b) developing a statewide organization for earth and space science teachers (PAESTA, the Pennsylvania Earth Science Teachers Association) where curricular resources and information on national happenings and events are shared. We anticipate that these approaches will benefit teachers of Earth and Space Science across the state, as well as provide a lasting framework for partnership efforts.

Section 4: Discussion:
The challenges that we face are in no way unique to ESSP, and while we are finding ways for our project to move forward and meet our goals we recognize that our approach is not the only route to success. Project management styles vary widely among individuals and across projects, and many of the ESSP Leadership Team members play leadership or supporting roles in several other projects as well. Our experience is that continued close interactions and establishment of structures for accountability keep us all engaged, responsive and moving forward together. This model works for most members of our group but can lead to tensions in times of competing priorities. In these instances, our long history of mutual respect trumps any short-term frustration and is critical to success of the project. While we advocate our engagement model, we seek to learn alternative approaches.

We recognize that many projects have some degree of difficulty in making the appropriate connections to engage districts for long-term change. We encourage discussion on this topic that delves into the realities of urban districts struggling with financial disaster and a history of high teacher turnover. Like many others before us, ESSP investigators are torn between a deep sense of idealism and the need to be productive in our work and mindful of our responsibilities to the National Science Foundation. We seek the opportunity to share best practices, as well as having a frank discussion of "worst practices" or failed efforts, so that all projects can benefit from our collective experiences. Our intent is to develop a document that would be useful to future MSP groups as they self-evaluate during the proposal process, and as they embark on their activities.

Section 5: How will you structure this session? What is your plan for participant interaction?
We envision beginning with a brief presentation on the educational and research focus areas of our project for the purpose of context. That presentation would introduce the life cycle successes we have had and the challenges we have faced, how we have addressed them in our Leadership Team, and how they have impacted our ability to fulfill the mission of the project. We anticipate setting up a few small group discussions at individual tables around questions of management and district engagement ("How does your project handle …."). After dialogue in the small groups, we would ask for reporting and discussion of a list of best practices in the large group. Our intent is to develop a document that would be useful to future MSP groups as they self-evaluate during the proposal process, and as they embark on their activities. We will post this document on our ESSP website as well as in MSPnet to disseminate our findings.