Abstract Name: STEM Faculty’s Evolving Perspectives on STEM Curriculum and Instruction while Participating in the Florida PROMiSE MSP Project
MSP Project: U.S. Department of Education MSP
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1. Questions(s) or issue(s) for dialogue at Learning Network Conference session:

- What can be done to enhance the quality and outcomes of the dialogue between STEM faculty and K–12 educators in the course of participating in an MSP?
- Are there differences in how mathematics faculty and science faculty approach MSP participation?
- How do STEM faculty’s perspectives on STEM curriculum and instruction evolve during the course of participating in an MSP?
- How can what is learned from collaborations between STEM faculty and K–12 educators in MSP projects be used to enhance future MSP projects?

2. Context of the work within the STEM education literature and within your MSP project:

The NSF MSP community has had a strong interest in looking at what STEM IHE faculty bring and take away from the partnership experience. This study extends the research on faculty/K–12 relationships, examining these issues in the context of a state department of education project.

MSP projects involve collaboration between STEM IHE faculty and K–12 educators. The collaboration can present unique opportunities but also raise provocative challenges. In some projects, such as the Florida PROMiSE project, the STEM faculty and K–12 educators work closely to create curricula for teacher professional development sessions. The STEM faculty and K–12 educators each bring their own perspectives, experiences, and assumptions to the curriculum design task. During the design process they must work together to communicate their assumptions and goals and to integrate those perspectives to create a unified curriculum.

The opportunity that arises from this collaboration is the possibility of creating a curriculum that is stronger and richer than could be created by either group alone. The concomitant challenge for MSP projects is to create an environment where that collaboration is productive, that is, the discussion is in-depth and thorough enough so that the two parties do not simply piece together a disconnected curriculum containing disparate contributions from each group. Instead, the hope is that designers can integrate their thinking into a synthesized coherent curriculum containing the educationally sound components of their original perspectives.
Florida PROMiSE, funded through the U.S. Department of Education’s Mathematics and Science Partnership Program, is an expansive effort to enhance K–12 mathematics and science education across the state of Florida. Florida PROMiSE engages university mathematics and science faculty, education faculty, and K–12 educators in an ambitious effort to design and to provide professional development in targeted mathematics and science disciplinary content for elementary, middle, and high school teachers across the state. The mathematics and science disciplinary faculty, the education faculty, and the K–12 educators work together to design the curriculum for a two-week summer institute. Unlike professional development that focuses on providing classroom pedagogical strategies to teachers, the Florida PROMiSE institutes focus on building teachers’ content knowledge. Eight different summer institutes were offered in 2009—four science and four mathematics. Each institute was offered in multiple sites across the state.

A unique feature of Florida PROMiSE is the opportunity for STEM faculty, education faculty, and K–12 educators to collaborate in the planning and delivery of these content-focused sessions. This teaming creates the opportunity for synergy between disciplinary experts and highly skilled teachers. Their close collaboration also presents a valuable research opportunity to observe the dynamics of integrating the perspectives of disciplinary faculty and K–12 educators.

3. Claim(s) or hypothesis(es) examined in the work (anticipating that veteran projects will have claims, newer projects will have hypotheses):

As we conducted our work, we examined the following hypotheses:

- STEM faculty and K–12 educators with different educational priorities approach the planning and conducting of a K–12 teacher professional development differently. These different priorities can present both opportunities to create an enriched professional development curriculum and challenges to establishing a productive collaborative relationship.
- Mathematics faculty and science faculty have somewhat different K–12 educational priorities which may affect the nature of each discipline’s collaborations with K–12 educators.
- Over the course of participating in a MSP project, STEM faculty will reflect on their initial priorities and subsequently adjust or temper their views. Opinions that could be called into question include what aspects of K–12 STEM subject matter content are important to convey and what instructional strategies are useful to employ.

4. Evaluation and/or research design, data collection, and analysis:

Westat, a research organization based in Rockville, Maryland, is conducting the summative evaluation of the Florida PROMiSE MSP project. As part of the evaluation, Westat has observed the STEM faculty and K–12 educators during curriculum design meetings, observed
the STEM faculty and K–12 educators teach the summer institutes, conducted teacher participant focus groups, and administered pre- and post-institute assessments to the teacher participants.

Most important for this proposal, however, Westat has conducted interviews of the participating STEM faculty before and after the implementation of the summer institutes. Twenty faculty were interviewed for 30 to 55 minutes each. Almost without exception, interviewers found the faculty eager to share their experiences, with many providing thorough and detailed responses to all questions.

The interviews of STEM faculty included questions such as the following:

**Examples of Pre-Institute Interview Questions**

- Sometimes during MSP partnerships, university faculty and K–12 educators have different priorities for what should be taught and how it should be taught. Have you observed this to be the case while developing the Florida PROMiSE summer institutes? Please describe the differences.
- Based on your understanding of the nature of your field and its important characteristics, what do you think is most important to convey to K–12 mathematics/science teachers?

**Examples of Post-Institute Interview Questions**

- Now that the summer institute is over, as you reflect back on the design phase leading up to the institute, what changes, if any, would you recommend for the design phase to make future institutes more successful?
- In the first interview we talked about the characteristics of your field that you thought were most important to convey to K–12 teachers. At that time you had cited _______. Reflecting on your summer institute experience, are you still convinced these are the areas and topics that are the most important to convey?
- During the first interview, we talked about instructional approaches— that is, ways of providing the instruction to the participating teachers. Based on your experience facilitating your summer institute, what kinds of instructional approaches did you find to be most effective for teaching K–12 teachers?
- Do you anticipate your Florida PROMiSE experience will change how you will teach your undergraduate and graduate students?

The pre- and post-institute interviews, supplemented by the other data collection activities, provide a view of the evolution of the STEM faculty’s thinking about subject matter content and instructional approaches.

Future evaluation plans include interviewing the K–12 educators involved in the design and teaching of the summer institutes and conducting another round of interviews of the STEM faculty after the second round of the summer institutes (fall 2010).
5. Key insights (retrospective for veteran projects, prospective for newer projects) that have value for the Learning Network:

Overall, the initial findings from the work to date describe:

- Some of the challenges involved in establishing a productive collaboration between STEM disciplinary faculty and K–12 educators.
- The differences in the educational priorities of mathematics and science faculty.
- The changes in STEM faculty’s perspectives on subject matter content and instructional approaches as a result of participating in the Florida PROMiSE project.

Based on interviews of STEM faculty before and after they implemented their summer institute curricula, the findings include the following:

**Importance of the initial curriculum planning phase.** STEM faculty recognized that the design phase was critical as it formed the basis for the summer institute curriculum and the ongoing relationships with the K–12 educators. Almost all STEM faculty felt the design phase was in need of improvement. Most felt there were differences in initial educational priorities between the faculty and the K–12 educators. Although in most cases faculty viewed these differences as helpful and stimulating, in some cases—particularly for the mathematics teams—the differences in perspectives between the faculty and the K–12 educators presented exacting challenges.

**Faculty beliefs about important components of subject matter before and after the summer institutes.** STEM faculty were asked about their beliefs about what STEM content they considered important to present to K–12 teachers. In general, their beliefs remained the same before and after teaching the summer institutes. Mathematics faculty tended to stress the importance of conveying the inherent logic and coherence of mathematics. Science faculty believed it was important to convey specific foundational concepts germane to their discipline.

**Faculty beliefs about important attitudes to convey.** Interestingly, STEM faculty also conveyed hopes for attitudes they would like to convey to the K–12 teachers. Mathematics faculty tended to hope teachers would develop an attitude of persistence—of understanding that although mathematics may be difficult, teachers and students should persevere. Science faculty tended to hope teachers would develop confidence in their ability to apply conceptual knowledge in one area to new topics. These beliefs were echoed in the post-summer institute interviews.

**Faculty beliefs about instructional approaches.** STEM faculty were also asked questions about their perspectives on instructional approaches for conveying STEM subject matter. Although prior to teaching a summer institute many faculty primarily had experience using a lecture approach, after the summer institute many acknowledged the advantages of engaging students in a broader range of pedagogical activities (e.g., inquiry, group work).

Due to their potential to inform current and future MSP projects, the insights and questions raised by this study that would be important to discuss during the Learning Network Conference include the following:
• Challenges and lessons learned regarding establishing a productive collaboration between STEM disciplinary faculty and K–12 educators.
• The differences in the K–12 educational priorities of mathematics and science faculty and what that might mean for planning future MSP collaborations.
• The changes in STEM faculty’s perspectives on subject matter content and instructional approaches as a result of participating in a MSP project and the potential implications of these changes.
• Potential opportunities for enhancing STEM curriculum and instruction in the broader STEM community that could result from the productive collaboration of STEM disciplinary faculty and K–12 educators.