The Portland Urban Systemic Program (USP)

Five Years of Building Systemic Support for Math and Science Education Improvement

2001-2006

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October 2006

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PART ONE:

INTRODUCTION

Beginning in September, 2001 when the Portland Public Schools received funding from the National Science Foundation (NSF) through the Urban Systemic Program (USP) initiative, the district focused, accelerated and strengthened its efforts to improve mathematics and science education K-12. Since its inception we at Inverness Research Associates served as the external evaluators to the Portland USP. The overarching goal of our evaluation was to document and assess the growth and development of the overall capacity of Portland Public Schools to improve K-12 mathematics and science instruction.

This final report describes what we learned about the specific accomplishments of the Portland USP. It also illuminates what we learned about the realization of the district's broader vision which both pre-dates NSF funding and will remain after the grant ends – namely, the establishment of a district-wide, on-going and self-sustaining system of supports for math and science improvement.

The Urban Systemic Program Initiative

The National Science Foundation launched its Urban Systemic Program in Science, Mathematics and Technology Education in 1999. The initiative was a K-12 based program aimed at promoting systemic reform of science and mathematics education in urban school systems characterized by high concentrations of students in poverty, and/or students from racial or ethnic minorities. It was created specifically to address the disparity between the academic performance of urban students, who comprise roughly half of all public school students in the United States, and their suburban counterparts. The USP hoped to draw attention to and remedy "the uneven allocation of resources, the lack of qualified and experienced teachers, the low enrollment in advanced courses, inadequate curriculum materials, lack of equipment and poor facilities, and few role models"[1] from which many urban students suffered.

[1] NSF 00-34 Program Announcement, "Urban Systemic Program in Science, Mathematics and Technology Education, A Foundation for K-12 Science and Mathematics Educational System Reform," page 5. www.nsf.gov/pubs/2000/nsf0034/nsf0034/.pdf

Breaking their own tradition with the USP initiative, the NSF situated funding and leadership directly in the districts themselves, deliberately by-passing institutions of higher learning, which historically served as the locus of control for NSF grants. USP guidelines organized the work districts were expected to do around two sets of "drivers." The first set of NSF drivers focused on particular aspects of systemic reform, such as standards-based curriculum and professional development; the second set focused on the "outputs and outcomes" of the system, such as student achievement and the elimination of the student achievement gap.

The USP grants funded districts to improve the implementation of a standards-based, inquiry-centered science and math education program, by emphasizing 1) the alignment of curriculum, instruction and assessment, 2) building leadership and expertise at all levels of the system, 3) increasing the competency of the teaching force, 4) promoting collaboration with colleges and universities, and 5) using data to identify areas within the system in need of restructuring.

Portland Public Schools was the last in a national pool of roughly 40 districts to receive a USP grant.

Inverness Research and the Evaluation of the Portland USP

In order to document the development of district-wide capacity to improve math and science education, Inverness Research conducted a range of evaluation activities deliberately designed to provide us with multiple perspectives over the five-year duration of the USP. We intended that each perspective teach us something about the nature and effects of the supports for math/science improvement that were being developed. We also intended that when taken together these various views would give us the opportunity to see convergences as well as mutually beneficial interactions within the overall support system.

What follows is a list of the major evaluation activities:

- We conducted annual district-level "landscape" interviews with key district administrators to learn about the state of the district. Our purpose was to learn about the ever changing backdrop of the district's academic priorities, political and financial pressures, and public agendas so that we could situate the USP within the district setting.
- Annually we administered a "School Profile" survey to all participating schools in the USP, which we then analyzed and reported data back to the USP. The Portland USP School Profile is based on a framework expressly designed to track change over time in key dimensions of systemic K-12 mathematics and science reform that we at Inverness Research Associates have used with many other systemic initiatives.[2] The key dimensions of the School Profile map well onto the NSF drivers.
- We conducted on-site interviews with participating school principals and school-level leadership teams. (September, 2003 and May, 2005)
- We conducted classroom observations of math and science teaching at selected schools. (January, 2004)
- We conducted in-depth interviews with math and science Teachers on Special Assignment. (Summer, 2005)
- We conducted in-depth interviews with math and science Teacher Facilitators from the Cohort One schools. (October, 2005)

[2] See www.inverness-research.org for a fuller description of the framework and for other NSF-funded projects for which we have used similar frameworks.

- We conducted interviews with classroom teachers from the Cohort One schools to assess the influence of the professional supports they received from the USP on their math/science instruction. (April, 2006)

This Report

The purpose of this final report which culminates our five years of study of the Portland Urban Systemic Program is two-fold.

First and foremost, the report provides an explication of the internal logic or "theory of action" around which the Portland USP leaders conceived and designed their work. Through our twenty years of experience evaluating systemic improvement efforts across the country, we have found that when a project has a well-articulated theory of action – one based on previous lessons learned, an understanding of local contexts and constraints, and overall sound thinking – and when there is a high level of congruence between the theory of action and the design and the implementation, the likelihood of sustained success is high. Therefore we have come to believe that understanding "the why" of any improvement program is just as, or even more instructive than understanding "the what" of the program.

A second purpose of this report is to describe specific accomplishments and outcomes accrued by the Portland USP. We have organized this discussion around six "cornerstone claims" we believe the Portland USP can legitimately make about the efficacy of their work. These six assertions about the results of the USP effort follow the same logic on which the project's theory of action was based. Taken together and sequentially, the claims or assertions we describe help build "a case," grounded in the evidence we have gathered, for the benefits of and the continued investment in Portland's mathematics and science improvement effort.

Our report is organized in the following way:

Part One: Introduction

We introduce the Portland USP, the National Science Foundation's Urban Systemic Program initiative, Inverness Research Associates, and the purposes and organization of this report.

Part Two: The Portland USP

We explicate the theory of action of the Portland USP and provide a brief description of the major components and activities that comprised the program.

Part Three: The Six Cornerstone Claims

This section stands as the body of the report. It is organized around each of the six cornerstone claims we feel the USP is justified in making based on our evidence of the efficacy of its work. The discussion of each claim includes three sub-sections: 1) the rationale for the project's focus on the dimension from which the claim stems; 2) an account of our findings and our evidence for the claim; 3) a summary of the significance of the findings.

Part Four: Conclusion

In this final section of the report we step back to view the overall capacity building of the Portland Urban Systemic Program over time. We conclude with our own thinking about the value and significance of the project.

PART TWO:

THE PORTLAND USP

Although the National Science Foundation set broad guidelines for participation in the USP initiative, one of the goals of the USP was to support urban districts in developing systemic supports for mathematics and science reform locally and indigenously. The NSF expected districts to develop their individual Urban Systemic Programs by assessing the opportunities and constraints provided by their own locales, and to formulate a program design and rationale based in and responsive to their particular contextual landscape.

The Contextual Landscape

In Portland the theory of action was based on a consideration of previous math and science reform work, the (then) current state of instruction in those areas, and local assets the district had, as well as particular constraints it faced. A thumbnail sketch of the environment that molded the theory of action includes the following key features.

- Historically in Portland Public Schools (PPS), as in the majority of large urban districts, the neediest students in math and science were concentrated in a distinct geographical area. They were served by a feeder pattern of schools all of which were viewed traditionally and stereotypically in the city as low status, low achieving schools.
- Another key feature was that a few years prior to the launch of the USP, the district had adopted challenging, standards-based curriculum K-5 in mathematics and science, as well as in mathematics 6-8. However, not surprisingly, the schools that took the lead in the implementation of the new curriculum were not for the most part the poorest and lowest achieving schools. In high school math and science, and in middle school science curriculum there was no district-wide adopted curriculum. Rather it was left to individual classroom teachers to define and organize.
- Financially Portland Public schools had suffered a decade or more of dwindling funding, forcing the district to cut back on professional supports for teachers, as well as to pare away at central office staff, in particular its curriculum and instruction department.
- Finally, the district enjoyed a very stable, very strong veteran teaching force, as well as long-standing and widespread community commitment to the public schools. However a string of superintendents and upper level district administrators over several years prior to the USP had created a nagging absence of unifying vision, strong instructional leadership and policy coherency in the district.

The Theory of Action of the Portland USP and the Major Program Components

Based on the contextual landscape features that existed in the public schools and in the city of Portland, the math and science leadership team developed a theory of action that served as the basis of the USP design. Below we briefly describe the key points in this theory of action, including a listing of the major program components that stemmed from the logic of the initiative.

1) The Portland USP focuses on the neediest schools to close the "gap" in math and science achievement between upper SES students and often minority, low SES students.

- The first cohort of USP schools was comprised of the highest needs schools in Portland. It was the deliberate intention of the USP that these schools benefit from the greatest intensity of the effort and from the longest participation in the program.
- As USP schools and teachers gained familiarity and expertise with the fundamentals of standards-based curriculum, and began to probe more deeply into instructional issues surrounding math/science education for high needs students, the USP provided them with intensive equity training.

2) Improved instruction in math and science is the key to "closing the gap." All students need a steady diet of high quality lessons in order to increase their math and science knowledge and skills

- The primary focus of the Portland USP was instructional improvement. It served as a guiding principle to the USP so that events, activities and other components of the effort were designed, both individually and in concert with one another, to achieve this aim.

3) High quality lessons, in turn, are dependent on multiple and simultaneously occurring capacities in well-defined critical dimensions.

4) Therefore in order to continuously maintain <u>and</u> increase the capacity to deliver good lessons in math and science to its students, it is necessary that the district actively provide support in the following dimensions:

a) Creating mechanisms and processes through which <u>teachers can develop leadership capacity</u> and assume leadership roles both at the school and district level

- At the district level Teachers on Special Assignment (TOSAs) were identified and selected from the ranks of expert teachers. Specially funded by the USP the TOSA position was developed not only to provide direct services to schools, but also to provide professional development and resources centrally. With the establishment of the TOSAs the USP also deliberately aimed to create a multi-leveled, highly interactive teacher leader cadre in the district.
- The USP designated one or two teachers in every participating USP schools as a Teacher Facilitator.
- Teacher Facilitators at each school were individually coached, monitored and mentored as leaders by Teachers on Special Assignment.
- Teacher Facilitators received specific training about leadership and facilitation, especially at the beginning of the USP but also throughout the duration of the project during monthly meetings.

b) Creating school climates and cultures characterized by collective responsibility for instructional improvement and collegial working relationships among teachers

- Teacher Facilitators received specific training on how to facilitate meetings and conversations among teachers that would lead to more collegial interactions focused on instructional issues in math/science.
- The project provided Teacher Facilitators with specially designed tools and structures that helped promote collegial relationships among teaching staff members.
- The USP deliberately "bought time" for teachers at participating schools so that they could meet to discuss instructional issues, thereby initiating and promoting a process of collegial problem solving.

c) Creating mechanisms and processes for furthering the full and consistent implementation of high-quality, standards-based curriculum

- The district provided curriculum materials to all teachers, and created mechanisms for their refurbishment.
- The district with support from the USP provided basic training to teachers in the use of adopted curriculum.
- The district with support from the USP developed a range of support materials for teachers such as assessments, pacing guides and other materials to advance the classroom implementation of the curriculum.
- Teacher Facilitators at each of the participating USP schools were trained to facilitate teachers at their schools in the analysis of students' state assessment test data, as well as in the examination of classroom assessments to further the improvement of instruction and the implementation of the curriculum.
- TOSAs were assigned to the USP schools to serve as coaches and resources to support classroom teachers' implementation of the curriculum.
- At the grade levels in which there were no formally adopted materials the district provided specially created documents and tools to classroom teachers to support their instructional choices.

d) Creating ongoing professional activities and processes offered centrally, but customized locally to meet the idiosyncratic, developmental needs of the teachers and students at each school

- The USP deliberately provided all the TOSAs and Teacher Facilitators with a range of professional experiences and tools. They were charged with selecting the most appropriate to use at their own local school site to further the goals of the USP.

e) Creating mechanisms for soliciting and maintaining the active commitment, <u>support and participation of the community</u> at large

- The USP developed tools and process for schools to inform parents about math/science improvement and to solicit their support, the most important of which were Math and/or Science Family Nights.
- The USP designated a fulltime TOSA whose chief responsibility was to serve as a liaison to the Portland community and community organizations, and to support teachers at the schools in conducting their own Math/Science Family Nights.

5) Thus, the Portland USP will be able to establish an infrastructure for supporting math and science education. This improvement infrastructure will be the primary legacy of the USP and will position the district to be able to sustain a process of continuously bettering instruction in math and science.

PART THREE:

THE SIX CORNERSTONE CLAIMS

After studying the Portland Urban Systemic Program the last five years, the evidence we at Inverness Research Associates gathered about the USP's theory of action enables us to make a series of claims on behalf of the Portland USP. In the following section of the report we describe each of the six claims we feel confident the USP can legitimately make about the quality and qualities of the accomplishments the project has achieved. Each description includes an elaboration of the claim, where we refer back to the USP's theory of action and rationale. We then continue with a detailed account of our findings and the evidence that corroborates them. Finally we conclude the description of each claim with brief summary thoughts.

CLAIM #1 – TEACHER LEADERSHIP PROVIDED DISTRICT CAPACITY FOR MATH AND SCIENCE IMPROVEMENT

The Portland USP empowered individual teachers at their school sites to provide leadership for ongoing math and science instruction improvement. As a result the USP developed a strong cadre of school-based Teacher Facilitators, supported by Teachers on Special Assignment. Together they spearheaded and broadened the math and science improvement effort, and increased the districts' overall teacher leadership capacity.

The Rationale for the USP Focus on the Development of Teacher Leadership

A major thrust of the Portland USP effort was to develop indigenous teacher leadership at all levels of the system but most especially at the school sites. The rationale for the focus on teacher leadership development included three key ideas. First, in any large urban school system upper level district leaders come and go, as do their political agendas, strategic plans, and their organizational changes. In order for a sustained focus on mathematics and science improvement to survive such policy and personnel churn in their district, the leaders of the Portland USP reasoned that the demand, commitment and expertise necessary for improving math and science instruction must reside at the local school level in the hands of the people who are most involved, namely teachers. Teachers would have to serve as agents of change. Second, given the strength of Portland's long-standing, self-reliant teacher culture, a top-down change initiative would have been likely to fail. Instead the USP leaders chose a path of individual teacher empowerment and collaborative leadership. And third, Portland Public Schools, like any other urban district, did not have sufficient resources to provide centrally the kind of intensive, long-term supports necessary for meaningful instructional improvement to occur at every school. Only teachers themselves could develop the knowledge and tools such an effort required.

In order to develop teacher leadership capacity throughout the district the USP aimed to create a robust community of teacher leaders. The two key groups within the community were intended to be the Teacher Facilitators at each of the participating USP schools, and the 17 Teachers on Special Assignment (TOSAs). The community was intended to support individual teacher leaders in multiple ways and venues; and, as a whole, to become a self-sustaining source of learning and leadership in the service of math and science improvement throughout the district.

The Findings and Our Evidence

FINDING: The Portland USP succeeded in its goal. It has dramatically expanded the district's teacher leadership capacity by creating a cadre of active Teacher Facilitators and expanding a group of TOSAs of the highest quality. Taken together they functioned as a network, where learning was disseminated and shared, and leadership was further cultivated and supported. The end result was the current existence of a multi-tiered learning community of leading teachers that provides critical capacity to improve math and science education throughout the district.

- First and foremost we cite our own experiences and observations in Portland as important evidence for the existence of a robust teacher leadership capacity that has been successfully developed by the USP since 2002. Data from more objective sources, such as the School Profiles, were corroborated by contrasting and comparing what we saw and heard early in the project with what we see and hear today. For example, in the spring of 2006 as we write this report: 1) it is easy to identify teacher leaders at each of the participating school sites; 2) interviewing these teachers leaders yields rich, consistent information across schools about the work of the USP and its benefits; 3) we hear unwaveringly positive accounts about the roles and value of the TOSAs to the improvement effort; these accounts come from USP participants across the spectrum – from classroom teachers, to Teacher Facilitators, to principals, to district administrators; 4) individually TOSAs, whose number has doubled under the USP, are among the most thoughtful, articulate and intelligent resource teachers we have interviewed in over 20 years of studying educational reform; 5) and finally, as we listen to Portland USP teacher leaders including both TOSAs and Facilitators we hear them speak about similar goals and issues in their district's math and science improvement effort, using common ideas, language and terms which we have found to be a good indicator of the presence of a strong professional community's discourse.

- According to our analysis of Cohort One School Profile data we have collected each year, active, indigenous leadership at the school level continued to grow over the course of the initiative. Consistently, in the final three years of the profile data, more than 80% of the participating schools report having an active leadership group dedicated to supporting improvement in math and science that meets 10 to 12 times a year. Increasingly, these leadership groups engage in the following practices:

    - Support, promote, and advocate for Standards-Based Math and Science (SBMS) in both formal and informal ways (from 62% in 2002 to 81% in 2005)
    - Serve as formal or informal resources to other teachers in promoting SBMS (from 27% in 2002 to 80% in 2005)

- Provide workshops or more formal presentations in the area of SBMS (from 21% in 2002, to 42% in 2005)
- Gather, organize and/or maintain materials for SBMS (from 46% in 2002, to 72% in 2005)

FINDING: The USP developed a cadre of very active, and increasingly knowledgeable and skilled Teacher Facilitators. At least one, and often two functioned at each of the participating USP schools, performing a large range of tasks and activities, thereby creating a school-based pool of teacher leadership capacity that did not exist in the district five years ago.

- From our interviews with Teacher Facilitators in the fall of 2005 we learned that they served in many critical roles and conducted dozens of activities to support math and science improvement in their schools. They did real, hard work at their schools in service of the USP goals.

  - All of the Teacher Facilitators with whom we spoke facilitated monthly meetings at their schools focused on math and/or science instruction.
  - Almost all worked closely with their principal and a TOSA to plan and organize these meetings effectively.
  - Almost all had employed USP-developed tools and protocols to promote cooperation, collegiality and collaboration among teachers on their school staff.
  - Almost all had provided a structure for looking at all student achievement through disaggregated data analysis of student tests.
  - Almost all had supported and achieved aligning math and/or science curriculum both horizontally and vertically at their school.
  - Almost all of the Teacher Facilitators had served as key disseminators of information about math/science teaching strategies, curriculum, professional development, resources, materials, etc., at their schools.
  - Almost all the Teacher Facilitators helped organize and support a Math/Science Fair for parents and local community members at their schools.
  - Many of the Teacher Facilitators modeled lessons for their teaching peers.
  - Many also helped organize and support professional development on equity topics for their staffs.

- The great majority of Teacher Facilitators we interviewed felt that through slow, steady work over five years they had successfully created more collegial and collaborative working conditions in their schools, thereby expanding the leadership of their fellow teachers.

  - Over half of the TFs reported the following scenario to us: In the beginning of the USP the TFs focused their efforts primarily on facilitating the monthly staff meetings. However, over time, a natural evolution toward more inclusion occurred, and other teachers became increasingly involved in the process. Staff meetings became more of a shared responsibility at many of the schools, thus significantly, according to the TFs, broadening the teacher leadership base in their buildings.

<u>FINDING</u>: Through five years of participation in the USP effort Teacher Facilitators enhanced their individual leadership skills and their sense of professionalism, thereby increasing the quality and depth of the overall Teacher Facilitator leadership capacity pool.

- Teacher Facilitators were carefully selected by the USP. Prospective TFs were chosen because they were effective classroom teachers, and because they were respected by their colleagues at their school site. Important requirements for becoming a Facilitator were recommendations not only from the school principal, but also from classroom teacher peers. Thus already capable teachers were targeted to increase their expertise and their leadership skills.

- The attrition rate for Teacher Facilitators was small. The majority of Teacher Facilitators who began work with the USP in 2002 remained through all five years of the initiative, thereby steadily accruing ever greater knowledge and skills.

- As a result the Teacher Facilitators benefited in a great range of both personal and professional ways from their USP service as leaders. They became more capable professional educators, capable of making increasingly significant contributions to their peers and students.

    - Teacher Facilitators learned how to function as leaders and their confidence in their own leadership abilities was greatly enhanced, as the following elementary teacher explained to us: *I learned that what I do makes a difference… I used to sit back because I was afraid of what other people would say.*
    - Several Teacher Facilitators told us that one of the benefits of their USP leadership experience was that it allowed them to become better teachers of math/science, giving them greater confidence in their teaching practice. The following is a small sample of quotes from our interviews: *I've become better at my practice because I've had time to look at what I do and why. It has made me a better teacher because of collaborating with other people, I feel like my own practice has been improved. My confidence that what I do makes a difference has improved.*
    - Those who had been teaching a long time often felt rejuvenated in their careers, as this high school veteran of 38 years told us: *I think the biggest benefit of the USP work is that it gave me something to work at, it keeps you going, re-motivates you, re-inspires you – it's kind of a fresh start. Personally, that is what it meant to me, just the chance to become involved in something like that again after spending so many years of just being a person in the math department that goes and teaches classes.*
    - Several Teacher Facilitators who were just beginning their careers felt supported and successful in taking on leadership roles with their more senior peers.

- In particular, serving in the Teacher Facilitator role broadened the horizons of the participating teachers. Fulfilling the role of a Facilitator and participating in the teacher leader community opened the doors of the classrooms in which they had been isolated. Under aegis of their USP work they conversed with other teachers in their own school and visited their classrooms; they worked shoulder to shoulder with their principal; they met teachers across the district, learning about different schools and classrooms, and hearing new ideas; they gained a district-wide perspective on curriculum improvement; and they often participated in professional experiences led by national-level experts in their field.

- From our interviews with Teacher Facilitators we learned that many provided support and leadership, not only at their school level, but they also began to participate in district-wide endeavors. For example, a science TF reported that he was involved with rewriting the district science standards. In mathematics there were two TFs who piloted new mathematics curricula to assist with the adoption process to choose a new mathematics textbook at the high school level.

<u>FINDING</u>: The Portland USP also successfully expanded the overall pool of district TOSAs, and strengthened and specialized their individual roles, thereby creating a cadre of the highest quality teacher leaders in mathematics and science. The USP TOSAs served as key links between the Teacher Facilitators, their schools and the central program, helping to conduit enthusiasm, information, resources, and ideas throughout the growing teacher-led improvement community.

- The Portland USP began its expansion of the district TOSA cadre with a very strong foundation, a core group of already very accomplished and experienced Teachers on Special Assignment. Each of them was highly skilled and knowledgeable in their field, with well-established connections not only in their own district but at the state and national level.

- Significantly, the TOSA position was a long-standing tradition in the district. For many years teachers and principals alike had known and established strong working relationships with the most veteran TOSAs. They were universally respected and valued, especially by the classroom teachers because the TOSAs were teachers too.

- Working thus from an already very strong base of capacity, the USP was able to ensure that new TOSAs were quickly incorporated into a high-level professional culture, and were readily available to serve in their new roles. Moreover each individual had an established history within the district as an effective math and/or science educator, and each was selected as a new USP TOSA for their ability and interest in working collaboratively and sharing their knowledge with other adults. Thus the overall pool of TOSAs expanded under the aegis of the USP was extremely strong.

- The Portland TOSAs served as the face of the math/science improvement effort. They were the primary source of new knowledge, ideas, skills and support. Specialized by their subject matter and grade level, they were assigned to particular schools for the duration of the grant. Therefore they were able to establish long-term, cumulatively-building relationships with principals, the Teacher Facilitator(s) and classroom teachers at their assigned school sites.

    - The TOSAs were highly valued at the school sites for their leadership and support. More than 95% of the Teacher Facilitators for each of the last three years of the USP judged the TOSAs to be actively supportive of their school level improvement efforts.
    - We learned from our interviews with Teacher Facilitators at the USP schools that the TOSAs performed a long, long list of services at the schools including but not limited to the following:
        -attended and facilitated staff meetings: *"…If I needed help modeling a protocol the TOSA would come out to our school. Or when we were looking at student work it was easier to let the TOSA take the lead and have it come from someone else so that I could be a member of the group."*
        -provided training with various protocols
        -helped to organize and implement math and science fairs

-obtained textbooks, materials and supplies for teachers
-helped staffs examine a range of data together, including student work
-helped with standardized testing
-modeled lessons: "…*A TOSA came out to do an inquiry lesson in the life sciences for professional development for my staff. He brought a bunch of plants and took a lesson from the textbook and turned it into inquiry."*

- In particular the Teacher Facilitators attribute much of their own leadership growth as well the increased confidence in math and/or science to their relationship with their TOSA. The TOSAs provided individualized, intensive and responsive support to the Facilitators at their assigned schools. They served almost as personal trainers – coaching, answering questions, problem solving, and commiserating.

- Learning was reciprocal, especially for the newer TOSAs. When we interviewed the Portland TOSAs they described how their own professional learning and overall capacity was enhanced by their work with the USP schools. They learned about math and science teaching from the Facilitators and other teachers in their assigned schools; by presenting material to others they learned it in new and deeper ways; and by interacting with multiple levels of their school system they gained perspectives and knowledge they had not previously had. In this way, through working for the USP, their own leadership growth was expanded.

FINDING: A major reason for the success of the Portland USP in creating more and better indigenous teacher leadership capacity throughout the district was because of thoughtful and purposeful "engineering" of how to direct its resources. The USP did not work through simple decree or a hope – but rather, the project deliberately provided potential teacher leaders with carefully designed professional development, coaching, tools and a supportive ongoing learning community.

- The selection of both the Teacher Facilitators and the TOSAs was deliberate and rigorous. Although principals ultimately selected the TFs, the process included recommendations from peers and consultation with the TOSAs. Each Facilitator had to show the ability to work well with their colleagues. In turn the new USP TOSAs were selected from the very best teachers in the district.

  - Our interviews with TFs, TOSAs and principals all corroborate how the selection process occurred.

- The Portland USP deliberately engineered redundant supports for the Teacher Facilitators. These included: 1) the support from their TOSA, who offered customized assistance over the duration of the grant; 2) support from centralized professional development activities; and, 3) as the USP grew and progressed TFs increasingly called on one another as members of their professional network for support and resources. What contributed to the effectiveness of these major strands of support was how readily and naturally they interacted with one another, creating a high degree of iterative, reciprocal and mutually beneficial exchange.

- The TOSAs were the chief supports to the Teacher Facilitators, and their job was deliberately designed to enable the TFs to succeed in their leadership roles. As we have mentioned the TOSA served as a coach, bringing to each TF a customized set of supports. The TOSA had much to offer and to share with the TF: years of teaching experience;

exemplary content knowledge; knowledge of change and change strategies; knowledge of school and district administrative rules and procedures; knowledge of current educational research and its implication for instructional improvement; and an expanded set of relationships from both the Portland Public Schools and national leadership circles.

While retaining their teacher (as partner) status, the TOSAs also brought with them the "authority" of their position and respected reputation which they could use in behalf of the TFs. They also brought a sense of mission and strong vision for math and science education improvement, in this way serving as a constant source of inspiration. And perhaps most importantly, through their own person, the TOSAs served as vivid models of teacher leadership.

- The USP asked Teacher Facilitators to re-conceptualize their ideas about leadership, but it did not leave the TFs to find their own way in new territory. Rather, as we have previously mentioned, they were given specific training in leadership and collegial relationship-building. They were taught to have the difficult conversations with their colleagues that necessarily accompany any math or science change effort. In particular they learned to use student data to ground those conversations in fact rather than opinion and anecdote. The goal was to let the data and rich discussions speaking for themselves – thereby motivating the need for change.

Summary Thoughts

In our view, the Portland USP can readily claim success with developing greater teacher leadership capacity for math and science education improvement in their district. Their theory of action – of how to achieve increased capacity – was sound. First they focused on creating change "from the bottom up," instead of from the top down. The USP also sought to make lasting changes to teachers' beliefs, recognizing that ultimately the individual is the unit of change. Changes that reside within the individual teacher, that is – their ways of thinking and teaching and learning vis-à-vis math and science education – are, therefore, lasting legacies. Schools come and go, and staffs and principals and reform foci also shift frequently in large urban districts. Given that reality, seeking to create changes from the bottom up, and individual-to-individual, are strategies that promise a greater likelihood of sustainability. Also when robust vision, commitment and skills reside locally at the school level, the work of improvement in math and science is more likely to continue in spite of district change. Finally it is important to point out that teacher leadership capacity does not disappear. It is a renewable resource, a district-wide (though often invisible) asset that can be harnessed and directed for worthy purposes. The development of indigenous teacher leadership is, therefore a wise, ecological model for improvement.

CLAIM #2 – COLLEGIAL CULTURE AT SCHOOL SITES SUPPORTED INSTRUCTIONAL IMPROVEMENT IN MATH AND SCIENCE

The Portland USP promoted a collegial culture and collaborative working relationships at the target schools in order to improve math and science education. As teachers at schools established and practiced learning how best to improve instruction through collegial, collaborative processes the likelihood of student accomplishment in math and science increased.

The Rationale for the USP Focus on the Development of Collegial Cultures for Learning

There were multiple, converging reasons for the Portland USP to invest heavily in the development of collegial relationships and collaborative leadership at school sites. First, the project drew on research evidence suggesting that in schools where student learning increases and where achievement gaps decrease, teachers work together systematically to improve instruction (Talbert and McLaughlin, 1993, 1999; Rosenholtz, 1989; Lewis, 1996).[3] Second, because of the nature of the teaching force in Portland – characterized by low teacher turnover and largely veteran teachers that had spent their careers together and had learned to rely on one another during times of adversity in the district – good will among teachers was an asset on which even greater collaboration at school sites could be built. Many years of working together for reform, "in the crawl space," as one TOSA citing Bob Moses of The Algebra Project described, had prepared teachers to work together to take responsibility for their schools and classrooms. Third, there was an understanding in Portland that in order to improve mathematics and science education it was necessary first to dispel the "culture of fear" commonly associated with those subjects in our country, and that so often short-circuits the teaching and learning experience. Finally, because as the project leaders reasoned, the overall goal of the USP was to create ongoing school learning communities where focus on math and science improvement was central, establishing stronger collegial, collaborative school cultures was a necessary first step.

Our Findings and the Evidence

<u>FINDING</u>: Our evidence from multiple data sources converges on the finding that in the great majority of the Portland USP target schools, working relationships and school culture did in fact become more open and collaborative. The shift in schools toward collegial, shared responsibility for mathematics and science education enabled schools to work toward USP goals more readily, efficiently, and meaningfully. In particular, in the schools where the USP was most successful, teachers credit the fact that they are now working collegially with others for their successes.

[3] Portland Urban Systemic Program in Science and Mathematics, 2004-2005 Annual Report to NSF, p. 7.

- Again we site our own experiences and observations from the best-case target schools we visited. In these schools classroom teachers, Teacher Facilitators, the building principal, and the assigned TOSA all relayed similar stories. They described, with confidence, the same process of improvement at the school, recounting the same "ups and downs," the same accomplishments, and the same next steps. Everyone was well-acquainted with the goals and processes of their USP work.

- The school profile data for the USP Gold Schools (those that were the first to join the USP effort) indicated a strong positive trajectory regarding the growth of collegial leadership at the school level. For example, when Teacher Facilitators were asked about the extent to which there was clear vision and shared expectation among the school community about focusing on standards-based math and science teaching and learning, the percentage of respondents indicating that "there is a clear vision of SBMS teaching which is widely shared throughout the school" went from 19% in 2002, to 35% in 2003, to 58% in 2004, and 62% in 2005. The overwhelming majority in the last three years the profile were completed also reported that their school engaged in a whole-school, collective decision when choosing what math and science were to be taught.

- In our interviews with the Portland TOSAs we heard many reports about the growth of collegial, cooperative relationships at the USP schools in which they worked. The following is one illustration among many, in this case provided by a middle school TOSA. He prefaced his description in the following way:

  I think you need teachers working together that share a common vision for the school. Traditionally, for as long as I can remember, we taught in isolation. We would meet once a month for our department meetings, but the actual teaching occurred in isolation. We didn't talk about practice. We didn't talk about student performance, we didn't talk about achievement, and we didn't talk about common curriculum. We were separate entities within our domain. So truly kids weren't receiving the same instruction. So what has happened is that teachers need to form a shared vision about what it is that you want to do and how you are going to address that, and then we all have to attack it in the same way…

  The TOSA told us that Middle School "Y" served as an example of a school with an established collegial culture. There were several different programs within this middle school – for example, a Japanese immersion school and four self-contained classrooms – that one would think would inhibit teachers working together. However, that proved not to be the case. The collaborative culture grew strong.

  Where you would think these programs would have built up walls between them, they haven't. Teachers continually talk to each other, work with each other, and learn from each other so that everyone does well. The principal is a very strong leader who also listens to individuals and seems to have a good relationship with nearly everyone on the staff. The trust is complete here – between teachers, between teachers and principal, between teachers and students and students and teachers, and between parents and community and the school staff.

<u>FINDING</u>: The Portland USP deliberately and successfully helped schools "engineer" the growth and development of collaborative, collegial school environments. As with the development of teacher leadership, the development of collegiality was not left to chance. The USP set the tone, and provided necessary strategies, tools and coaching support. In other words, the USP created an infrastructure to support schools in creating collegiality.

- The "engineering" for collaboration that took place in Portland was based on a set of core, philosophical principles which shaped the design of the activities and processes the USP offered target schools, and created the same coherent message across the district and from year to year. Four of the most paramount were as follows. First was the design principle of invitation. The entire USP effort occurred in a context of invitation, not top-down mandate or coercion. Schools and teachers were invited to participate in the improvement effort. Second, constructivist ideas of how adults and students learn under-girded designs. The USP was not a lock-step march; it did not use a one size fits all approach. Rather, supports to schools and Teacher Facilitators were flexible and responsive, deliberately geared to varying "developmental levels." A third design principle was one of egalitarianism that permeated the ways in which the USP worked. The USP leaders sought to avoid hierarchical relationships, instead sharing and equalizing knowledge, decision-making and responsibility for students' math and science achievement. Deliberately TOSAs remained teachers on special assignment, and TFs were facilitators not leaders. A final important principle was inquiry. The USP endeavored to promote reflection and inquiry throughout all aspects of its work.

- The USP leadership team not only advocated and engineered cooperative, collegial working relationships but also sought to model them. They made an authentic attempt to "walk the walk, not just talk the talk." For example, the math and science TOSAs formed a strong partnership with one another. While they were assigned specific schools, they all helped each other, working at each other's schools when needed. As one TOSA explained: "Each TOSA worked towards establishing more intimate or interactive relationships with a set of schools. And then of course if a school needed something that was someone else's expertise, then we knew to dish it off or incorporate those things in it. It was a more collaborative model for us."

- A key to the success of establishing collegial cultures at the USP target schools was that the Portland USP devoted time and resources to tools and strategies for developing collegial culture. They made a concerted effort to seek out and then share well-designed processes and activities for promoting cooperative learning and inquiry. These strategies were often developmental in nature; that is, they were deliberately flexible, and open to various levels of use, becoming increasingly sophisticated as collaborating groups of teachers evolved. Strategies mentioned most frequently as especially useful in creating collegiality by the Teacher Facilitators were: 1) Linda Foreman's "protocols;" 2) structured ways of looking at student data that was school-specific; 3) grade level articulation conversations; 4) examining standards as a group; and 5) focusing on establishing curriculum.

- Finally, the USP provided mechanisms and funding that gave teachers time to meet and collaborate, often for the first time according to many of the Teacher Facilitators we interviewed. As one TOSA explained: "Because teachers tend to be in isolation, especially in high school, often times you don't have many opportunities for group interactions and so this provided opportunities for teacher time, for teachers to meet, to talk, to collaborate, to work together and that is something that literally I hadn't seen in over 30 years as a

classroom teacher." Moreover, as the benefits of having real time to work together emerged, schools on their own made efforts to schedule face to face time. Time became a resource they learned to tap.

FINDING: The Portland USP successfully extended its collegial culture to the parent community. Almost every USP school, including many high schools, held Family Math and/or Science Nights, and almost universally met with overwhelming success. These successes were particularly significant in schools that had previously faced challenges involving parent and community members.

- The USP again, rather than leaving things to chance, engineered mechanisms to reach out to the parent community. It provided an infrastructure for supporting schools that included the designation of a full-time TOSA. The TOSA specialized in community relationships as well as the organization and implementation of Math and Science Family Nights. She provided technical assistance and moral support to Teacher Facilitators who launched Family Nights at their schools.

FINDING: In the schools where a collegial culture was not developed the reasons for failure varied, but often involved a lack of principal leadership.

- We learned from our TOSA and Teacher Facilitator interviews that the reasons for the failure of the growth of collegiality at some of the USP schools was sometimes due to the fact that some staffs as a whole simply did not embrace the idea or see the real need for collaborative leadership. Some TOSAs, especially those working with high schools, spoke of older teachers who simply were not willing to change. Others spoke of staffs where the faculty simply "didn't get it," so the school dropped out.

- Other reform agendas "pushed out" the USP effort to develop collegiality, especially at the high school level where the small schools initiative was occurring.

- In other situations, the principal leadership was the weak link. Generally by not actively supporting the USP work or by simply being unaware of the purpose and parameters of the effort, the principal did not lend active support.

    - According to our School Profile data, Gold Schools experienced a growth in principal support at the outset of the grant that peaked in Year 3 and quickly returned to Year 1 levels thereafter.
    - In our interviews with project leaders and TOSAs when we asked them to reflect on what factors were critical to the establishment of collegial school cultures, almost all of them agreed that overall, the USP could have done more work with principals to, first, bring them on board, and second, to educate them about how to provide ongoing support to their TFs and teachers.

Summary Thoughts

According to one of the Portland USP TOSAs, "One of the major goals of our USP was to create a professional learning community and to bring everyone to the table… we established protocols and norms that really enhanced school communities on a whole. Today I see staff meetings operating at a different level than they were before, not just in math or science but in general. The USP has raised the level of professionalism." Our data supports this TOSA's views, as well as the larger claim we have just discussed.

As the Portland USP fostered collegial, collaborative school cultures in the service of math and science improvement, individual classroom teachers benefited. Although we did not survey individual classroom teachers we heard much about what happened to the USP teachers from those who worked with them closely – principals, TOSAs, and Teacher Facilitators – with whom our interviews suggest the following range of benefits.

Perhaps the most important benefit was that for many teachers, working collaboratively with their colleagues was a transformational professional experience. Changing ideas of how to work at a school, and understanding the benefits of working together are legacies of the USP that are likely to endure. Learning to work together was a capacity that we were told would last, even as teachers changed classrooms, grade levels and schools. As of the writing of this report several teacher groups are continuing to meet on their own, even though the NSF grant was no longer paying them for their time.

Other benefits of a collegial culture to teachers covered a wide spectrum. Teachers learned a more reflective, critical stance toward their classroom practice. As teachers talked with one another about the teaching of math and science, they opened up and grew less fearful. They created more "open door" sharing of classroom strategies and lessons. They asked for and gave one another help, developing important new and varied sources of support for improving their teaching. In many cases they also developed greater openness to learning new content or subject matter, a key issue in math/science teaching especially at the elementary level. School-wide teachers developed greater clarity around standards and benchmarks. Everyone within a school was on the same page, therefore individual teachers felt more confident that what they were teaching was the right thing to teach. Finally as teachers grew in their own confidence as math and science teachers, they felt more comfortable and more capable of creating classroom environments in which students could and did take more responsibility for their own learning.

CLAIM #3 – PROFESSIONAL SUPPORTS FOR TEACHERS ENABLED THEM TO IMPROVE MATH AND SCIENCE INSTRUCTION

The Portland USP supported classroom teachers through a range of professional supports enabling them to improve the quality of their math and science teaching. In particular the USP developed a group of highly experienced Teachers on Special Assignment (TOSAs) whose knowledge of schools, best practices and subject matter enabled them to customize and deliver professional support to schools and teachers in highly effective ways.

The Rationale for the USP Focus on Professional Supports for Teachers to Improve Math and Science Instruction

Realizing that the classroom teacher's quality of instruction is the single most influential factor on student achievement, the Portland USP invested the majority of its resources in the professional learning of its teachers and the improvement of their teaching practice. Moreover, with strong instructional materials already in place as the USP began its work, math and science teachers in Portland had the opportunity to take the next step, to concentrate on improving their use of the new curriculum. From workshops on how to implement a particular unit, to sessions on student work, the USP engaged teachers and schools in a variety of activities designed to support standards-based math and science teaching and learning. The investment in individuals also made special sense in Portland because of its stable teaching force. Finally it was logical to provide a wide range of flexible and adaptable supports, so that as teachers developed and matured vis-à-vis their math and science teaching, the professional supports could expand and accommodate their growing sophistication.

Our Findings and the Evidence

<u>FINDING</u>: The Portland USP effectively provided teachers with a broad range of professional supports that addressed varying audiences, needs and evolving challenges as the USP effort progressed.

- The following is a partial list and description of the professional development activities and events the Portland USP offered the target schools and their Teacher Facilitators. We have highlighted those that were cited most frequently by TFs and TOSAs.
  - Kick Off Banquet in Downtown Portland – This was a tone-setting event held at the outset of the project. It involved key players from a variety of institutions, including higher education. All project principals and TOSAs were invited to attend. The gathering provided an opportunity for Project Leaders to articulate clearly and publicly their vision for the USP.
  - Teacher Facilitator Retreat – Teacher Facilitators attended a 3-day overnight workshop at the Menuca Retreat Center in the Columbia River Gorge. The meeting was facilitated

by Teachers Development Group. Here, Teacher Facilitators received training and practice related to the kinds of discussions that they would be expected to facilitate back at their school sites. Principals also attended portions of the workshop.

- Summer Institutes – Each summer the USP offered week-long Summer Institutes that include workshops on curriculum and pedagogy for both math and science.
- Lesson Study – The USP developed its own lesson study model. The work started with Middle School Mathematics and has now spread into other areas.
- Book Study – Some elementary schools engaged in a school-wide book study project as part of their USP work for 2005-06. Teachers select and read the text. Teacher facilitators and/or TOSAs facilitate the discussions.
- Developing Mathematical Ideas (DMI) – A small group of elementary schools participated in the DMI training as the centerpiece of their USP work for the 2005-06 school year. Sessions were facilitated by some of the TOSAs who recently received training to become DMI facilitators.
- EMELI (Equity in Mathematics Education Leadership Institute) **–** At the high school level, math and science teams pursued an equity-based strategy for closing the achievement gap. They attended multiple workshops facilitated by Julian Weissglass and the NCEE (National Center for Educational Equity) staff.
- Quarterly District Teacher Facilitator Meetings – TFs met as one large group with TOSAs and the USP leaders. They had opportunities to talk with one another and also received training on various topics, for example, training with Linda Foreman on the use of protocols with which to begin discussions about math and science in their buildings, or, as another example, training on the use of student groups with Ruth Tsu.

<u>FINDING</u>: The professional supports teachers received were valuable to the teachers who received them.

- In one section of the School Profile, Teacher Facilitators were asked to report on the extent to which various factors served as supports or constraints to successful implementation of standards-based reforms in math and science. Each item was rated on a scale of "–5" (major barrier) to "5" (major support). The items and their mean scores for 2002 and 2005 are listed in the table below according to the amount of growth or improvement that was reported over the three-year period.

Factors	2002 Mean	2005 Mean	Status
The time for teachers to work together	-2.1	1.0	*From barrier to support*
The time for teachers to engage in in-service activities	-0.7	2.2	*From barrier to support*
The time available to teachers for planning, setting up, trying out new materials.	-1.9	-0.1	*Decreased barrier*
The availability of workshops and institutes	1.2	3.0	*Improved support*
Overall district policies	1.2	2.8	*Improved support*
The availability of instructional materials for SBMS	1.4	2.8	*Improved support*
The availability of skilled coaches to help teachers implement SBMS in their classrooms	0.6	2.1	*Improved support*
Overall school priorities	1.2	2.5	*Improved support*
Political support from district for SBMS	-0.6	0.7	*From barrier to support*
Political support from the community for SBMS	-0.8	0.5	*From barrier to support*
District testing policies	-0.8	0.5	*From barrier to support*
Teacher attitudes at this school for SBMS	1.5	2.7	*Improved support*
Financial support from the district for SBMS	-0.8	0.4	*From barrier to support*
State testing policies	-1.6	-0.7	*Decreased barrier*
Financial support from the Portland USP for SBMS	2.8	3.4	*Improved support*
Technical support from the Portland USP for SBMS	1.8	2.2	*Improved support*

Note that the results indicate improvement along every factor over the course of the USP. According to Teacher Facilitator ratings, the greatest supports for successful implementation were “the financial support provided by the USP,” followed by “overall district policies,” “the availability of instructional materials,” and “teacher attitudes.” “State testing policies” and “the availability of time for planning, etc.” remained the only barriers reported by the Gold School Teacher Facilitators.

- Another way of viewing the benefits of the professional supports the USP provided the target school teachers is the following. According to the School Profile data, USP Gold Schools experienced increasing levels of professional supports over the course of the USP. Below is a list of the sources and types of support that helped USP teachers:

  - Teacher Facilitator support (from 12% in 2002, to 38% in 2005)
  - Support from district resource people (from 24% in 2002, to 58% in 2005)
  - Other math and science workshops offered by the district (from 31% in 2002, to 50% in 2005)
  - Other workshops offered by universities, museums, etc. (from 0% in 2002, to 19% in 2005)

- Similarly, Teacher Facilitators were asked to indicate the extent to which "the absence of professional supports serves as a barrier to the overall successful development of school-wide SBMS teaching and learning." This figure decreased over the course of the USP, from 35% in 2002, to 8% in 2005.

FINDING: The Portland USP TOSAs effectively supported the professional development of teachers in the service of the implementation of improved instruction in mathematics and science throughout the district.

- Although we have described the roles and activities of the Portland USP TOSAs vis-à-vis their contribution to the growth of teacher leadership capacity in the district (Claim #1), it is also important to understand the critical role they played in making the USP professional development offerings effective. They organized and provided most of the centralized level of professional development. Simultaneously, as we have previously mentioned, they provided individualized technical assistance, coaching and mentoring to the individual target schools. This combination of efforts proved to be key to the efficacy of the USP by creating an important dynamic, a back and forth exchange between the centralized level and the school level. In particular, the TOSA role brought the professional development learnings directly into the schools and classrooms – individualizing, re-enforcing and reaffirming the central messages.

- When we asked Teacher Facilitators, "What were the overall benefits to you and your school of having a TOSA?" they responded in the following ways:

  - They said that student achievement at their schools improved because of their work with the TOSAs. They attributed this to working collegially as a staff which included looking carefully at teacher practice, and analyzing student work and test data. They felt that the professional development the TOSAs had provided had reached beyond the TFs and had impacted the broader teaching staff at the target schools.
  - The Teacher Facilitators credited the TOSAs with bringing new ideas and new materials to the teachers.
  - They felt that the TOSAs had tapped into community and university connections to improve the district as a whole.
  - They also said that the TOSAs had been instrumental in standardizing assessments across the district.
  - Finally, the TOSAs served as an important resource and support to TFs and classroom teachers. Because teachers at school sites often perceived their district as large, bureaucratic and impersonal, the TOSAs offered a welcome human face. Especially with the dismantling of the curriculum departments and because of budget constraints, teachers had no instructional support, nowhere to go with questions or problems regarding curriculum and instruction. With the USP providing the TOSA presence, the TFs said teachers had "someone to go to." A high school teacher facilitator added, "They provided access to the inner workings of the district…" so teachers could get support.

Summary Thoughts

The USP provided a large menu of professional development offerings to participating schools, but because these were coherent, designed along similar philosophical principles and all focused on similar goals, the professional development program was an effective one. Moreover the professional development choices supported school staffs in learning to collectively identify their professional development needs and selecting opportunities that would meet these needs as a group. For example, early implementers of the Investigations curriculum in elementary schools, who were ready for deeper levels of implementation, started taking part in DMI training. At the other end of the spectrum, schools that came late to Investigations or that had experienced a high rate of turnover worked with TOSAs to do more detailed work connected to implementing particular lessons or discussing elements of best practice.

We wish to underscore that the TOSAs served a unique role in making the USP professional development efforts effective. Because the TOSAs were teachers too, they were respected and trusted as peers by classroom teachers. They were listened to. And thus they were able to serve as important bridges between the district and individual schools, helping schools to navigate their own professional development pathways and bringing lessons learned from the school level back to the USP leaders.

CLAIM #4 – A BROAD AND DEEP LEVEL OF CURRICULUM IMPLEMENTATION STRENGTHENED MATH AND SCIENCE EDUCATION FOR STUDENTS

The Portland USP broadened and deepened the level of implementation of standards-based math/science curriculum.

The Rationale for the USP Focus on Improving the Level of Implementation

Typically the implementation phase of any district curriculum adoption is short-lived and superficial, a brief closing chapter that concludes the adoption cycle. In contrast to what usually happens, the leaders of the Portland USP wished to focus their energies on the implementation of standards-based curriculum that had already been adopted in the district. Two years before the advent of the USP they had selected very high-quality curriculum – Investigations in elementary math; a FOSS kit-based program in elementary science; and Connected Math in middle school. Their aim was to move large numbers of classroom teachers beyond initial use toward more masterful teaching of the curriculum. A second goal was to use the hoped-for momentum and successes of this process, to push for adoption of high-quality curriculum in math and science at the other grade level bands.

The rationale for the focus on a deeper, more meaningful implementation included a number of factors. First, although standards-based materials had already been adopted in elementary and middle school math and elementary science, district-wide use of the curriculum was spotty or

cursory. Some schools used the curriculum and others did not; even in schools where many teachers used the curriculum materials, equal numbers frequently did not. For the most part classroom teachers were left on their own to teach math and science as they saw fit, and as they were able. The implementation also suffered from alignment issues. There was little alignment between grade levels. Nor was there alignment between standards, curriculum, instruction and assessment. Prior to the USP grant the district had simply been unable to provide the array of supports teachers and schools needed to implement the curriculum broadly, deeply and universally.

Our Findings and the Evidence

FINDING: According to School Profile data and interviews with TOSAs and Teacher Facilitators the level of curriculum implementation increased in the district because more classroom teachers used the designated curriculum.

- Regarding the extent to which teachers implemented the designated materials, Teacher Facilitators in the USP Gold School estimated that the percentage of teachers who have made SBMS a substantive part of their practice has increased over the course of the USP – from roughly 60% in 2002, to roughly 80% in 2005.

- Gold School Teacher Facilitators also reported growth in the priority that teachers give SBMS – in 2002, 50% reported it being a high priority; in 2004, the figure rose to 77%, and in 2005, it was 71%.

- According the interviews with Teacher Facilitators the level of implementation varied from subject matter (mathematics of science) and grade level:

    - In elementary mathematics the TFs reported that Investigations and Everyday Counts were used regularly and with fidelity. TFs reported that 95-100% of teachers used Investigations, and that the usage of these materials increased over the life of the project.
    - In elementary science TFs also reported that FOSS science kits were used more regularly by classroom teachers, and that teachers in their schools felt more comfortable with the kits.
    - In middle school mathematics TFs reported that Connected Math was used fairly widely.
    - In middle school science TFs reported that more science was taught, and more inquiry-based activities were used in many classrooms; however, implementation was not consistent across the classrooms.
    - In high school mathematics the Discovery series was used by teachers according to TFs. (College Preparatory Math was adopted in the spring of 2006.)
    - In science at the high school level the picture of curriculum implementation was even more mixed than at the middle school level according to TFs. Facilitators reported working on inquiry work samples and common tasks in science, as well as trying to integrate science into other curricular areas. But, they said, there was not consistent usage of common or core materials in science at the high school level.

<u>Finding</u>: There are indications that as the implementation broadened, it also deepened. Classroom teachers improved the quality as well as the quantity of implementation.

- Teacher Facilitators told us that they considered the implementation in math and science, especially at the elementary level, to be deeper than it was before the USP. They cite several reasons for thinking as they did:

  - The USP gave both the teacher leaders (TOSAs and Teacher Facilitators) and the classroom teachers they influenced proven tools with which to make the changes the USP advocated. They "didn't just call for monthly NSF meetings, they taught the skills" that were needed to implement the curriculum well.
  - Teachers had opportunities to visit classrooms K-5 to see how the curriculum spirals through the grade levels. According to many TFs this activity created more real "buy-in," because often for the first time teachers could see firsthand how the curriculum fit together. They were then able to understand the importance of using it with fidelity in order for it to be the most beneficial to students as they progressed through school.
  - The USP leadership did not focus simply on implementation. Rather their view was that an implementation of standards-based curriculum should be in service of student learning. The underlying aim of the implementation was to have students' conceptual understanding "drive the curriculum," not just the adopted materials. As one TOSA explained: "This is a mind set and a philosophy. This isn't just a program, but a philosophy we wanted teachers to embrace. So teachers began to realize that is wasn't so much about the materials per se, but this was within them."

Summary Thoughts

Unlike many curriculum-driven reform efforts we have worked with, the Portland USP did not have to devote its first few years striving to put the curriculum "in place." The initial implementation pre-dated the grant. As a result, the USP was able to concentrate on broadening and deepening the implementation throughout its five-year effort in a way that many projects are rarely able to do even in the final few years, if at all.

As of the writing of this report there are indications that the implementation will continue to broaden and deepen. The new district administration has taken an active role in bringing on the last few schools in the final years of the USP grant. A number of these schools, especially at the elementary level are more affluent ones with long histories of high student achievement scores. The message from the district has been that "good is not good enough," and that these schools, by embracing the USP improvement effort could enhance their students' math and science achievement even more. As we have mentioned, in another development at the high school level, plans are in place for a district-wide implementation of CPM (College Preparatory Mathematics), a more standards-based curriculum than the one that has been used since the beginning of the USP.

While the rate of improvement of the implementation may not have been as rapid as the USP leadership had hoped, we believe that the consistent pattern of implementation successes and positive trajectory are clear across multiple indicators.

CLAIM #5 – THROUGH THE WORK OF THE USP STUDENTS INCREASINGLY RECEIVE A STEADY DIET OF GOOD INSTRUCTION IN MATHEMATICS AND SCIENCE

As a result of the influence of USP supports on classroom teachers, students in the target schools increasingly receive a steady diet of good quality, developmentally appropriate math and science lessons.

The Rationale for the USP Focus on the Importance of Students Receiving a Steady Diet of Good Instruction in Math and Science

This fifth claim is an "outcome claim," based on the efficacy of the preceding four. In other words, as a result of successfully 1) empowering teachers at their own school sites to provide leadership for math and science improvement, 2) creating collegial, collaborative school cultures whereby staffs can work in concert with one another, 3) providing a broad range of professional supports to teachers in service of math and science betterment, and 4) broadening and deepening the implementation of standards-based curriculum, the Portland USP can legitimately claim that students in the district are much likelier to receive a steady diet of good instruction in math and science than they were before the grant. This claim represents the major goal or *raison d'être* of the USP.

Until quite recently, the Portland Public Schools operated under a system of site-based management. Math and/or science instruction varied significantly from school to school, along with the curriculum, assessment and expectations for student performance. The USP brought a much needed systemic approach to improving math and science in the district so that all students would have the same high-quality opportunities to learn.

Our Findings and the Evidence

FINDING: Classroom teachers spent more time teaching math/science, therefore students were more likely to receive a steady diet of instruction.

- School Profile data indicated considerable growth from 2002 to 2005 in the following instructional areas, according to the reports of the Gold School Teacher Facilitators:
  - The amount of time spent on SBMS in the average classroom
  - The number of SBMS topics covered in the average classroom
  - The number of new SBMS topics in the average classroom
  - The amount of SBMS experiences children are having
  - The amount of small group work in the average classroom

FINDING: Classroom teachers increased their ability to provide good math/science lessons, therefore students were more likely to receive steady, good quality instruction.

- As part of the School Profiles, Teacher Facilitators were asked to provide ratings about what an observer might see with respect to the average teachers' ability and inclination to teach SBMS in their school. Below is a list of the indicators and the corresponding % of "high level" ratings reported by Teacher Facilitators in 2002 and 2005. We see a pattern of regular improvement.

Indicator	Percentage Reporting High Rating in 2002	Percentage Reporting High Rating in 2005
The average teacher's ability to provide standards-based learning experiences for their students	58%	85%
The average teacher's ability to use a discovery approach in teaching SBMS	50%	85%
The average teacher's inclination to teach SBMS	50%	73%
The average teacher's enjoyment of teaching SBMS	47%	80%
The average teacher's knowledge of SBMS	74%	92%

- Even more telling, in 2002, only 31% of Gold School Teacher Facilitators judged the SBMS teaching as high quality in their school; by 2005, 67% reported that this was the case.

- Our interviews with Teacher Facilitators confirm the statistical picture of a district in which classroom teachers are increasingly able to provide a steady diet of good quality math and science lessons to their students. TFs reported that teachers told them they felt more confident in their teaching. "Now I understand why I'm teaching what I'm teaching."

- Teacher Facilitators almost unanimously felt that improved collegial relationships at their schools supported improved instruction in the classrooms:

  - Collaboration promoted awareness and a sense of shared purpose among teachers. "Awareness makes all the difference. We help each other."
  - In particular, common, clearly expressed goals for students that were communicated through increased collaboration also helped schools improve their instructional programs in math and science. "We need to have a similar focus and desire for our students and it's important to be able to plan and talk with other teachers looking at the curriculum."
  - Teaching grew more focused and student-centered as a result of collaborative examination of student work.

- Grade level alignment also improved because of collaboration. As one TF explained to us, "Math builds on previous knowledge and seeing how it builds in all the grades is helpful. It's important that everyone is on the same page and using the same vocabulary. The spiraling piece is so important because the math curriculum is built that way. You need the math curriculum K-5 and collaboration has helped decrease the achievement gap."
- Finally, many of the Teacher Facilitators told us that they felt that every teacher had strengths. Therefore, teaching improved when teachers collaborated with one another to openly share their practice. As on TF said: "Talking about different ways of teaching a concept is really healthy." Hearing a variety of strategies and skills from a variety of people improved instruction: "The more teachers you have thinking about how to do something it's going to produce more interesting ways of teaching and make students more engaged." Another elaborated, "Collaboration makes for a richer lesson because you're continually upgrading your lessons and getting feedback

FINDING: The Portland USP actively solicited community and especially parent support for its curriculum implementation.

- 100% of the targeted USP schools had some kind of math/science (or both) Parent Night. The initiative leadership designated a specially focused TOSA devoted to the support of this strand of work alone. The TOSA provided schools with materials and technical assistance for conducting successful parent nights.

Summary Thoughts

A high school science TOSA described the long-term goals of the USP. "Ultimately the goal was to make sure that no matter which school a student attended, they would have the same quality instruction throughout the district. If we were serious about bridging the achievement gap, we needed to make sure that the kids at high needs schools received the same opportunity to be exposed to the same type of instruction as those at more affluent schools." Over five years of the Portland USP a quick "before" and "after" picture shows well the accomplishments of the initiative in providing better and more consistent instruction K-12 in mathematics and science.

For example, in the elementary grades a year or two before the commencement of the USP Investigations had just been adopted in mathematics. At that time there was very little classroom instruction in science because teachers lacked both instructional materials and a vision of what good elementary science teaching might look like. In contrast in the final year of the USP Investigations is fully implemented, and the great majority of elementary schools use a kit-based program to teach science. There is both broader and more consistent instruction in both subject areas, and a greater range of topics is taught. Moreover, because of now many years of consistent usage classroom teachers are becoming very knowledgeable about the designated curriculum. They have progressed from initial to skillful and on to masterful use. Thus a large cadre of teachers with a great deal of experience and expertise in the adopted curriculum exists today that did not five years ago.

The strength of the successes with providing consistent good quality instruction in the elementary grades has "pushed" upward, driving improvement at both the middle school and high school levels. Students who have received a steady diet of good math and science

teaching K-6 naturally do well in those disciplines. Although it was not within the parameters of our evaluation work to track student achievement data, the district itself has, and has reported that student achievement in math and science has increased across the district, but most especially at the elementary level. Consequently, in 2005 there are groups of secondary students in Portland who have received four or five years of good quality instruction in math/science as elementary students. Their presence in upper grades presses the system to respond to their expanding needs.

As a result even in the final year of the USP the district is still working actively to provide an ever better district-wide K-12 math program, focusing on the remaining challenges at the middle and high school levels. For example, the math and science courses required for high school graduation have increased. Students must now take three years of both. Moreover, as we have mentioned, the district has just adopted a new math curriculum at the high school level, CPM, which will provide better consistency across the high schools and more challenging material to students.

CLAIM #6 – THROUGH THE WORK OF THE USP THE DISTRICT HAS PUT IN PLACE AN INFRASTRUCTURE FOR IMPROVEMENT IN MATHEMATICS AND SCIENCE

The Portland USP helped create an "improvement infrastructure" capable of driving and producing continuous systematic improvement in mathematics and science education.

The Rationale for the USP Focus on Creating a Vision and an Improvement Infrastructure for Mathematics and Science

This sixth and final claim we believe the Portland Public Schools can make is also an "outcome claim." Its legitimacy is based on the efficacy of preceding claims. In other words, as a result of building simultaneous capacity in the four key dimensions we have described – teacher leadership, cooperative and collegial culture, professional supports for teachers, and curriculum knowledge and implementation – the USP has established the very strong beginnings of an "improvement infrastructure" designed to support the ongoing improvement of math and science instruction in the district. As an important corollary, the USP effort has also successfully promoted both a vision and an understanding of systemic change throughout the district that have, in turn, served to promote and make cohesive the developing improvement infrastructure.

An infrastructure for improvement serves as a critical element that is often missing in improvement efforts, hindering school districts from making sustainable and on-going changes once special funding ends. In the case of Portland the math and science leadership realized that grant monies come and go. For ongoing and lasting improvement in math and science education in their district a system of self-organizing, self-sustaining structures and mechanisms for the purpose of math/science improvement had to be put in place.

Our Findings and the Evidence

FINDING: The Portland USP effort succeeded in building capacity in four key dimensions necessary for systemic improvement in math and science education: 1) leadership; 2) collegial culture and cooperative working relationships; 3) professional development; and, 4) curriculum implementation. Taken together these capacities helped establish a system of structures and strategies for improvement.

- We have described the work of the USP in each of four dimensions extensively in previous sections of this report. What follows is a brief summary of the key achievements again in order to illustrate how the combination of these capacities worked in concert to create an infrastructure for improvement.

  - In terms of leadership the USP work contributed to the development of a large cadre of Teacher Facilitators (at least one and sometimes two per participating school). In addition, an already highly accomplished core group of TOSAs was expanded by 4 USP TOSAs to make a total of 13. Their function was to provide individual coaching and mentoring to the TFs, and to design and provide centralized professional development in math and science. Finally the two USP directors, also TOSAs, one representing math and the other science, were both very well respected veteran teachers of long standing in the district. Taken together these multiple tiers of teacher leaders evolved into a robust **teacher leadership network** working actively together to improve math and science.
  - As we have noted much of the work of the Teacher Facilitators and the TOSAs who supported them was directed toward creating more **open, cooperative and collegial working relationships** at the target schools. Because they were often successful, the effects of collegiality enabled classroom teachers at school sites to focus on the same educational goals. As teachers at schools individually endeavored to improve their math/science teaching practice, they also forged relationships with other teachers and TOSAs across the district who shared similar aims. In this way collegial habits of mind became the connective tissue between various members of a growing district-wide improvement community.
  - The Portland USP's **professional development** program was not simply a tempting potpourri of offerings, but rather a strategically designed, developmentally sequenced set of professional experiences intended to support the growth of teachers in realizing the goals of the USP. In other words the professional development offered by the USP was well-aligned with the learning objectives of the initiative. For example, in the first years Teacher Facilitators learned leadership and facilitation skills necessary to creating collegiality and communication, and importantly, their first efforts were supervised and coached by the TOSAs. At the same time, classroom teachers could take classes whose aim was to introduce them to the adopted materials and programs, or they could attend summer institutes where offerings extended or expanded on the core curricula. Later, as the needs of schools became more sophisticated, teachers participated in discussions examining student work and test score data led by their TF, or professional experiences focused on mathematical content, group work, lesson study or equity issues.
  - One of the major goals of the Portland USP was to both **broaden and deepen the implementation of standards-based math and science curriculum**. USP leaders wanted more teachers across the district to use the designated curriculum, and they wanted them to use it more effectively. The aim was to have greater numbers of teachers implementing the curriculum, and to simultaneously move increasing numbers

of them beyond initial use toward more masterful teaching of the curriculum. As we have described the Portland USP was largely successful in improving not only the "quantity," but also the "quality" of the implementation.

FINDING: The USP bolstered the district's once modestly staffed math and science curriculum departments, creating a dynamic center of math/science improvement activity able to serve schools throughout the district.

- The USP special funding enabled curriculum leaders in math and science to create a well-staffed, robust facility for professional development and school improvement. The Portland Public Schools' Professional Development Center at Rice became the home to the math and science TOSAs and the USP TOSA directors, where Teacher Facilitators met and where many classes, activities and workshops were held. It developed into the place where math and science resources and expertise were found in the district. In other words, it became the gravitational center for the growing improvement infrastructure for math/science the USP helped create.

FINDING: The USP helped create a strong, well-articulated vision for math and science education. The USP also created a vision for systemic change in the district that became increasingly adopted among a wide spectrum of individuals. In turn, this broadly shared vision of both math/science education and systemic improvement served to promote and make cohesive the developing improvement infrastructure.

- We at Inverness Research Associates have studied dozens of math and science improvement efforts for over two decades. In our experience not one has succeeded without a strong, clear vision that spurs and guides the effort, and that is deliberately increasingly shared among various constituents within a district. In addition, we have also learned that unless the vision is highly supported by a leadership group that includes both those directing the initiative and those at the highest levels of a district's administration it is unlikely to serve as a driving, inspirational force. In Portland just such a vision was created by the USP effort, and was shared by very many. The holders of the visions ranged from the highly supportive new Superintendent to classroom teachers, parents and community members. When a critical mass begins to adhere to similar ideas and goals, as it did in Portland, their commonly held vision acts as an agent for change, lending focus and coherence to the efforts of many.

Summary Thoughts

A high school TOSA described better than we can the effects of the improvement infrastructure for mathematics and science education the USP initiative helped build. He told us, "Everything, and all the specific building responses that I see are results of the big symphony of efforts. It is not a cause-then-effect, or one-on-one relationship. It is that there is a broad range of factors that the USP has been involved in, and over here is the broad range of outcomes. As a result of the multi-faceted efforts that we have been doing since the beginning and revising as we went along, most of our schools are finding success. And that success is reflected in the standardized scores – that is our ultimate proof."

PART FOUR:

CONCLUSION

Through its work over five years, the USP initiated a process of developing and building an "improvement infrastructure" for mathematics and science education in the Portland Public Schools. It was the successful result of concerted and simultaneous efforts to bolster teacher leadership, create collegial and collaborative working relationships, provide high quality and strategically designed professional development, and broaden and deepen the level of curriculum implementation. This improvement infrastructure positions the district to be able to sustain a process of continuously bettering instruction for Portland students in math and science. And it will also stand as the primary legacy of the USP.

Our conclusion to this report is straightforward. Given the relatively small scale of the USP investment, roughly $20 per student per year, it has reaped enormous benefits, leaving behind a host of tangible and intangible assets in the district. To name the most significant these assets are: a well-honed, highly respected and very experienced leadership team for math and science; a district-wide group of teachers and teacher leaders committed to math and science improvement; a cadre of classroom teachers with vastly improved skills and knowledge in math and science teaching, as well as skills and knowledge about how to work together to provide and continuously improve high-quality programs for students; systems and structures organized to deliver and maintain curricular materials; a strategically designed, well-crafted professional development program; a clearly articulated and commonly held vision for high-quality math and science education which lends coherence to efforts for improvement at multiple levels of the system; and finally, the accumulated good will and success of the USP effort which enables people to continue to work hard and with optimism toward their shared goals even in difficult circumstances.

It is, in our opinion, to the best interests of the district to continue to maintain and support the improvement infrastructure the USP has established, to protect the working assets that are now already in place. As with any infrastructure, once dismantled, it is difficult to resurrect. Once dismantled the people who led the creation of the infrastructure, the modes and structures of work that were established, and the habits of mind that were shared are all dispersed. Moreover, what is also lost when infrastructure systems are destroyed is the potential to establish ongoing improvement mechanisms which can strengthen the infrastructure as it does its work, in this case supporting efforts in the district to improve mathematics and science education. Thus the cumulative benefits of a long-term investment are lost. Even though it may appear that taking cost-cutting measures by diminishing or eliminating an established infrastructure are necessary and good, they are short-term benefits. They do not outweigh the much larger cost of losing the accumulated and accumulating wealth from such a long-term investment. There is a slow, steady stream of benefits that continuously accrue in a district when an improvement infrastructure is maintained.