About This Summary

This overview of the 2010 Math and Science Partnership Learning Network Conference offers brief summaries of the plenary presentations and panel discussions that took place during the conference. The intent is to provide a sense of the overall conference themes and highlights.

Cover Graphic
The words in the cover graphic are the result of a frequency analysis conducted on notes from a jigsaw activity to define “learning network.” The words used most frequently are largest and the remainder descend in size based on frequency of use.

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Participant comments have been paraphrased; they are not exact quotes. The contents of this document do not necessarily reflect the views of TERC, the National Science Foundation, or the organizations of any participants.

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An electronic learning community for all MSP projects.
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Readers interested in pursuing any of the plenary session presentations summarized here are encouraged to access MSPnet. Full video recordings of the presentations as well as all PowerPoint presentations used during the conference are available on MSPnet. All papers submitted for working group sessions during the conference are also available on MSPnet.
OPENING REMARKS

The Math and Science Partnership

James Hamos
MSP Program Lead
National Science Foundation

James Hamos launches the 2010 Learning Network Conference with a review of the Math and Science Partnership purpose, history, key features, scope and approach.

The summary below offers a clear articulation of the MSP program and goals. Hamos points to a model of a benzene ring as an illustration of how the partnerships themselves work. While each starts as a partnership between school district(s) and institutions of higher education, many create partnerships of vastly different...
The MSP program focuses on these five key features. There have been 145 funded MSP projects since the beginning of the program in a variety of “flavors” that have evolved over time, from the large Comprehensive Partnerships, to the Targeted Partnerships that focus on one piece of the puzzle, to Institute Partnerships that concentrate on teacher leadership. New partnerships initiated in the past several years include MSP-Start Partnerships, which are essentially planning activities to create new partnerships, and Phase II Partnerships involving those who have been engaged with MSP for a period of time taking their work to the next level and making it more experimental to resolve issues in STEM education. Finally, there is a rich cohort known as the RETA projects (Research, Evaluation and Technical Assistance), that develop tools and methods to study what the partnerships are all about, serving as a resource for the MSP project and the nation.

The shaded areas in the map at left indicate the thirty-nine states in which there are MSP

### MSP Key Features
- Partnership-driven, with significant engagement of faculty in mathematics, the sciences, and engineering
- Teacher quality, quantity, and diversity
- Challenging courses and curricula
- Evidence-based design and outcomes
- Institutional change and sustainability

### 145 Funded MSP Projects
- 19 MSP-Start Partnerships (FY 2008, FY 2009)
- 6 Phase II Partnerships (FY 2008, FY 2009)

### National Distribution of Partnership Activity

- Over 900 K-12 school districts
- ~5 million students
- ~147,000 teachers of K-12 mathematics and science
- Over 200 institutions of higher education
- Over 2600 faculty, administrators, graduate and undergraduate students

For a color-coded version of this map go to www.MSPnet.org
The scope of the MSP program, outlined above, represents the direct reach of the partnerships’ work.

Hamos concludes with an explanation of the theme for this year’s Learning Network Conference. It is “intergenerational” because attendees include those who began with the MSP program in 2002 as well as those who have joined more recently. The projects have much to share and learn from each other.

As for “learning network,” the first meeting of the MSP projects in January of 2003 was called a Learning Network Conference. Now participants are being asked to help define what a “learning network” means.

The Learning Network Conference

Hannah Sevian
MSP Program Director
National Science Foundation

Hannah Sevian opens her remarks by citing a book familiar to many MSP projects (see below) and observes that the Learning Network Conference is viewed as part of a professional development pathway for members of the MSP Learning Network.

As for “learning network,” the first meeting of the MSP projects in January of 2003 was called a Learning Network Conference. Now participants are being asked to help define what a “learning network” means.

“We have planned a conference that will help you to meet more colleagues and learn about the work of your colleagues and the broad MSP community. We hope that you will strengthen existing connections and develop new ones and that these will help you bring your MSP work to new levels of success.

- Hannah Sevian

- The LNC is one event in a professional development pathway for members of the MSP Learning Network

- Professional development is more meaningful when designed with an explicit theoretical framework

- It is important for the MSP program to lead by example.
MSP is an intergenerational learning network that focuses on improving student achievement in math and science through innovative partnerships. It involves research literature on learners and learning, teachers and teaching, and how professional development impacts these areas. The goal is to design a change process that fosters national collaboration, as mandated by the original Congressional authorization.

The diagram below is from Sevian’s book, "Designing Professional Development for Teachers of Science and Mathematics." It illustrates the theoretical design framework for planning professional development of science and math teachers. The framework was employed for planning this LNC.

Sevian proceeds to dissect and describe the components of the diagram, starting with “Knowledge & Beliefs.” This step required conference planners to review and articulate ways in which the research literature guides MSP work, in particular the literature on learners and learning, teachers and teaching, and how professional development can impact these. The desire was to have this LNC be a change process. The most important question, Sevian notes, “is what is the change that we needed to seek? We want to challenge you today and tomorrow to think about what a learning network is, and what it can mean to be part of this learning network.”

Sevian observes that when you engage in this process you want to think about context. This required articulating assumptions about expectations of the LNC. Some of the relevant aspects include:

- Research literature: learners & learning, teachers & teaching, how PD impacts
- Change process

Note that “Evaluation” points directly to “Vision and Standards.” We want to study the process of the LNC as well as the outcomes. The Westat group has been engaged to study the Learning Network Conference. The purpose of the LNC as mandated by the original Congressional authorization that created the MSP enterprise is to foster greater national collaboration. The evaluation and research is aimed at better understanding how these collaborations occur in order to promote more productive collaborations.
questions that needed to be answered included: What has been learned from program evaluations, from studies that have been done, from LNC participants’ backgrounds and past experience? What do participants expect? In what ways is it reasonable to expect individual participants and their projects to grow? Star members of the MSP community were recruited for the LNC Planning Committee which was assembled to design this session in alignment with the goals of the conference.

Finally, there is “Plan” and “Do.” Eighteen strategies are outlined in the Designing Professional Development book and MSP projects have employed a variety of these. This conference will combine both traditional and innovative strategies.

The next step involved determining the goals, which required unpacking the critical issues outlined below. The goals, stated on the agenda, are deliberate and were developed through hard-won effort, Sevian notes.

**Why We Do This Work**

During the 1990s Hannah Sevian worked at an inner-city urban school serving a primarily immigrant population, teaching sheltered Spanish, bilingual, and advanced placement classes. Sevian realized a student in her sheltered class knew chemistry but not English, so he was transferred to her AP chemistry class and they worked on improving his ability to communicate his understanding in English. He earned a 5 on the AP chemistry exam and proceeded to earn a 5 the following year in AP physics.

Sevian reads a quote from the student’s college application essay, which relates a background in a war-torn country, being threatened at gunpoint and beaten, and eventually fleeing to the U.S. The student points to education as his own haven and as the way to kill ignorance and build nations.

Sevian notes that we are in the business of creating opportunities, and students come to American education from many worlds. It is our job to make STEM careers possible for all of these students.
MSP: An Intergenerational Learning Network

Jigsaw Activity
Participants were organized into small groups comprised of a cross-section of MSP projects to attempt to define the nature of a ‘learning network’ in the context of MSP. Then each of those initial groups merged with adjacent groups, compared notes, and worked jointly to further refine their definition.

DEFINING A ‘LEARNING NETWORK’

Excerpts from Group Discussion

A Neural Network Analogy
How do we connect synapses and create a coherent system that continues to thrive? How do we facilitate that? What is excitatory (e.g., trust, communication) and inhibitory?

Micro to Macro
Learning networks are formed at the school and district level, to the MSP partnership level, to state level, to national policy level.

Incentives
What are the incentives for involvement? Credits? Professional development? Mandates? Access to resources?

Optimizing Knowledge Flow
How does knowledge flow through the system? Some can be synchronous or live, but there should be easy access to archived knowledge.

Knowledge Production
If this is the goal of a learning network, how do we do a better job of this at the national/policy level so that concrete knowledge is produced? We need convergence to form a body of knowledge.

Mutuality
All members need to gain benefit and respect from the network. This is dependent on the way you set up governance.

Ongoing
Learning networks are ongoing and need to be nurtured. One-shot PD is useless. You need reflective experiences, bringing folks back together, ongoing involvement both face-to-face and via the Internet. As one teacher said “I wasn’t aware I was signing up for life but I guess I am.”

Benefits
Learning networks allow you to learn from others, combine resources, knowledge and experience, and avoid reinventing the wheel.

The Results
Group notes were collected and subjected to frequency analysis. The result appears on the cover of this document. The words used most are the largest and the remainder descend in size based on frequency of use.
SOCIAL NETWORK ANALYSIS OF THE MSP LEARNING NETWORK

9 Network Questions

The rest of this survey asks you some questions about your network of colleagues and how you interact with them. Listed in the tables below are a range of different types of colleagues with whom you might engage. For each of the questions (A-I) below, please put a check in the box beside the individuals with whom you interact in substantial ways.

This first set of questions asks about your current interactions

A. With whom do you discuss innovative research?
B. With whom do you collaborate on MSP-related research?
C. With whom do you collaborate on articles or presentations?
D. To whom do you go to plan professional development for MSP participants?
E. With whom do you work to revise pedagogy?
F. With whom do you consult regarding making changes to curriculum design?
G. With whom do you discuss MSP-related assessment/evaluation issues?
H. With whom do you discuss the roles and responsibilities of a partnership?
I. Which workplace roles pose barriers to you in various aspects of your MSP work?

Karen Stephenson (Erasmus University; NetForm International) leads conference participants through a social network analysis survey for MSP that she and Joy Frechtling (Westat) are conducting.

About Social Network Analysis
For an in-depth explanation of social network analysis and how it is used, see Karen Stephenson’s keynote presentation on page 34 of this document.
The Activity
Participants engaged in a rapid-fire “speed dating” exercise, spending two minutes at a project information table and then moving on to the next, using the suggested questions below to elicit information.

Objectives
Objective 1: To get exposure to the wide range of MSP projects.
Objective 2: To facilitate deeper interactions during the poster session.

Suggested Questions
- What one thing coming from your experiences with your MSP project NEEDS to be shared with other PIs and researchers in the field?
- What has been the greatest obstacle to moving your project forward?
- What has been the greatest success thus far for your project?
- What has been your best strategy for getting K-12 teachers engaged in your project?
- What potentially is “transformational” about the findings from your project?
Nancy Zimpher begins by describing her presentation as one part story, one part theory of action and one part call to action.

The Problem

Zimpher poses three propositions to frame the problem statement. The first is the leaky pipeline, based on following ninth graders through the system.

When Zimpher lived in Cincinnati, the statistics were as follows.

Across the river in Kentucky, starting with 100 ninth graders, by graduation date only eleven had crossed the line. The real crisis behind all of this, Zimpher notes, aptly described in Crisis in Our Cities, is that beneath the assumption that we are graduating about 70% of our students from high school, the truth of the matter is that only forty to fifty percent of our urban youth in high-need schools are making it to the high school finish line.

The pipeline is leaking well before we start to keep book in the

A Reintroduction

- Dr. Nancy Zimpher was the keynote speaker at the very first Learning Network Conference in January of 2003, where she spoke passionately about the need for sustained, committed and intensive partnerships among universities, schools, businesses and local government in support of K-20 education. That theme has been the defining characteristic of her incredible career. • Elizabeth VanderPutten

PowerPoint Presentation

The full PowerPoint color presentation for this keynote address is available at www.MSPnet.org
ninth grade, Zimpher observes. We also have a leaky teacher pipeline and this statistic has not moved in a decade: of all of the teachers we prepare, in five years fifty percent will no longer be there; in urban settings in three years fifty percent will no longer be in the teaching profession.

We know that both the student and teacher pipelines are leaking, and we have no system of education. The diagram at left, which appears in all of the materials for the math/science pipeline, represents the desired effect, with K-12 and higher education united and served by a host of community organizations, business, industry and philanthropic organizations. It is the ideal, and not what exists in most cases, Zimpher notes.

Based on her own experience in three states, Zimpher highlights the challenge of creating better communication and links between state departments of education with commissions of higher education—two administrative and regulatory agencies that are not linked statutorily at the state or federal levels. Zimpher cites two regulatory acts which govern K-12 and higher education as examples of this struggle: the Higher Education Act, which took approximately eight years to get reauthorized, and now the Elementary and Secondary Education Act. What little crosswalk there is between K-12 and higher education that has occurred in those two efforts can largely be attributed to Title II and the kind of work that NSF does with the Department of Education, Zimpher notes.

Continuing to set the context, Zimpher observes that the Higher Education Secretariat in Washington, D.C., which serves about forty higher education trade associations, is just down the street from the Learning First Alliance, composed of associations representing K-12 education. The only thing the two have in common is the American Council of Colleges of Teacher Education. Aside from that link, these two mega-trade organizations have never found occasion to meet, Zimpher reports.

It is not surprising that those working on partnerships between K-12 and higher education should feel caught in the cracks in something that is uncodified and outside of the regulatory system. The disconnect extends to the education and training going on in labor, energy, defense, and other departmental agencies. “I defy you to try to connect those dots at the federal level,” Zimpher states, but adds, “I do believe that we have an administration that gets it and will work tirelessly to begin to connect those dots.”

Solutions

Milwaukee Partnership Academy

Zimpher then proceeds to the story segment of her presentation, pointing to solutions. The first involves the Milwaukee Partnership Academy, which
evolved from “a big idea.” Zimpher explains that she often utilizes the concept of the “big, hairy, audacious goal” described in *Built to Last*, by Collins and Porras. Addressing the problem of the leaky pipeline, be it students or teachers, as well as the disconnected systems required a very big idea to move it forward. In this case, it was getting every child in the Milwaukee Public Schools performing at or above grade level in reading, writing and mathematics.

This didn’t happen overnight or because everyone was in agreement, Zimpher relates. The stimulus for this partnership was a large federal grant by the Department of Education encouraging communities to work collaboratively to solve the leaky pipeline. One of the things that Milwaukee did was to develop five strategic activities to move the dial for every child in reading, writing and math.

The partnership was built around this big idea of literacy and the notion of creating a literacy framework and organizing teaching leadership teams at the school level, weaving professional development around literacy. This was on the tail end of the “reading wars,” and in most school districts there was dissension about how best to teach reading. This partnership between the Milwaukee Public Schools, the higher education institutions and the community allowed the partnership to demystify the teaching of reading, and this was done by developing a very comprehensive literacy framework.

**Five Breakthrough Strategies**
1. Balanced Literacy Framework
2. School Learning Teams
3. Professional Development
4. Monitor and Report Student Progress
5. Tutoring and Family Literacy

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**Balanced Literacy Framework**

- **Reading Aloud/Oral Reading**
- **Word Study/Vocabulary**
- **Guided Reading**
- **Shared Writing**
- **Interactive Writing**
- **Shared Reading/Collaborative Reading**
- **Guided Writing/Writer’s Workshop**
- **Independent Reading and Writing**
In Milwaukee a literacy coach was put in every building (a major decision on the part of the school district), as well as a school learning team composed of teacher leaders, principal, parent leaders and university faculty members so that the team could help move the goals of that building and provide assistance in terms of professional development as well as assessment and measurement.

These notions are alive in Milwaukee today, Zimpher reports, having survived leadership changes in both higher education and the school district. The Milwaukee Partnership Academy, in some fashion, continues as an all-district partnership to improve learning and advance outcomes. This is where the Math and Science Partnership is nested.

One of the theories of action for the Milwaukee Partnership Academy is that every Monday afternoon, without fail, members of the university, the school (particularly directors of curriculum), members of the union (particularly those engaged in professional development), and to a lesser extent, members of the business and philanthropic communities met to assure that the literacy teams were working, the literacy coaches were performing, and the literacy framework was still secure as the focus of the work.

**Strive**

Zimpher then contrasts the Milwaukee experience with her more recent experience in Cincinnati. In this case, the catalyst of a $20 million DOE grant to move the dialogue was missing. However, there was some antagonism. “Never underestimate a dose of antagonism to actually move the partnership dial,” Zimpher states.

As the new president at the University of Cincinnati, she sat down with the superintendent of the district and several school board members and told them the university was there to help them. The district’s response was, “No thanks.”

“While higher education is often credited for slow-moving, committee-driven bureaucracies, we are met in equal proportion by the resistance of our public urban school districts to share the problem,” Zimpher observes. “I think that is largely because we talk past each other and we set up a situation that assumes that...
they’ve got a problem and we don’t.”

Zimpher introduces the topic of supply chain management, noting that for too long universities have said, if you would just send us better prepared students we would do a better job on our graduation rates. “We need to admit the fact that we prepare the teachers who teach the young people who arrive at universities in high need of remediation,” she points out.

In this case, the university presidents from University of Cincinnati, Xavier and Northern Kentucky University got together and determined not to let the school districts shut them out. They decided to identify a message that was indigenously theirs, but that they needed help with. “Of course for every university,” Zimpher remarks, “that is access, success, and completion.”

The newly formed partnership called Strive involved Cincinnati and Northern Kentucky and created its own big, audacious goal: that every student would graduate, no exceptions.

Much like the Milwaukee Partnership Academy, this goal was driven by five points.
lifelong workforce learning. Researchers at the University of Cincinnati were asked to document the stops or benchmarks along a student’s road map to success and Strive has been focused on this diagram now for over five years.

To make this come alive, the diagram below offers an example of what was developed, in this case focusing on early childhood. It details what it means for every child to come to kindergarten ready to learn. An important part of the story, Zimpher stresses, is that everyone in the community who had a stake in early childhood was rounded up to participate. Most of the organizations involved had not talked to each other in the past and the focus of this effort was to get them on the same page.

Employing General Electric’s Six Sigma strategy (akin to the scientific method) contributed to the success of this effort.

**Strive Six Sigma:**

**Define** exactly what we want to do. Deliverables include a list of all team members and a team charter containing the problem definition, project scope, goals and objectives.

**Measure** what improvements need to occur to achieve our goal. Deliverables include a process map for improved student supports and a data plan.

**Analyze** factors that determine outcomes. Deliverables include identifying source of variation, analyzing the data and establishing local evidence.

**Improve** current strategy and/or fill gaps with new or existing resources. Deliverables include an improved process map and action plan.

**Continue** to improve on the action plans. Deliverables include a continuous improvement plan.

After training, there are now thirty to forty skilled Six Sigma operators. When someone makes a recommendation to Strive (e.g., a strategy to get every child ready for kindergarten), they have to prove it through data and show how that data can be applied to Cincinnati and Northern Kentucky, and also collect data on impact.

This led to a process where every segment of
the road map is divided into a group of like-minded educators or reformers, who come together on a set of key strategies that are evidence-driven, rely on data, and are outcome oriented. All of the people working on early childhood in Cincinnati are focusing on two evidence-based strategies: home visitations for highly at risk children and high-quality early childhood programs.

**Goal 1: Every Child is Prepared for School**

**Student Success Networks Underway:**
- Quality Early Childhood Education
- Home Visitation

This has been transformative, Zimpher states, and while the example here involves early childhood education she encourages the audience to envision a similar strategy employed in the math and science partnerships in which all members of the community get together, are trained in something like Six Sigma, and are required to report out their agreed upon, evidence-based, outcome-oriented strategies before they can move through the endorsement process. You cannot be endorsed for a Strive intervention unless you have shown the data, continue to collect data, and the body that runs Strive accepts your intervention.

**Moving Ahead Nationally and the MSP**

What does all of this mean in terms of embeddedness? In Syracuse, for example, instead of talking about Strive, you would be talking about Say Yes to Education, a comprehensive birth-to-career pipeline initiative owned by the entire community. The Harlem Children’s Zone is another community-based intervention in which the MSP would fit quite nicely, Zimpher opines. Then there is the Ohio STEM Learning Network, a set of satellite efforts, some of which resemble this look at comprehensive partnerships.

“There are a thousand points of light in this country,” Zimpher states, including the MSPs, and forty Urban Serving Universities, about a dozen of which are looking seriously at Strive.
Zimpher prefers an approach that would overlay these maps because there is only so much capacity each community and adds, “My thesis is that we are a bit too fragmented to actually move the pipeline dial.”

Zimpher points out how well the Strive framework for partnership implementation aligns with the structure and composition of the Math and Science Partnerships. She commends the K-12 and IHE crosswalks in the Comprehensive Partnerships and advocates for a strengthening of those crosswalks. One of the things she has worked on is the notion of boundary spanners and creating easy ways for people from one constituency to crosswalk to others. In Milwaukee, for example, teachers-in-residence came to live at the university and co-teach many of the critically important courses, math included.

While a second notion of the Math and Science Partnership is that it be targeted around discipline and grade level to be more focused, Zimpher observes that you are only as good as the larger collaborative and the effort to get all kids focused on math and science and completion. The nature of the Institute Partnerships and the RETAs all fit nicely into this larger context.

Zimpher concludes by outlining five ways in which the Math and Science Partnership fits into the larger gestalt of sealing the leaky pipeline.
of students and teachers to create a seamless system of education. As a metaphor she points to Cincinnati-style Skyline Chili (a combo of spaghetti, chili sauce, cheese, beans and onions flavored with cinnamon and chocolate).

First, she notes, we have to figure in the pipeline and how the absence of preparedness for kindergarten may be still haunting us when we work with seventh and eighth graders. Looking at math and science seamlessly from birth to career might be very helpful.

Second, both Strive and the Milwaukee Partnership Academy are evidence-based and outcome-driven. “I can’t tell you what difference evidence makes to the philanthropic community,” Zimpher states. The goal in Cincinnati is to convince philanthropies to only fund evidence-based interventions rather than pet projects or unfounded beliefs. This endorsement process is like the *Good Housekeeping* Seal of Approval, Zimpher observes. If Strive says it’s so and philanthropies follow suit by investing in what is endorsed and evidence-based and outcome-driven, “it can change your life.”

Third, there is only so much capacity in each of our communities. The map in the center below depicts Ohio and Kentucky, where they need to work across school districts. In a metropolitan community there is typically one United Way, one YMCA, one Boys and Girls Club, and so on. The point, Zimpher states, is that unless we have a community riveted on the success of every child in every discipline, we are not using...
our capacities well. “It is a call to go home, take a look and figure out where the impetus might be for bringing this structure together.” In both Milwaukee and Cincinnati these initiatives were driven by a steering committee of many constituent groups, organized by an executive committee typically driven by three or four co-chairs. Being the convener does not mean you have to hog the chair, Zimpher observes. In fact, it means more if you can find a way to co-chair with others who need to be involved. Executive leaders must be at the table and the expectation must be that all need to show up.

In Cincinnati they will be publishing their third report card this April with 54 variables: 34 are moving up and 14 are moving down or not moving. Of the 34 moving up, about ten of them have moved the dial about ten percent. The annual report card includes math and reading scores, graduation rates and freshman and sophomore retention. The university being open about its data encouraged the school system to do the same. Being open about accountability and publishing data is key not only to MSPs but to district-wide initiatives Zimpher advises.

The final ingredient is visionary leadership: “The partnerships and the projects that you belong to are best lived in the context of a strategic plan where the universities and the school districts to which you belong actually have a vision of the future, a strategic plan, and you can see yourself in it.” Zimpher did this at the University of Milwaukee with “massive amounts of input.” This was called the Milwaukee Idea, and the Milwaukee Partnership Academy was a major part of that strategic plan.

### 4-way Ingredient:
**Sustained by Investment in What Works**

#### Strive Report Card

<table>
<thead>
<tr>
<th>Goal 1: PREPARED for School</th>
<th>Percent of children assessed to be ready for school</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal 2: SUPPORTED In and Out of School</td>
<td>Percent of students with more than 20 developmental assets</td>
</tr>
</tbody>
</table>
| Goal 3: SUCCEEDS Academically | • Percent of students at or above reading proficiency  
• Percent of students at or above math proficiency  
• Percent of students who graduate from high school |
| Goal 4: ENROLLS in College/ Career Training | • Average score on the ACT  
• Percent of graduates that enroll in college |
| Goal 5: GRADUATES and ENTERS a career | • Percent of students who are retained in college  
• Percent of students who graduate from college |

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**Our Value Proposition:**

SUNY can be a major force for economic revitalization and increased quality of life for New York’s communities.
plan. In Cincinnati, UC/21 is the strategic plan and Strive is central to that plan.

The strategic plan for the State University of New York is under construction and the hope is that it will be a place for these birth-through-career partnerships. One of the key themes unfolding in that strategic plan is the education pipeline.

In closing, Zimpher reads a quote from a New York Times editorial by Nicholas Kristof (see sidebar) and observes that in the same month the New York Times Magazine had as its feature story “The Big Fix.” She quotes from that feature story: “More-educated people are healthier, live longer and, of course, make more money. Countries that educate more of their citizens tend to grow faster than similar countries that do not. The same is true of states and regions within this country. Crucially, the income gains tend to come after the education gains...There really is no mystery about why education would be the lifeblood of economic growth. On the most basic level, education helps companies to make complex products that the rest of the world wants to buy and thus creates high-wage jobs. Education may not be as tangible as green jobs. But it helps a society leverage every other investment it makes, be it in medicine, transportation or alternative energy. Education — educating more people and educating them better — appears to be the best single bet that a society can make.”

“And you,” Nancy Zimpher concludes, “are part of that dream.”
Q & A with Nancy Zimpher

Encouraging/Enabling University Presidents

Q: I’m a math professor and we have a new university president. Do you have any advice on how to get our new president engaged in K-12 activities in other than a lip-service kind of way?

A: I am actually asked that question a lot and have been in the very dangerous situation of being rebuffed by funders because they tend to call it something like the “Zimpher effect,” like I’m the Lone Ranger and there’s nobody else doing this. In fact, I think many of your presidents are engaged at one level—too engaged to call it superficial but not engaged enough to call it “showing up.”

I’ve said to deans that I would have been such a better dean if I had been president first because these presidents need you. They need you to show up in their office just like the medical school does (and trust me, he or she is a regular). I think we are somewhat timid in education and arts and sciences. Show up with a plan that elevates your partnership to this kind of community base, help this president get organized and in some respects, push them out the door.

I do think we can do a better job of commanding the presidents’ attention not by whining, not by complaining, not by asking for more money, but by showing a partnership model they could not only embrace but lead. I just don’t believe there is a university president in the country that doesn’t want to be viewed as a leader and I think we can help them. • Nancy Zimpher

K-12 Interaction at SUNY

Q: Are you pushing for more K-12 interaction with SUNY?

A: Absolutely. And the statistics in New York are identical to the statistics I have shown, so my very first important staff addition was a title I created that I borrowed from Milwaukee. I now have a chancellor’s deputy for the education pipeline. Her entire portfolio is to seed these partnerships across the state of New York, with my help of course, convincing presidents of local campuses that this is not only good for the community but in their best interests. • Nancy Zimpher
Opening Remarks

Linda Slakey
Acting Executive Officer, Directorate for Education and Human Resources and Division Director, Division of Undergraduate Education, National Science Foundation

Linda Slakey offers a brief review of how the Math and Science Partnership program fits in the context of the support for learning that the NSF provides in the STEM disciplines. Slakey views the MSP as a learning trajectory that reaches back to the Middle School Math initiative and comes forward through the Collaboratives for Excellence in Teacher Preparation and the Systemic Initiatives. The critical lesson learned through that sequence of programs was that if NSF was going to fund programs that were genuinely helpful to teachers, there had to be broad partnerships involved that include STEM disciplinary faculty, those whose expertise is in how children learn and most importantly, teachers and schools.

MSP has in many ways lived up to expectations in manifesting that model. In more recent years it has expanded its own sense of partnership to include intense and carefully thought out partnership between the National Science Foundation and the Department of Education.

The title of this conference and the way it has been conducted for the last several years with a focus on the learning network extends the sense of partnership even farther, encompassing all of those who have been funded as part of the MSP as members of a very large learning network with the potential for synergy. Slakey concludes by welcoming participants and colleagues from the Department of Education and their views on the Math and Science Partnership and how we move forward on STEM education.

Kathleen Bergin
MSP Program Director
National Science Foundation

Kathleen Bergin offers a transition to the panel to follow by recounting a story that reflects the heart of this work.

“This is the work we are engaged in,” Bergin states. “We need the scientists, but we also need the passion of the very gifted individuals who want to teach in our schools. That is the work that we are privileged for the last eight years to have been engaged in with my colleague, Pat O’Connell Johnson.” Bergin and Johnson and a number of MSP programs came together over eight years ago in the first funding, and have worked together since then to fund this work. Bergin concludes by introducing Pat O’Connell Johnson and fellow panelists.

The Heart of the Matter

Samantha Lopez, currently a fourth grader, is destined to become a chemist in the biological sciences and discover the cure for juvenile diabetes. That will be possible because when she reaches ninth grade, Sam Varnel will be her teacher. She will get so turned on to chemistry and physics by taking physical science that she has a burning desire to become a scientist.

However, right now Sam Varnel is a senior in high school, a state science fair award winner who will go on to the international science fair and excel in math and science. Every adult he speaks to about how he wants to be a high school teacher says, “But you could be so much more.”
Panel Discussion

_In this panel format, Patricia O’Connell Johnson poses a series of questions for Michael Lach and James Shelton. The discussion is followed by a question and answer session with conference participants._

**ARRA Funds: Investing in Innovation Fund**

**Q:** Patricia O’Connell Johnson

Part of the ARRA funding we received included about $650 million for education innovation. I’m going to ask Jim to talk about that program.

**A:** James Shelton

Shelton begins by setting the context for the Investing in Innovation fund. It is $650 million of the total $10 billion in competitive funding that was part of the Recovery Act. The Investing in Innovation Fund was originally called the “Invest in What Works and Innovation Fund.” Shelton relates that he fielded two types of phone calls: one by those enthused at basing work on strong evidence and taking it to scale, and another by those excited by the opportunity to try things that are uncharted and untested.

One of the known challenges, Shelton explains, is that we know that our continuum of innovation breaks down. While there is a lot of innovation occurring in the field, we need to pose the following questions:

- Is it tied to our most important needs in the field?

_DOE MSP Update

Patricia O’Connell Johnson precedes the panel discussion with a brief update on the Department of Education’s MSP program. When this program started the hope was that there would be collaboration at the state level between NSF and DOE MSPs. Some projects that were originally DOE MSPs now have NSF MSP grants. The state MSP program received its 2010 appropriation and will be continuing with a slight increase. As of the last annual report, the DOE was funding about 600 projects around the country, most between $300 to $400 thousand a year but representing a wide range. Professional development was provided to over 60,000 teachers, involving a median of 105 hours in a twelve-month period. Those teachers taught over 2.5 million students. There is evidence from information collected from the projects that a large majority of the teachers made statistically significant gains in their knowledge in both math and science. Proficiency scores in math in those teachers’ schools gained at a greater rate than schools and classrooms without those teachers._
• Is it tied to a research agenda that is supporting and feeding into it?
• Does it go from something that is promising in the early stages to something that has enough evidence to be validated at a great scale?
• Are the things that get proved out the things that scale the most?

The reality, Shelton observes, is that this is not how it currently works. Things are brought to scale without good evidence that they work. The field does not set great priorities around our research agenda. We do not coordinate well across our research objectives and across universities and programs.

The question then was how to use this program to start to set the frame for that to happen. The goal is to use this as a way to set the frame for bringing evidence into decisions about grant making at the DOE and hopefully across the administration overall. This means a little money for a little bit of evidence, modest funding for a moderate amount of evidence, and big money only when you get to really strong evidence.

The Investing in Innovation fund is focused on LEAs and nonprofits that work directly with LEAs to improve student outcomes, as well as consortia of schools, not on states.

Comment: Patricia O’Connell Johnson
The Department has never had this much money available for innovation funds, and those engaged in MSP programs may be ideal candidates for applying for this funding.

The Role of a Special Advisor for Science and Department Priorities

Q: Patricia O’Connell Johnson

Michael Lach was Director of Science in the Chicago Public Schools, so it is clear why Arne Duncan wanted him to come work with us, but we’ve never had a Special Advisor before so I’m going to ask him to talk a little about his job and then the Race to the Top work because he has been fairly involved in developing the strategies for that program.

A: Michael Lach

Lach explains that his job is to serve as the...
point person in the DOE for mathematics, science, engineering and technology education, to synthesize the work in the department, craft a comprehensive strategy that matches what the country needs and the President wants, and work with other agencies in the government as well as the public and private sectors to get as many as possible pointing in the same direction to achieve the desired goals.

There are a few ideas that define what the work looks like, the first of which James Shelton alluded to. It is clear that we will not be able to get results for kids in STEM education that our country needs and our kids deserve, Lach observes, if we don’t focus on the whole pre-K to 20 system. The department has set four assurances or strategic directions to get there, and STEM education is approached in this context. Lach’s challenge is to figure out the science, technology, engineering and mathematics piece to that and a few necessary common pieces have been established.

The first is that as the standards change and get higher and clearer, supports will be needed for teachers to enable them to teach to those standards as well as a mechanism to organize and motivate the broader educational community to provide those tools and supports so that teachers can teach to these newer higher standards.

Second, we know that leadership matters. Lach cites Education Week’s “Quality Counts” report a few years back, which showed that most principals and superintendents were aware there was a national problem with science and math education but didn’t think it was their problem and didn’t do anything about it. Lach also points to the compelling evidence that schools organize differently around mathematics than they do around language arts. The goal is to focus on the issue of leadership in the work ahead.

1. Standards and Assessments

We need clearer, common, higher standards that describe what kids know and are able to do. Different states have different levels of expectations for what kids need to know and different ways to measure that, as well as different support organizations and mechanisms. We know that high standards make a difference for kids and have spent considerable time listening to states. We now hear many states wanting to enter into partnerships with one another around fewer, clearer, higher standards. This is moving forward initially in reading language arts and mathematics, though there are states interested in doing similar work in science and we expect that will follow.

2. Data Systems

Investing in data systems and all of the tools and protocols around that is our second assurance. This includes data systems that can track kids pre-K through college, data that allows us to compare the performance of students and match that to a particular teacher or principal, and data that allows us to match teacher performance to the IHE that provided teacher preparation for that teacher. There is also a component around helping districts, schools and teachers make sense of what this data means so we can identify what’s working and not working and make needed change happen.

3. Effective Teachers and Leaders

The third deals with great teachers and leaders and the idea that fundamentally, education is about people, and great people really make a difference. This involves thinking about what it means to be an effective teacher (in our minds it is one that gets results for kids), ways to increase the number of those teachers, and making sure they are working where they are most needed so that the best qualified teachers are working with the students who need their help and support the most. This involves work on teacher evaluation systems, recruitment systems and preparation systems.

4. Turning Around the Lowest-Performing Schools

The Secretary is passionate about this fourth assurance and made a name for himself doing this very difficult work in Chicago. There are schools that have been egregiously underperforming for years, and this assurance calls for the courage amongst leaders to do something different if a school isn’t working, and there is a myriad of tools and mechanisms to accomplish that.
Third, and related to the above, it will be necessary to be particularly focused on motivating and inspiring kids and adults around this work through after-school programs, funding new curricula, internship experiences, and relationships with scientists and engineers. In fact, Lach adds, the President has asked all of the scientists and engineers in the federal government to spend time with students.

“My job is to stitch all of that together into a compelling strategy that provides that kind of support,” Lach states, “and I’m not going to be able to do that without all of you helping.”

Standards of Evidence

Q: Patricia O’Connell Johnson

One of the things that we keep hearing and something that both the NSF and DOE have been stressing is standards of evidence for education innovations and what we need in terms of better evidence so that we can move this enterprise forward. I’m going to ask Jim to talk about this administration’s notions about evidence, what is useful evidence, and how we can marshal that evidence for better education outcomes.

A: James Shelton

The definition is still evolving, Shelton explains. While it is easy to begin to start to plot points of strong evidence based on past work, one question which poses an exciting opportunity to partner with NSF is: What does rigor look like when you’re actually in the developmental process? How do you do that in a way that starts to answer questions about whether something is high potential, and in what context?

They are working on this inside the Department of Education, Shelton notes, but this is something that will cut across the administration. Currently the Investing in Innovation fund has a higher evidence threshold than just about any other program in the department, he observes. Once these standards of evidence, are established, the next frontier is identifying what is required in the field in order to put it in front of our children, particularly millions of them at a time.
A: Michael Lach

The Secretary is very interested in having reauthorization of ESEA happen soon, Lach confirms, adding that it is up to Congress to figure out how it will happen. Over the past months there has been momentum and consensus behind the agenda the Department has been driving, and there is optimism that that will frame much of what happens with ESEA. For example, the Secretary has said he wants to be very tight on the goals but loose on the means so that schools, districts and states are free to try innovate as long as the results are coming in.

Another aim is to craft legislation that gets to the idea that growth matters and there are lots of ways to measure what an effective school or district is. As a result, we should see a lot of work around ways to show what improvement is like, how to talk about that, and how to move that ahead.

We also believe in accountability, Lach observes, and that closing the achievement gap is a really important thing to do for the country. The goal is to put a spotlight on our most vulnerable kids all over the system and make sure that people are working as hard as they can to do well by those kids.

A: James Shelton

Shelton follows on Lach’s comments, adding that one of the most important shifts in the Department’s thinking is to think about growth as an important indicator as opposed to just status. For example, if you are a school that moves students from point A to point B, then you should get credit for that even if point B is short of the ultimate goal.

A second important shift is in the definition of highly effective teachers and leaders rather than higher quality. The focus is on the impact that teachers are having on student outcomes and the broader way that we define that.

Third, there is a focus on enabling better forms of assessment as a part of the overall accountability system so that we are answering questions that matter to us about what our students have learned and what they know and are able to do, as opposed to very narrow assessments regarding whether they happen to answer a particular question like they did last year.

A: James Shelton

The Secretary has been clear that we want to set the context for broad reform, Shelton responds. That means not just thinking about proficiency. The name “Race to the Top” is deliberate and a theme that can be taken a number of ways, including race to the top as compared to other nations and race to the top of states within the United States. It also focuses on the question: How do we create the incentives to not only reach the minimum proficiency bar but actually excel? How do we push ourselves to build a system of continuous improvement so the bottom is never acceptable again?

This leads to Shelton’s vision regarding what education could look like in ten years, which he outlines as two distinct potential paths. One relates to a simple restatement of current facts. We are still in an economic crisis, he notes, and in two to three years, people are going to realize that education revenues are a lagging indicator of economic recovery. What that will mean for most states and districts, unless they attempt superhuman feats, which unfortunately we have not shown the will to do, is that over time our budgets are not going to reach even the levels they were at in the last year as the recovery funds run out.
One path we could go down, Shelton speculates, would be to stare that in the face and fail to act until the cliff comes, at which point we make fairly draconian cuts without a real strategy for how we are going to produce better outcomes for children.

An alternative path would involve doing the following:

1. Think about a new and different ESEA which is much more strategic and puts more power into each of the resources we put into our education at the federal level, but also helps with alignment and leverage of resources between and among states as they move forward. There are many reasons people could support the idea of common benchmarks and college and career-ready standards, not the least of which is economy of scale in terms of assessment, resources, tools, and so on.

3. At another level, when we look across the entire system, we see that we have clear gaps in curriculum, assessment and other tools and professional development, and we need to be filling those gaps with very specific types of R & D. That is where our investment dollars need to be going.

With constrained resources, that is the kind of system we are going to have to develop, Shelton states, and we are going to have to do it at light speed, something that is unprecedented. The good news, he adds, is that we don’t have to make it up. There are many people who have figured out how to do this before in other sectors and in other countries and how to apply many of those principles to education. “If we do it right,” Shelton concludes, “we can land in a place where we can actually move ahead very, very quickly. If we can do that, then I think in ten years our education system will look incredible, with incredible learning opportunities and experiences for students.”

An Anecdote Related to the Future of Education: James Shelton

Carnegie Mellon had an Open Learning Initiative with a focus on gateway courses in math and science. One of their best courses was the result of a complete redesign of a course in statistics. They did this with a grant of about $500 thousand in addition to a lot of human investment on campus. This statistics course usually has a pass rate of about 42% and the redesign led to a pass rate of about 98%. In what is normally a one-semester course, students met for half that time.

How did they achieve twice the pass rate in half the time? They identify three major contributors. The course was put online, so when students went home after class they received immediate feedback about what they had and hadn’t mastered. The professor receives feedback across students on what the class has mastered as well as guidance and support on how to structure the next class as a result. Finally, they redesigned the study groups so that it was not always the “top” students leading the “bottom” students, but the student who had best mastered a particular concept. This resulted in students who had never had the opportunity to lead a study group having the opportunity to do so, adding to individuals’ sense of self-efficacy.

Think about what you could do using a similar model, Shelton urges. Think about covering core content while saving time, money and staff. Think about the ability to offer many more opportunities to students, from internships to experiences in the field, allowing them to engage in what they are most interested in. What could we do in terms of reengaging students then?
Most kids start off loving science and somehow we manage to steal that away. If we could just learn how not to do that we would be way ahead of the game.

- James Shelton

What about the “E” and “T” in STEM?

Q: Patricia O’Connell Johnson

The President talks a lot about STEM, so I’m going to ask Michael to talk about the “E” and “T” in STEM.

A: Michael Lach

One of the goals of ESEA authorization is to undo some of the narrowing of the curriculum that has occurred under No Child Left Behind, Lach explains. This means figuring out how to enhance and encourage engineering and technology within all of the disciplines and make those sorts of connections, and it is something the Department is committed to doing.

Audience Q & A

Elementary Emphasis on Language Arts

Q: Audience Member

Many years ago Larry Lowery told us that if you teach language arts you get language arts outcomes, if you teach math you get math outcomes, but if you teach science you get language arts, math and science outcomes.

We know that language arts is a tool and not a content area, and research tells us it doesn’t have a strong body of evidence to support overemphasis in the elementary curriculum. Teachers at the elementary level tell me they have 20 minutes in the school day to teach science, social studies, and character development as well as three other areas the district expects them to focus on. And the students who are in the most need of science are the ones who get more language arts and less science.

My question is, what is the vision of the federal government to overcome the overemphasis of language arts in the elementary curriculum? What policy decisions might be in the offing that could give us some hope?

A: Michael Lach

First, Lach observes, the President has done two events in the past two months to highlight the importance of STEM education, and it is clearly something he thinks is important for kids and for the country. You will see DOE policies line up around that to make sure that is appropriate and the right priority. In addition, he notes, there is optimism in the Department that the new version of standards in language arts, mathematics and science really gets at these issues that have many different names but deal with critical thinking, communication and the like. In the science community it is talked about in terms of helping students be able to craft an argument based on evidence which, as has been pointed out, is a language arts skill as well as a science skill.

The group assembled here has an opportunity that the Department will support: to make sure that the definition of language arts, mathematics and science that our new common standards espouse has this idea that to know science is to communicate it, and to communicate in our language means to be able to communicate about science.
A: James Shelton

Part of this is not a policy issue, Shelton points out, rather it is a product and solution issue. The reality is that for some reason people have developed the hypothesis that just spending more time on reading and writing is the way to improve reading and writing scores, and they have divorced that from what you read and write about. Part of that is because the industries that surround our education system support that way of thinking. What people in this room need to do, and many have already done, is craft curriculum and professional development around how to teach the core reading and writing skills in the context of science, engineering, and so on.

Scientifically Based Approach to Title I

Q: F. Joseph Merlino, MSP of Greater Philadelphia

The Title I regulations call for emphasis on a scientifically based approach to how money is being spent by districts, which is encouraging. However, in large bureaucracies such as we have in Pennsylvania, we find there is almost zero capacity at the district or state level in actually making sure those regulations are complied with in the sense of acting as if there is a scientific approach to doing things. How do you see helping districts, particularly administrators and systems at the district and state level, organize themselves in a coherent, aligned way so that when you do programs it doesn’t get lost in a sea of chaos?

A: James Shelton

This raises an important issue, Shelton responds, and there are three parts to it. The first is getting some coherence around what evidence standards actually look like so that we are all working on the same page. The second part is including those as a requirement for at least a descriptive categorization of the products and services that are put forth. Right now what is required by Title I is an evidence-based, scientifically-based approach to research. That is not sufficient to provide enough guidance to anyone, let alone a Title I director, on how to actually include or preclude things.

Third, there is a significant amount of capacity building that needs to be done. The reality is that it will not be possible to build that capacity at every district level. It will require a partnership between national, state, and regional capacities with districts to help them with the kind of evaluation and screening that need to be done and to support individuals’ decisions when it comes time. However, Shelton observes, we can lower the threshold for the capacity required at each level by getting the first two things right.

Common NCLB Standards Across States

Q: Peter Joenks, College Ready MSP, University of Arkansas

I was encouraged to hear James Shelton’s remarks about ESEA legislation and reallocation, particularly in terms of looking at student progress. I’m curious to know what the Department’s stance is about the following. Currently, every state working with NCLB is working with a different assessment to determine whether or not schools are proficient. Is there any talk about creating a common assessment similar to the NAEP?

A: James Shelton

We would never talk about that but a bunch of states are and we think it’s a great idea.
Comment: Patricia O’Connell Johnson
The National Science Foundation over the last year added the National Science Board, which as one of its interest areas has put together a group looking at STEM innovators from pre-K through career. They had a meeting in August in which scholars from a number of different disciplines came together to look at this question and the Secretary of Education and James Shelton came and spoke, so there is a lot of interest both at the NSF and at the Department of Education in considering how we develop innovators. I think the basic messages are as we’ve said: Yes, we have to have high standards and opportunities for those really exceptional kids, but we also have to have ways to create more kids that are extraordinary. I think we’ll see more interest and policy and talk about that as we move forward.

Michael Lach fielding questions after the panel

Higher Achievement Standards for Future Scientists and Engineers

Q: Christina Sormani, Math Teacher Transformation Institute MSP, Lehman College, CUNY

My question concerns what we consider assessment of high levels of achievement. So far in this meeting, we keep talking about creating future generations of scientists or engineers for America and yet at the same time, the statistics are all about pass rates. Future scientists and engineers are those who ace their math and science classes. We need to be offering challenging math and science classes along the lines of trigonometry and precalculus as well as biology, chemistry and physics—along the lines of New York State standards on those subjects. And at the same time, not just call for something like 65% on the Regents Exams but something like 85% or 95% as an assessment tool for denoting achievement. What is the US doing about this?

A: Michael Lach

Lach piggybacks on Shelton’s comments by noting that this is a challenge for all of us in the STEM community. Rather than filtering out the best kids to become scientists and engineers, what we need to do is become pumps because there are a large number of kids who don’t have a fair shake at taking these kinds of courses and doing this kind of work. “If we give them the right kind of tools and supports, I think we’ll get even bigger numbers of kids who know this stuff really well and can have any career they want.”

A: James Shelton

Shelton refers to his earlier remarks about ESEA, stressing that the hope is to set a very clear bar that communicates that we want all students to reach college- and career-ready standards, which includes a certain amount of background in all STEM disciplines, and that you get to those places by taking rigorous coursework. The goal is to create incentives so people aren’t just shooting for and allocating resources to getting students to the proficiency bar but to the top levels of the performance curve. When we talk about the achievement gap, we need to talk not just about hitting the proficiency bar, but about equitable distribution of performance across the spectrum. Those steps should help, in addition to moving towards standards that are more transparent about their actual level of rigor.

Comment: Christina Sormani
I wasn’t talking about segregating the classes, I was referring to the fact that there are many students who go on to STEM fields and do very well, but because their teachers never taught the complete courses they took remedial for four years and then finished their master’s in eight years. This isn’t about segregating, it’s about bringing up the standards, even for the minority schools in the Bronx.
The Status of Teachers

Q: Kacy Redd, Strengthening Science Teacher Preparation RETA, Association for Public and Land-Grant Universities

I’m not too far away from being a student and I considered a career in teaching. What I wrestle with sometimes is raising the status of teaching. How do we get our best students to want to be teachers? I’m wondering what the Department of Education has thought about that aspect of the problem.

A: James Shelton

Unfortunately this is a long-term problem, Shelton comments, noting that he is one of the people who wanted to be a teacher and his family preferred that he pursue the more lucrative path of computer science and engineering. After doing that, in business school he also received a masters in education and was asked what he was going to do with something like that.

“The status of education, even among ‘enlightened’ people, is a real issue,” he confirms. The current administration has committed itself to this issue, to raising the profile of the teaching profession, to raising the compensation of the teaching profession, and in particular recognizing hard-to-staff positions, which will help with the STEM agenda. There has also been a lot of buy-in from the private sector in terms of their interest in public-private partnerships, with a clear recognition from them that we have got to rebrand the teaching profession. Some of the best in the world at branding are currently thinking about this problem. The good news is that the profession will see itself raised. The rebranding strategy has a high probability of working, though it remains to be seen if Congress will buy into it.

There is also an unprecedented opportunity both in terms of the outflow, which has been slow because of the economy, but also the inflow because of lack of other opportunities. And while some may be thinking of teaching as a short-term holdover solution, Shelton comments, as we all know, once you step into the classroom it is hard to step back out. Combined with the other efforts under way, there is an opportunity to hold onto a lot more than we otherwise would.

Growth Models: All Students

Audience Comment:

Since we’ve talked about growth models, status models and reauthorization, I just want to stress that as you know, trying to build growth models, is not an easy thing to do. I also want to stress that whatever growth models you finally authorize for different states should apply to all students. Some states try to use growth models to get AYP without actually looking at growth models across all students.

James Shelton

There are several refrains you’ll hear from this administration and “all students” is way up there on the list; “all” does mean all.
COLLABORATIVE COMMUNITIES AND LEARNING NETWORKS

THE INTERACTION BETWEEN TRUST, COLLABORATION AND LEARNING

Opening Remarks

Karen Stephenson
Associate Professor, Rotterdam School of Management, Erasmus University and Corporate Anthropologist, NetForm International

Karen Stephenson opens her talk about her pioneering work with social networks with an image of the chemical transference between two neurons as a way to start thinking about civilization and connection. “I think that is the biggest challenge we face in the 21st Century,” she states, “how we bring together people with diverse interests.”

Stephenson proceeds to draw from the large database she has collected over the years to share some examples of community and complex partnerships. Referring to a triangle diagram, she notes that Oliver Williamson won a Nobel Prize in 2001 for talking about the two relationships at the base of the triangle. We can transact with one another as well as with technology. When there is some uncertainty, or as Williamson called it, “asset specificity,” people come together to try to resolve that uncertainty either in the partners that come together or in the nature of the problem they are attempting to solve. When they do come together, they sometimes use authority, someone in charge. Those bottom two ties, Stephenson points out, largely dictate the way we operate in businesses, communities, government and schools. Regarding the top of the triangle she notes, “Probably the most powerful human connection people can have is one of trust.”

While there have been many books and articles written about trust, most are from the soft, social capital side. “I believe trust can be looked at in a disinterested fashion, much like Machiavelli talked about it in The Prince,” Stephenson observes. “Trust is a force field, equivalent to nuclear force, I believe, that binds people together and is probably the ma-
Major contributor to why cultures don’t change.” This means that when you are trying to move forward in a school district or complex partnership, the way people trust one another before a change is announced is often the very thing that is a major resistor to the initiative. If you can find the key connectors inside trust-based relationships they can help move forward change. Trust is both a powerful force for change and a powerful resistor.

Moving on to organizational outcomes, Stephenson again refers to Williamson’s work. The idea of authoritative relationships trying to resolve uncertainty or ambiguity gives rise to the business firm. If you solve for that uncertainty using authoritative relationships, you can create a service or produce a new product which you then sell through a marketplace of transactions. Trust, which Stephenson points out is the one thing we don’t measure, is again at the top of the triangle and gives rise to another organizational structure called networks. While it took Oliver Williamson eighty years to win a Nobel Prize for his work on the base of this triangle, Stephenson opines that it will be another eighty years before trust and networks are recognized as a force for change.

The focus of this presentation, Stephenson explains, is about the outcome of trust, which is the human network. In the model below, on the left we see the hierarchical structure of authority which, though elegant and simple, is not how life goes in most organizations. We cannot live without hierarchical structures, which have lasted for hundreds of years and have a perpetuity of their own, but change little and infrequently. To the right is a human network, drawn from actual data, based on how the individuals involved not only socialize but get their work done. The lines connecting the black nodes are two-way ties. Note the nodes, shown here in white, that are the mathematical cut points in graph theory. If you were to remove those nodes the entire network would disaggregate. Having worked with the United States, British and Dutch governments, Stephenson points to efforts to attempt to identify these connectors in fraud networks, financial networks and terrorist networks.

In this case, the aim is to find those nodes not because we are trying to disaggregate something but because we are trying to build something, a learning community. We want to know how we can effectively collaborate and
connect and connection is not a random event, Stephenson explains. There are efficiency models for how one can connect.

When the hierarchy and network merge in real life, because we don’t have the tools to see them or measure them, networks can undermine people’s authority or stumble and get in the way.

“If I were to just talk about those three types of relationships—transactions, authority and trust—I wouldn’t be addressing what I truly believe is the challenge for the 21st Century, the way people come together and connect in these complex partnerships,” Stephenson states.

“The word for that is ‘heterarchy.’”

In looking at how a heterarchy first forms, Stephenson beings by reviewing some flawed assumptions about partnership. Simple partnerships are dyadic and are something we understand: two people connect for a variety of reasons. But what if you add one more node to that partnership? Imagine that you are the node at the top of this triangle, surrounded by positive relationships. On the lower left is your spouse, who loves you. On the right is your spouse’s mother, who loves your spouse and who loves you because you care for her child. But then imagine that you have a conflict with your spouse. Suddenly things change, the relationships become somewhat negative, and you’ve got to figure out how you got off track and how to mediate it because there is a lot of trust holding this together. Then imagine that your spouse tells your mother-in-law about the conflict, and suddenly you’ve got two negative relationships.

This is a very simple diagram of a three-person network, Stephenson notes. Everyday we wander through hundreds of networks with hundreds of connections, and we can see how easy it is to go off-track with one simple three-way connection. “Inside organizations there are a lot of these little tripartite relationships,” Stephenson observes, “and this, my friends, is where politics begins.” We don’t have control over one of those relationships and there is a lot of uncertainty and ambiguity in an indirect relationship, she explains.

Elaborating further, Stephenson reviews a taxonomy of structure. It begins with a single person forming a simple partnership and then expanding out to a three-person network. This is the basis of a human network and how we come together all the time, she explains. At the institution level, institutions also come together in partnerships. When two come together it is governed by a simple contract. When you have
three, it gets complicated. The definition for “heterarchy” begins with three or more. Two is the simple dyadic partnership. In a heterarchy, in all of those institutions that might be in direct partnership, there is always an indirect relationship that is going on. It is the same thing that happens on the bottom half of the diagram with a human network.

Stephenson uses the example of the faculty structure at the UCLA Depart-
Female Mentorship is a “Game Changer” in the Tenure Ranks

Definition of Heterarchy

Consists of at least 3 or more distinct hierarchies each with its own raison d’être, which must collaborate with each other to accomplish a collective good more complex than any one hierarchy can manage or achieve on its own.


The transformational challenge for this in the 20th Century, Stephenson asserts, is to move away from a dependence on hierarchical structure to an understanding that networks exist, and understanding of these two structures in complex partnerships which are called heterarchies. Examples of heterarchies include the health care system, the education system, and the financial system.

Those in the MSP program are facing this challenge, Stephenson notes, and we cannot look to the past because we don’t find records of it in archeological traces. The reason for this, she opines, is that never before in the course of human history have human beings been this interconnected. While we cannot look to the past, Stephenson says, “I believe that little tiny bits of the solution are in this room; we just have to bring it together.”
39MSP: An Intergenerational Learning Network

Stephenson proceeds to share what others are doing with heterarchy. In the U.K. government, there are twenty-five heterarchy pilots. They are interested in reducing burglary, domestic violence and other crimes in the community and realize that policies and initiatives won’t make a difference in terms of lowering crime rate. It requires the support and efforts of volunteer organizations and local elected councils in local communities. This comprises at least a tripartite network or small heterarchy that usually consists of thirty or forty different organizations. Nobody knew how to run an organization like that or who to talk to, other than the heads of the various organizations.

What Stephenson and her group did was identify collaborators.

Identification of key connectors in the community of Mansfield. The dense connections center on the police department.

Collaborators

1. London: Newham borough in London
2. SW region: Domestic violence in the county of Devon
3. Eastern England: Neighbourhood improvement in King’s Lynn, a town in the county of Norfolk (Young Foundation) in Fristed (a district within King’s Lynn)
4. Eastern England: Children and young peoples services in King’s Lynn
5. East Midlands: Domestic violence in Northampton
6. East Midlands: Nottinghamshire Sport in the county of Nottinghamshire
7. East Midlands: Burglary in Nottingham which is the county town for Nottinghamshire
8. East Midlands: Anti social behaviour in Derby which is the county town for the county of Derbyshire
9. East Midlands: County sport delivery in Lincolnshire county
10. East Midlands: County sport delivery in Leicestershire and Rutland counties
11. East Midlands: Anti social behaviour in Mansfield, a town in Nottinghamshire
12. East Midlands: Local strategic partnership in Mansfield, a town in Nottinghamshire
13. East Midlands: Neighbourhood improvement in Mansfield (v2), a town in Nottinghamshire

Used with permission from Karen Stephenson, “Rethinking Governance” from The Handbook of Knowledge-Based Policing: Current Conceptions and Future Directions. Edited by Tom Williamson. C 2008 John Wiley & Sons, Ltd.
the key connectors in the community—those who had connections with other people, who were trusted by other people, who were considered to be knowledgeable in certain areas but were not necessarily known as leaders. The police department is dense with connections, particularly to the elected officials in the box to the left, which is where the strong connections typically lie in local communities.

Stephenson and her group were able to find key connectors throughout other parts of the community. Those key connectors ended up having the solution once they were brought into the room and into the discussion. They never would have been identified or involved had this technique not been used, Stephenson notes, and as a result, many solutions have been provided in the U.K. when it comes to PPPs (public-private partnerships) and LSPs (local strategic partnerships).

In a heterarchy, you can’t co-locate all of the members, Stephenson observes. How do you bring them together? The answer to that question lies with the key connectors. Once they are brought together, they are able to design a solution for closing the gap. Each connector has part of the solution. What is needed is to identify them and then bring them together. “And, my friends, they are not the usual suspects,” Stephenson adds.

Another connector story involves Philadelphia. There are many issues regarding leadership in Philadelphia, along with soaring dropout rates and crime rates. Liz Dow, President of Leadership Philadelphia, called upon Malcolm Gladwell to give a talk in Philadelphia around 2004. Gladwell had written about Stephenson’s work in the New Yorker in 2000. When he spoke about connectors and tipping points Dow said, “These are the people I need to find, the unusual suspects in Philadelphia. Help me find these people.”

Gladwell told her that he didn’t know how to find them but knew someone who could, and connected Dow with Stephenson. The idea was so powerful that Stephenson was drawn in despite the lack of funding for the project. A core group of people was assembled from various public and private sectors including futurists, lawyers, marketing people, and the two newspapers, and a call was put out to identify these connectors.

This involved devising a methodology which is a two-part stage of social network analysis. There
is a modified snowball sample that involves collecting nominations, calling the nominations and cleaning the data to eliminate gaming. You then look at who might have received the highest number of nominations, call that list and ask them. While statistical breaks were spotted at about 200, with an all-volunteer team donating the time that number was overwhelming. They decided to look at the top 100 people and because there was a tie for the last position the final number was 101.

The proposition behind the questions was, imagine that Philadelphia is on the short list for 2012 and has the opportunity to be recognized as one of the best cities to live in. If you were going to believe in that proposition, who would you call?

Those 101 nominees were then asked if they knew each other. The connectors were convened in December of 2006 in an unpublicized event. The intent was to recognize the participants. A video featured all of the projects represented in the room, and while the event was scheduled for two hours, they had to push the attendees out the door four hours later because the connectors were busy connecting.

This is what the connectors looked like. The

1. Among this list of 101, who do you know well enough to pick up a phone to call on to roll up his or her sleeves and see an effort through to the end?
2. Among this list of 101, who is in your local community (whatever you consider to be your community)?
3. Among this list of 101, who do you consider to be particularly innovative; who could bring “big picture” ideas to this effort?
4. Among this list of 101, who do you consider to be particularly innovative; who could bring “big picture” ideas to this effort?
four boxes represent not-for-profit, government, academic and private arenas, and within each box there is a separate circle for male and female.

After looking at how they were connected between sectors, the next step was to look at how they connected internally. Observe the dearth of connections in the academic sector at the right.

Stephenson notes that PR firms in a city often put together a short list of the fifty or one hundred most powerful people in the city, and the firm that did this in Philadelphia was very interested in the results of this network study. Those identified as connectors were not the usual suspects and in fact, when compared side by side, there was only a one percent overlap between the two lists.

The one person where there was an overlap is now the mayor, Stephenson reports, “and guess who he is using to improve civic engagement? He’s got the usual suspects and he’s using the unusual suspects.”

Several things of note were learned. Philadelphia’s educational institutions draw people to the area and those people often return to the area. Next, the non-native was as powerful as the native. Most connectors were too busy to mentor so a program was developed to get them involved with mentoring in the high schools. Finally, a list of competencies was developed. “What we’ve found is that in traditional leadership courses the competencies that are identified are very different from connectors’ competencies. We think we could add a few more competencies, particularly since heterarchy is a 21st Century problem and connection is a part of that skill set,” Stephenson explains.

This idea caught hold and NetForm is now or soon will be conducting studies in Louisville, Tuscon and Portland. In conducting these studies in four very different regions in the nation, NetForm will be looking very carefully at those competencies to see if they’re consistent. “If they are consistent that is interesting,” Stephenson says. “If they vary because of local regional constraints that too is interesting. It is a living experiment.”

Below is an image Benjamin Franklin created, cutting a snake into thirteen pieces representing the thirteen colonies with the legend,
“Unite or die.” This leads back to the concept of heterarchy and complex partnerships, Stephenson observes, because going into the 21st Century we need to connect.

In February of 2010 the book *Six Degrees of Connection* will be coming out, which includes an afterword by Karen Stephenson.

In summary, Stephenson reviews the points and examples she has covered (*outlined in the sidebar*). If this can be done in all of these instances, it can be done here with the MSP, she states. This is why conference participants were asked to fill out the network survey forms earlier (*see page 9*). “This is a learning network and you are all collaborating,” Stephenson points out, “let’s do a baseline measure and see where we are. And maybe we should do a measure later on, a year from now.”

Stephens notes that when Jim Hamos opened this conference he used the diagram below, depicting the core participants of this benzene ring of the IHE and K-12 school system.

Stephenson closes by posing an alternative model of pentacene, with more rings representing other aspects of the community, and then points to a real image of a pentacene model which we have seen for the first time only recently as a result of modern technology.

“The real thing is very, very close to the model,” she points out. “So my friends, when we come up with these models for collaboration maybe they are not so far from reality. Maybe we can learn something from heterarchical models and try to implement them in our collaborative communities here.”

(PhysOrg.com) - For the first time, IBM researchers in Zurich, Switzerland, have taken a 3D image of an individual molecule. Using an atomic force microscope, the researchers constructed a “force map” of pentacene, an organic molecule just 1.4 nanometers long. As the researchers explain, the technique is roughly analogous to how an x-ray machine images bones in the human body by looking through flesh. In this case, the scientists could look through the electron cloud and see the atomic backbone of the molecule.
The Learning Activity
Participants were organized into small groups, each focusing on one of the four vignettes that follow. After an initial discussion, small groups focusing on the same vignette combined to compare notes and continue the discussion together. Finally, a representative from each combined group reported results to the plenary session. • Led by Ann McKenna and Daphne Rainey, NSF

MSP VIGNETTES: A LEARNING EXERCISE

Measurement Group Report-out

• What happens when evaluation becomes so misaligned that it is no longer measuring what the project is attempting to accomplish? First, evaluators of these projects have to keep in mind they are not actually developing instruments specifically for each project because of time and cost constraints entailed in assuring the reliability and validity of each measure. As a result, measurements developed by other MSP projects such as the RETAs are used. What do we do in the few cases when those measures are not aligned with the project being measured?

• If they are marginally aligned, we can identify specific items that are most salient to the actual intervention and evaluate both the overarching results and present those total data points. If there are a few specific items of particular relevance to the intervention we can pull those out and highlight those.

• If the assessment is so misaligned that it can’t be used well, then it is time to sit down with your project again. Ideally, this should have been addressed up front. As the project changes, the project changes the evaluation changes in tow. If not, it’s time to sit down and reevaluate what assessments you’re going to use. There is no point in collecting data that is irrelevant to the project. If it’s not relevant, don’t use it, find a new measure.

• MSPnet has a lot of resources regarding assessment, and there are many colleagues represented here at this conference with expertise as well as others outside that can all reference us to materials that are salient to a particular project.

• Could this situation have been avoided? A more useful exercise would be to identify what we have learned from this situation that would allow us to identify and tackle other project-specific issues and identify resources that in the Learning Network that can help.

• We do have a lot of expertise and tools that we use within our own MSPs. We would like to see the KMD and MSPnet become resources for us as we add our assessment tools to the resource base. For example, what is available for inquiry? It is difficult to find a standardized test to measure inquiry? Let’s share that so that MSPnet becomes a robust resource.
Commitment Group Report-out

• All agreed this was a nightmare scenario of decay of commitment to a project. An initial idea that was tossed out was having a disaster response team.

• The group focused more on heading off a situation of this type before it occurs rather than responding to a disaster, and how to generate a plan that will provide a structure to maintain the partnership.

• One idea was that people commit to opportunity rather than time-bound rewards. Making sure that opportunities are available in the project is important.

• Understanding the levels of power and the levels of influence that are associated with the project can help to ensure that the project is made visible to those with power and with access to opportunities.

• One project cited a plan that involved teachers reporting regularly to administrators, which maintains the visibility of the teachers’ work at the administrative level.

• An advisory board can also help connect the project to significant external nodes and to administration.

Commitment Vignette
A group of PIs consisting of STEM faculty, school district administrators and an evaluator put together a genuinely partnership-driven MSP proposal that was funded for five years. After hearing about the positive funding decision there was tremendous excitement for the project by the project team and institutional partners. All expressed great eagerness to work together and optimism for what they could accomplish.

Three years later, key stakeholders are not regularly attending meeting, some participants are resistant to committing their summer time to professional development, others are affected by competing needs, and various faculty and administrators have turned their attention to newer projects. In addition, one of the original PIs and some supporting administrators have left their positions and can no longer be involved in the project.

1. What can the project leadership do to rekindle the original commitment and enthusiasm?
2. How might the project have been designed to lessen the impact of these types of issues?
3. What should/could the project leadership be doing to build partner ownership to ensure post-project institutionalization?
4. How can the project leadership use the Learning Network to help them deal with the situation?
Quality Teaching Vignette

A small group of faculty have worked with a local district to develop an MSP proposal, which is funded. The MSP project starts, and many faculty and administration at this university are excited because this represents an opportunity for disciplinary faculty to be engaged with the community, and this is aligned with the university’s mission. By and large, the faculty have strong content knowledge, but they have limited formal knowledge about pedagogy. Because many of them have extensive teaching experience, they are not convinced they need to examine and reflect on the quality of their teaching. Additionally, pre-tenured faculty are working toward tenure and feel they need to place priority on contributing to discipline research, and that their involvement in the MSP would not be as valuable as effort spent on their research. The signals they receive from the administration seem to underscore this perception.

1. How do you begin to get the faculty to value improving the quality of their teaching and learning in their classrooms?

2. How do you incentivize pre-tenured and senior faculty to get involved?

3. How do you move in directions of institutional change?

4. What are the leverage points in the short term? Long term?

5. Who are the stakeholders and how can they be engaged?

6. How can you use the Learning Network to help you?

Mathematics faculty might be perceived as good teachers in the university context, but when teaching K-12 teachers they receive a different kind of feedback. What is “quality teaching” given the two contexts?

Part of the problem deals with communication. Mathematicians and educators use the same words, but they have different meanings. For example, educators use the term “discovery” and “guided discovery” in one way, while mathematicians have a very different notion about what it means in terms of discovering something in mathematics.

There was also this notion of being an interloper, with each group seeing the other as an interloper in an unfamiliar domain.

In one project, a helpful source was having a math educator facilitate the communication because the mathematics education faculty have a foot in each world and are able to look at the information being presented and translate it.

Because of communication barriers, partnership members may think they are talking at cross purposes when in fact there may be some commonality they are unable to recognize.

Team teaching was another strategy that came up. For example, pairing the content faculty with a highly knowledgeable teacher who can facilitate the process of working with an unfamiliar audience.
But It Looked Good on Paper... Report-out

- At the core of this vignette was the question: How do you negotiate power and respect within MSP program partnerships? This notion of whose voice is heard at any given time and whose voice is valued becomes important when you are building a partnership.

- The power dynamic is felt across disciplines and particularly between higher ed and school system personnel.

- There are issues of race, gender and power, which we don’t often talk about but are often at the hub of much that happens. These issues need to be out on the table.

- One idea was to identify the source of power. Is it just in the title or is it in what people bring to the table? In partnerships, we need to question whether we are giving someone voice because of their title or because of what they bring to the table. How is what they bring to the table negotiated in the context of the work that needs to be done?

- Working on small tasks is a strategy that can be used to build relationships and trust. By engaging members of your partnership in working together on small tasks with clear intentions, they are able to learn how to negotiate power and roles.

But It Looked Good on Paper...Vignette

Scenario
A wonderful planning group was conceived. It included three STEM faculty in three disciplinary areas, a couple of college education faculty, and three K-12 district representatives with different roles (teacher leader, principal and science curriculum coordinator). As individuals, each higher education faculty member had experienced success in working with K-12 and vice-versa. Additionally, each member of the committee, both K-12 and higher education, brought a unique area of expertise or experience that significantly strengthened the proposal. The group had never worked collaboratively on a project before.

Problem
Within six months of their first summer academy, a couple of problems arose and felt like a perfect storm. During the planning of the summer academy activities, the District Coordinator tried to push the District’s latest greatest reform on the project. On top of that, the faculty could not get in sync. The education faculty and disciplinary faculty argued over the deliver of content and how best to connect with teachers and schools. When it boiled down to it there was one disciplinary faculty member who was particularly resistant to adopt a methodology that was beneficial to teachers.

1. How does the leadership team solve this problem while maintaining the integrity of the original project?

2. How can the project team use the Learning Network to resolve this problem?
Scaling Up

Joan Ferrini-Mundy
Acting Assistant Director
Directorate for Education and Human Resources
National Science Foundation

Joan Ferrini-Mundy notes the challenging nature of this conference. Participants tackled some challenging issues in a deep and intellectual way, and addressed the question of what it means to be part of a learning network, how a learning network grows, and how to determine the efficacy of a learning network. The thinking that has gone into addressing these and other key questions help to inform not only the work in the MSP program but much more broadly in EHR and what occurs across the Directorate.

Ferrini-Mundy refers back to the Department of Education conference panel and observes that a major question for those currently engaged in the education arena in Washington is about scaling up and reaching large numbers of people with well-informed, well-tested interventions and innovations. The question Ferrini-Mundy poses to this MSP Learning Network is: How could we collectively take on this question of what it requires for something to be scalable? The question being asked, she delineates, is not how we scale up the very good ideas and interventions we have developed through the MSP, but rather how we help make sense of what it means for all of these to be scalable and what it would take to have them reach broadly and impact a large demographic.

EHR needs to be a place that tackles some of these crucial questions, she states, and is then prepared to partners with a number of other agencies and entities to effect the scaling up process being discussed.

There are a number of different models for scaling up. There is the knowledge-diffusion-deployment model: We’ve got something that works. We know a lot about what works. Why can’t we just tell everyone about it really loudly? That is oversimplified, Ferrini-Mundy admits, but not entirely oversimplified.

Another is a replication model where the notion is that we identify some innovation that appears to be very effective in a particular context and then call for it to be reproduced in a variety of other contexts. That is another approach and there are also many variants and local adaptations.

“One place where the conversation is not as rich as it needs to be is in the array of models that make sense for scaling and the way in which those models get discussed and talked about in particular projects at local levels or in regional areas because this notion of what is scalable, particularly for projects using federal investment, is going to be a central question for us moving forward.”

Ferrini-Mundy proceeds to unpack this question further and consider what this effort will require. One idea that was voiced by the Department of Education panel was the
importance of some sort of evidence and different levels of evidence for different stages of an idea as a part of what is needed for the hand-off to the next level of implementation, development or scale-up.

Something that has been established, through solicitations at NSF and through the literature, is the importance of being able to demonstrate, with appropriately rigorous methods that suit a particular project or intervention, some kind of measure of its efficacy or impact on learning or other objectives targeted by the project. To do that requires a number of things: clarity about the intended outcome, good measures that are valid and reliable to provide information about outcomes, and designs and methodologies suited to the work at hand that will provide information about whether what you are trying to do is causing what you want to happen. “That continues to be an important focus for us and it will be important in our conversations with education going forward,” Ferrini-Mundy states.

Beyond that is the question of figuring out what it is that you actually do, and this is where the network idea could be used in a very suitable way, Ferrini-Mundy notes. For example, take a group that runs a summer institute for upper elementary mathematics teachers, working on their mathematical knowledge for teaching. You could identify measures to take a look at the teachers’ pre- and post-content knowledge. You might even be able to get a comparison group or random assignment to your summer institute. The design issues are in place, the assessment issues are in place, but how do we find out what you actually did in that institute for those three weeks with those teachers in a detailed enough way so that someone else could look at what happened and either decide to adapt or replicate certain pieces in their own context?

“I’m not convinced that traditional publication outlets give us a very good way of sharing that level of programmatic detail,” Ferrini-Mundy notes. What might be missing, but what a network might help gather, is a detailed description of these interventions in a way that lets others understand enough about what has been done that they can pick and choose and learn from it.

“It’s not enough to know whether the kind of learning or motivational improvements that you hoped for actually happened,” Ferrini-Mundy explains. “We need to know the so-called ‘active ingredients,’ to quote Larry Hedges.” How can we share at a level of detail that is workable in a way that highlights the active ingredients so that the body of knowledge being accumulated goes beyond general kinds of findings to much more specific findings that can spread in interesting ways?

A final point involves the idea of “translational research,” which is used in other fields such as engineering and medicine. It is the notion that you can’t just hand the basic research to practitioners, that some very particular kinds of documentation or translation need to be added.
to that research in ways that make it usable. That may already be happening in a network like the MSP, Ferrini-Mundy observes, but the question is, how can we extract some of that and learn how to do that better and make that a more specific and visible part of the work that we do?

In closing, Ferrini-Mundy encourages those in the MSP Learning Network to think about scalability and models for scalability, about documentation and about translation as they go about their work. She adds, “I’m optimistic that because of the existence of the network and the consciousness you have about the ways in which you are learning and advancing learning that maybe we can make some progress on some of these topics as well.”

What We Have Learned

James Hamos
MSP Program Lead
National Science Foundation

James Hamos notes that the MSP is an R & D effort, which involves both the doing of the work as well as the study of the work. He proceeds to explain how those at NSF talk about the MSP and draw knowledge from the MSP to share with stakeholders. NSF conducts in-depth studies on the aggregate level across all of the MSPs to see whether there is impact on student achievement and to report on progress.

Slides like the one at left are produced to show that there are increases in student achievement at multiple levels: elementary, middle and high school. At the aggregate level, NSF is looking at this type of year-by-year progress as well as studies that look at national comparison of schools and school districts with which MSP projects are working. There are meta-analyses...
Are Students Learning?

**Following Student Achievement**
- Year-by-Year Trend Analysis
- Matched comparisons
- Meta-analysis pre/post assessments

**Closing the Achievement Gap**

In 2007 the first MSP “National Impact Report” was produced. The findings outlined below as well as reflections on individual projects can be found in a new “National Impact Report” coming out shortly.

![Achievement by Student Subgroups - Elementary Schools](image)

that are happening as well.

Then there is the big piece, Hamos observes, which relates to what Joan Ferrini-Mundy was talking about and the discussions throughout this Learning Network Conference: What are we learning? What are the sort of things that we can pull out of the MSP that are worthy of sharing? The points outlined here are lessons drawn from real data from real projects. Some may seem trivial but still have resonant meaning; others are quite profound. “We want you to build on all of them,” Hamos notes. “We need you to dig deeper and add to these further.”

**What Are We Learning?**

- Through new long-term and coherent courses and programs, the involvement of STEM faculty and their departments in pre- and in-service education enhances content knowledge of teachers.
- MSP projects are making new contributions to the STEM education literature related to teacher content knowledge and teacher leadership.
- STEM professional learning communities are powerful exemplars in professional development.
- Research methods in ethnography and social network analysis help document change in institutions and partnerships.
- Higher education STEM faculty, often with the aid of teachers-in-residence on college campuses, are broadening their discussions of teaching and learning and supporting new efforts in teacher preparation.
- New centers and institutes devoted to K-16 math and science education facilitate interactions between higher education and K-12, offer professional development for STEM faculty, and advance the scholarship of teaching and learning.
- Revised tenure & promotion policies recognize faculty for scholarly contributions to the advancement of math and science education.
There are also some new ideas emerging that provide glimmers of hope, Hamos observes, “and we need you all to be thinking about these in relation to your own work.”

In addition to the reports and data from projects, the project highlights illustrated by quantitative results as well as photos and anecdotes collected each winter in response to the Government Performance and Results Act provide important bits of evidence. For example, there is currently interest in Washington concerning charter schools, and information from MSP projects working with charter schools can help inform those discussions.

Hamos then offers an update on where MSP is heading. There will be an MSP solicitation this year, and all of the types of awards funded in the past are expected to continue. Those currently engaged in MSP work are encouraged to be part of this competitive process.

In closing, Hamos refers back to the jigsaw activity during which conference participants attempted to define a learning network (see page 8). “You define the next stage of this Learning Network,” Hamos observes, pointing to the following two questions.

What have we learned about learning networks?

How will we engage with the MSP Learning Network in the year to come?

He encourages participants to internalize these questions and notes that the survey process launched by Stephenson and Frechtling during this conference should provide us with data points about the MSP social network in the future.