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Understanding the Role of Partnership Configuration in the NSF MSP Program

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The National Science Foundation's (NSF's) Math and Science Partnership Program (MSP) promotes the development, implementation, and sustainability of exemplary partnerships to produce high-quality math and science education at all K-12 levels. The MSP Program anticipates that the partnerships will be instrumental in improving student achievement, as well as reducing achievement gaps among student populations differentiated by race/ethnicity, socioeconomic status, gender, or disability, a strategy advocated by Haycock, Hart, and Irvine (1991). This paper explores how different configurations influence the types of partnering and educational activities undertaken by partnerships. It further provides illustrative examples of education partnerships from the National Science Foundation's (NSF's) Math and Science Partnership (MSP) Program, which calls for inter-institutional partnerships among institutions of higher education (IHEs), local education agencies (LEAs), state education agencies (SEAs), and other for-profit and nonprofit entities. The study examines partnerships awarded in three cohorts during FY2002, 2003, and 2004 in three categories: Comprehensive Partnerships, Targeted Partnerships, and Institute Partnerships (Teacher Institutes for the 21st Century). Data sources include interviews conducted with the MSPs, archival data submitted by the awardees as part of the MSP Program's Management Information System (MSP-MIS), available extant literature, awardees' annual reports, awardees' evaluation reports, documents available through the awardees' learning network (www. MSPnet.org), and Web site information reported by the individual partnerships in the MSP Program accessible through 2007. Preliminary results indicate that the particular type of configuration of the MSP partnership does not appear to significantly impact the quantity and types of activities the MSPs carry out and accomplish. Those partnerships configured with multiple IHEs did, in some instances, show an enhanced capacity to conduct a greater number and richer array of activities.

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Introduction

Scant *empirical* evidence exists on how partnerships work and if they result in their intended outcomes (Clifford, Millar, Smith, Hora, & DeLima, 2007; Marra, 2004); however, there is evidence that partnerships create added value (Barnes, Carpenter, & Bailey, 2000). Interorganizational partnerships are an important component of research efforts that anticipate creating real-world applicability and relevance. Approaching research efforts individually, partners may not be able to accomplish what would otherwise be possible as a collective. Thus, the unified partnership entity may be able to generate more than the sum of its parts and has become an important component of the National Science Foundation's (NSF's) Math and Science Partnership Program (MSP) that requires a partnership between institutions of higher education (IHEs) and K-12 school districts.

Partnership Formation and Configuration

Partnerships form for many reasons that benefit the individual partners such as sharing information, building capacity, combining resources, bringing expertise and talent together to learn from each other and work toward a common goal (e.g., curriculum development), accessing previously unavailable networks or target groups, influencing policy and decision makers, and seeking new funding opportunities.

Often, partnerships are viewed as a single freestanding entity or concept, but partnerships in general are configured in a range of shapes, sizes, and arrangements for their overall governance. A partnership structured as a centralist model has a strong core group of partners that make all decisions centrally. A partnership structured as a hub and spoke model has a central leading partner and many subgroups or lesser partners. The central leading partner makes decisions coordinated through the hub, but all partners are not equally involved or have equal decision-making authority. Some partnerships operate somewhere between these two models.

Several factors guide the configuration of a partnership. First, when developing a partnership structure, the anticipated outcomes of the partnering endeavor and the urgency of these needs contribute to the resulting partnership configuration (Epanchin & Colucci, 2002). In education partnerships the outcomes may include an enhanced workforce (new teaching skills or increased content knowledge), curriculum revision (updated or aligned to new state standards), the creation of new teaching programs, courses, or certifications, vertical articulation, and the creation of learning networks or communities, just to name a few. These types of needs would require a partnership between an IHE and K-12 schools (districts) such as when an IHE serves as the supplier of services to fill the need of increased content and instruction and the K-12 teachers would be the recipients of the service.

Other factors guiding partnership configuration take into account inclusiveness (such as decisions about whom to include, or if power extremes are represented), having

an equitable and shared responsibility as the reason they have come together for the partnership, a general consensus about priorities and best practices, approaching the partnership with the flexibility to be responsive to changing and dynamic situations, and having commitments to sustainability, if applicable.[1] Available, willing, and qualified leadership further contributes to partnership construction. For instance, when examining leadership in IHE and school partnership configurations, Firestone and Fisler (2002, p. 450) propose using a "micropolitical perspective" because of the sometimes conflicting agendas and special interests of the two groups. To address the conflict and bridge the span between IHEs and K-12 schools, the authors believe that "boundary spanners," (p. 450) rather than leaders isolated at IHEs or K-12 schools, are in a better position to lead the partnerships. The authors theorize that the partnership may best come together through the development of a professional community (with shared ideals of change). They found that while sharing elements may encourage improvement, only "subunits" of the partnership are most apt to become professional communities.

The Role of Pre-existing Relationships in Partnership Configuration

Pre-existing relationships also play a role in partnership configuration. When pre-existing partnerships or relationships exist, they can provide a foundation of familiarity, shared interest, mutual commitment, and trust, which may accelerate the rate of implementation of new grants while facilitating start-up and also the partnering process. In many instances, successful partnerships and relationships are sustained from grant to grant. In these cases, those lasting beyond the grant period usually have a combination of individual and institutional support focused on developing and sustaining the partnering relationship (Phillips, Rivo, & Talamonti, 2004).

The general consensus in the literature is that to be successful, partners should either have a pre-existing relationship or be able to devote time during the initial planning phases to get to know one another and build a relationship. However, sometimes the funding agency does not view this step as necessary or does not believe that a grant can allot the time to do so (Seifer & Krauel, 2003).

Alternatively, pre-existing partnerships or relationships may inhibit the pace of implementation due to previously established institutional patterns and behaviors. For example, a newly configured partnership consisting of members who collaborated previously may not agree or fully support new leadership, new operational components, new overall vision, or new direction. Further, partners may perceive that they are not being dealt with fairly or are not equally represented at the table, compared to their earlier roles. Partners also may feel strain with regard to their own internal economic and financial priorities that may not align with those of the overall partnership. Given these historically ingrained patterns and sentiments, the partnership may suffer because these issues carry forward to the new undertaking.

Partnering in Education Settings

The report, *A Nation at Risk* (National Commission on Excellence in Education, 1983), encouraged the initiation of K-12 and IHE partnerships, and some of these partnerships have been in existence for at least two decades (Catelli, Padovano, & Costello, 2000). For example, in an attempt to improve schools and renew teacher education, the National Network for Educational Renewal has been working with IHEs who are in partnership with schools to develop collaborative networks that include education faculty in colleges, schools, and departments of education. Goodlad (1993) maintains that for educational renewal to occur there must be a robust link between the reform of teacher education and school reform. For this to take place there must be strong and effective partnerships. Essex (2001) holds that partnerships between IHEs and schools are critical to renewal, but require support and commitment from top leadership at both institutions.

For K-16 public education, the main hypothesis is that partnerships are needed to coordinate and align the actions and policies leading to improved student achievement, starting with widespread agreement over the goals for student learning, based on rigorous content and performance standards (e.g., Raizen, McLeod, & Howe, 1997). Partnerships are needed to create coordination and alignment across these institutions, as well as within K-16 systems that traditionally have been "loosely-coupled" (Weick, 1976, p. 1). Partnerships also can provide continuity of focus, align curricula and assessments, create desired normative climates, and instill accountability (Elmore, 2000). For example, the Annenberg Foundation's "Challenge" gifts, which began in 1993, have helped build strong coalitions among businesses, foundations, universities, and grassroots community groups to generate greater public will and support for public school reform (The Annenberg Foundation, 2002).

At the same time, previous research suggests that collaborations between IHEs and local education agencies (LEAs), far from taking place within a congenial and enduring framework, may even evoke the clashing of two cultures (Committee on SMTP, 2001; Conference Board of the Mathematical Sciences, 2001; Goodlad, 1993; Goodlad & Sirotnik, 1988). Even IHE interdisciplinary collaborations faced institutional challenges (Bohen & Stiles, 1998). Some of the participating IHEs might even have grappled with tensions over the historic role of schools of education (Clifford & Guthrie, 1988; Tierney, 2001; Timpane & White, 1998) and the evolving role of professional development schools (Clark, 1999; Committee on SMTP, 2001; Holmes Group, 1990; Rice, 2002). Given the nuances of partnering amongst educational institutions and agencies, the importance of creating a collaborative partnership becomes evident.

Obstacles to creating and sustaining collaborative partnerships include a wide range of factors. Turnover of staff can cause difficulties in terms of continuity (of content or infrastructure support, etc.). Staff turnover may be disruptive to a partnership for reasons other than the departure of key leadership. Disruptions may result from the departure of faculty, administrators, or teachers. Another obstacle is size. Size can refer to geographic expanse between partners, the sheer number of participants, or the physical size of a facility. As an example of physical size, an IHE department or school

could be so spatially large that communication and interaction become challenging and fragmentation occurs (Bullough & Kauchak, 1997).

Methodology

This study examines partnerships awarded in three cohorts during FY2002, 2003, and 2004 in three categories: 1) Comprehensive Partnerships, 2) Targeted Partnerships, and 3) Institute Partnerships (Teacher Institutes for the 21st Century). Comprehensive Partnerships are required to work across the K-12 continuum in mathematics, science, or both. Targeted Partnerships focus on a specific grade band or content domain (e.g., middle school mathematics). Institute Partnerships focus on the development of teacher intellectual leaders in mathematics or the sciences. Data sources included interviews with the MSPs, archival data submitted by the awardees as part of the MSP Program's management information system (MSP-MIS), available extant literature, awardees' annual reports, awardees' evaluation reports, documents available through the awardees' learning network (www.MSPnet.org), and Web site information reported by the individual partnerships in the MSP Program accessible through 2007.

Education Partnerships in the National Science Foundation's Math and Science Partnership Program

The NSF MSP Program promotes the development, implementation, and sustainability of exemplary partnerships to produce high-quality math and science education at all K-12 levels. The MSP Program anticipates that the partnerships will be instrumental in improving student achievement, as well as reducing achievement gaps among student populations differentiated by race/ethnicity, socioeconomic status, gender, or disability, a strategy advocated by Haycock et al. (1991).

A required partnership in the MSP Program is between an IHE or eligible nonprofit organization (or consortium of such institutions or organizations) and one or more local education agencies (LEAs) that may also include an SEA or one or more businesses (National Science Foundation Authorization Act, 2002). This type of partnership arrangement is vertical in nature in that LEAs are partnering with entities (e.g., IHEs) at later points along the pre-K-20 education continuum.[2] The theory is that this verticality may enable the LEAs to maximize their educational potential and establish student pathways (Howard Community College, 1999). The MSP Program also distinguishes between core and non-core partners. Core partners share responsibility and accountability for the MSP grant. All core partner organizations are required to provide evidence of their commitment to undergo the coordinated institutional change necessary to sustain the partnership effort beyond the funding period. A non-core or supporting partner is *not* required to commit to the institutional change necessary to sustain grant activities beyond the funding period, but is an important stakeholder in

K-12 math and science education.

The complexity of the MSP Program derives both from the nature of the individual grants and their collectivity. Individually, each of the grants is being conducted by a partnership and not a single entity, with a core set of partners deeply engaged in the effort at both institutional and individual levels − sharing goals, responsibilities, and accountability for the grant.[3] While certain partnering requirements apply to the MSP partnerships (as stated above), these partnerships have structured themselves in four basic configurations as shown in Table 1.[4]

Table 1

Type and Number of NSF-MSP Partnership Configurations

Type of Configuration	Number of MSP Partnerships with this Configuration
1. One IHE with one school district	3
2. One IHE with multiple school districts	13
3. Multiple IHEs with one school district	7
4. Multiple IHEs with multiple school districts	25
Total	48

Note. From MSP Annual Reports and MSP Evaluation Reports.

Specifically, with regard to how composition or configuration impacts the four types of MSP partnership configurations, the first partnership configuration, one IHE with one school district, could result in the partners working in sync together on agreed upon activities or it could result in the partners pursuing independent sets of activities in isolation. This would depend on the nature of the relationship between the two partners (equal partners, not equal partners, something different). The second partnership configuration, one IHE with multiple school districts, could have a dominant, strong IHE partner that mandates all of the partnership activities with little influence from the other partners. Alternatively, if the school district partners are not in unison they may all be pursuing different activities that may or may not be aligned with the goals of the partnership. Also, configuration may impact the types of activities the partnership pursues. For example, configuration with multiple school districts may lead to a focus on activities in the K-12 setting as opposed to IHE-level activities such as the development of a new master's program at an IHE partner institution. The third partnership configuration, multiple IHEs with one school district, could lead to the IHEs presuming they know what is needed at the district level with little input or influence from the district. The fourth partnership configuration, multiple IHEs with multiple schools districts, could potentially go in the same direction, but

with the influence on several district partners it would be less likely to do so. Due to the number of IHEs and school districts, this type of configuration could possibly lead to the richest array of activities.

Engagement of Community Colleges, Vocational Technical Colleges, or Tribal Colleges

The composition or configuration of the partnership may predict or define the activities it undertakes. Those partnerships engaging community colleges, vocational technical colleges, or tribal colleges within their partnership may have the ability to utilize IHE faculty to a greater extent due to their more flexible teaching schedules and their non-tenure track positions that do not require extensive research and publication for professional advancement. Thirteen MSP partnerships include a community college, vocational technical college, or tribal college as partners (see Table 2). Three of these exist in the partnership configuration of multiple IHE partners with one school district, and the remaining ten exist in the partnerships configured as multiple IHEs with multiple districts. The MSP Partnerships have as few as one community college, vocational technical college, or tribal college associated with them and as many as four. These types of community college relationships may not exist in the first two types of partnership configurations because both are structured such that one IHE leads the effort with single or multiple districts as partners.

Partnering Activities

This section will examine partnering activities the MSP partnerships carried out, and the next section will examine education activities pursued by the MSP partnerships. This section is comprised of a set of illustrative partnering activities reported by the MSP partnerships including distributing or awarding funds, disseminating information and increasing awareness, partnering communications, evaluating the partnership and its activities, and enlisting external STEM professionals.

Distributing or Awarding Funds

The MSP partnerships distributed and awarded funds through mini-grants, grants, sub-grants, sub-awards, and general funds to further and advance the goals of the partnership. Other stated purposes of these awards included strengthening the partnership, fostering collaboration, generating awareness of the MSP's work at the local and regional level, conducting specific activities, purchasing supplies, and building the capacity of local or regional partners. Since the process of obtaining an award was competitive, some core partners provided technical assistance and training on proposal development and submission, which served as a learning experience to increase the partner's skills in grant writing techniques. The MSP partnerships also viewed the awards as a possible source for the partnership to achieve long lasting

Table 2

Presence of Community College Partner with Type of Partnership Configuration

Type of Configuration	Type of Partner
	Community College, Vocational Technical College, or Tribal College Partner
1. One IHE with one school district (*n* = 3)	0
2. One IHE with multiple school districts (*n* = 13)	0
3. Multiple IHEs with one school district (*n* = 7)	3
4. Multiple IHEs with multiple school districts (*n* = 25)	10
Total	13

Note. From MSP Annual Reports, MSP Evaluation Reports, Annual Survey of Partnership Projects (all years of data reported), and Annual IHE Participant Survey (all years of data reported).

benefits and effects on the partners. In other words, they could work through the partnership to bring about change at the local level.

Awards ranged in funding levels from approximately $1,000 to $80,000. A small amount of money is sometimes all that is required for an activity, and compared to the conventional grant-awarding process, mini-grants can be a way for the partner to obtain funds without a significant investment of time or resources. The MSP partnerships did show differences with respect to the requirements for application for funding in one critical area–the work proposed. Of the eight MSP partnerships that made sub-awards, five required that the partner propose work on a specific area as opposed to allowing the partner to determine how funds would be deployed after receiving the award. When the MSP partnership stipulates proposal criteria they exert more influence over the direction of the award and can make sure that the sponsored activity aligns with that of the partnership's goals. This becomes especially important when multiple school districts receive funding. Without guidance and encouragement on the use of the funding, school districts could potentially enact several disparate activities that do not further or augment the partnership's mission and goals.

Of eight MSP partnerships making awards, six fall into the configuration category of having multiple IHEs partnered with multiple school districts. The remaining two partnerships are configured as one IHE partnered with one school district and multiple IHEs partnered with one school district. Perhaps the sheer number of partners makes a difference. Partnerships with several partners need to find ways to keep the diversity

of partners engaged and interested over the course of the long-term relationship. In addition, by dispersing several awards that serve the partnership's goal or mission the partnership is ideally creating coherence and cohesion among the partners and their activities. Finally, sometimes covering a large geographic expanse, the partnership is poised to communicate and disseminate its activities and goals to a broader audience at a local level, thus increasing the potential for impact.

Dissemination

The MSP-MIS and the MSPs' annual and evaluation reports show that the MSP partnerships are involved in a multitude of dissemination activities. The MSP partnerships produced and disseminated materials and findings about their partnerships to articulate the value-added of the partnership itself, its tools, and its strategies. To maximize the impact of dissemination, the MSP partnerships targeted different audiences including NSF, the research community, the education community, parents of students, and other community members interested in the improvement of K-20 educational practices.

Proportionate to their relative sizes, partnerships belonging to each of the four configurations types conducted approximately the same number of dissemination activities (approximately three activities per MSP). Among ten categories of activities, MSP partnerships participated most frequently in three: 1) developing Web sites; 2) producing, disseminating, and presenting materials and resources; and 3) holding parent/student math/science nights. Forty-six of the 48 MSP partnerships developed Web sites, 37 produced, disseminated, or presented written materials and resources, and 22 held parent/student mathematics/science nights. In the remaining categories of activities, 11 MSP partnerships produced and disseminated videotapes or DVDs. Seven opened resource centers for teachers, parents, or the community. Configuration of the partnership does not appear to impact the amount or particular type of dissemination activity.

Partner Communications through Meetings

The MSP partnerships reported that one of the key factors in maintaining their partnerships was communication and developing trust among the partners. Trust is one outcome of good communication behaviors, such as providing accurate information, giving explanations for decisions, and demonstrating sincere and appropriate openness. Roman, Moore, Jenkins, and Small (2002) find that partnerships are more likely to succeed if "partnership structures support multiple organizational contacts with clear lines of communication across organizations, as well as equal decision-making among community organizations and government agencies…Success appears likely to be achieved when both horizontal integration (among community organizations) and vertical integration (between community organizations and traditional power holders)

are strong" (p. 70).

Leadership also plays a critical role in partnership communication. Leaders within the partnership initiate, guide, interpret, and monitor communication dialogues and identify communication needs and shortcomings. Even though partnerships are based on the notion of broad-based ownership and power sharing, several studies found that strong leadership is important to overall success (Birkby, 2003; Drug Strategies, 2001; Metzler et al. 2003). The nature of the pre-existing partnerships may further contribute to lines and modes of communication being more readily established since leadership may be in place and the modes of communication may already be in existence and routinized (Davis & McCullough, 2006).

Communication occurs through a range of activities, and as of the award period 2006-07, the MSP partnerships have been communicating through a variety of mechanisms. These include establishing advisory boards, steering committees, or advisory councils and convening regularly-scheduled meetings; convening regularly-scheduled meetings to discuss the partnership entity; convening regularly-scheduled meetings, conference calls, or electronic communications to maintain general communications or for general planning purposes; convening retreats; creating management and communication plans; and developing forms for information sharing (e.g., reporting forms, logs, etc.).

Of these types of communication activities, the MSP partnerships held regularly-scheduled meetings most frequently, and nearly all MSP partnerships in each of the four types of configurations reported holding such meetings. Both of the MSP partnerships configured with just one school district had 100 percent participation in holding regular meetings, perhaps because it is easier logistically to schedule these types of meetings since there is only one school district partner. The second most frequently occurring communication activity was convening meetings to discuss the partnership entity (as opposed to general discussions or planning meetings). Those MSP partnerships configured with multiple IHEs held this type of meeting frequently (i.e., proportionately speaking, at twice the rate of those MSP partnerships configured with one IHE). Overall, just under 40 percent of the MSP partnerships reported holding regularly-scheduled advisory board, steering committee, or other guidance board types of meetings. Finally, only those MSP partnerships configured as multiple IHEs with multiple districts reported holding significant retreats to discuss partnership issues. A retreat is one manner in which to more deeply engage a large number of partners for an extended period of time, supporting participation by all of the partners.

Evaluation

Evaluation is a critical component of a successful partnership (Gomez & de los Santos, 1993). Evaluation of the partnership assists partners in determining what works, what is effective, and what is not so effective with respect to the functioning of the partnership. Evaluation also can help demonstrate the effectiveness of programs

the partnerships support. However, evaluation can be a major challenge for some partnerships given their many endeavors and management responsibilities.

The MSP partnerships drew upon an assortment of different methods of assessment and instruments to conduct evaluations (see Table 3). The methods employed include case studies, interviews, focus groups, surveys, secondary document analysis, and site visits.

The partnerships are measuring the effectiveness of their partnerships and are beginning to examine outcomes related to their activities. To attribute distal outcomes to the work of the partnership, it is important to have documented the partnership start-up process, identified key elements of the partnering relationship, and assessed the immediate effects of the partnership on major stakeholders: the members of the partnership, the partnership itself, and the targeted community.

Three MSP partnerships report that they are conducting a formal case study of the partnership. Seven partnerships say they are conducting formal studies about how their partnerships work, while eight partnerships report that they are using formal partnership assessment instruments. Fifteen partnerships include evaluation tools or methodologies embedded within annual or evaluation reports such as interview guidelines, site visit protocols, and other project documents. Seven partnerships mention that they are doing something in assessment but it is either in the preliminary stages, not reported well, or simply unclear as to what it is.

All three partnerships configured as one IHE with one school district are conducting some type of evaluation of their partnerships. The modest size and scale of these types of partnership configurations may contribute to their ability to conduct evaluations because it may be less costly and more manageable. Only four of the original 13 partnerships configured as one IHE with multiple school districts are conducting evaluations. In this instance, it may be that the IHEs do not think there is a need for an evaluation. Within this configuration category, three of the four partnerships are working on an embedded type of assessment.

Four of the seven partnerships configured as multiple IHEs with one school district conducted evaluations in at least one of each of the categories, except case study methodology. Eighteen of the 25 partnerships configured as multiple IHEs with multiple school districts conducted evaluations with the majority using an embedded assessment ($n = 10$) or doing a formal partnership assessment ($n = 7$). Of note, this is the only type of partnership configuration using a case study methodology. These two types of configurations have in common the participation of multiple IHEs (as opposed to one dominate entity).

Enlistment of External Support

As reported to the MSP-MIS and in the MSPs' annual and evaluation reports, the partnerships enlist support from STEM industry and business personnel who work in disciplinary fields. The more that links with business are created, the higher the

Table 3

Types of Evaluation Assessment by Type of Partnership Configuration

Type of Configuration	Type of Evaluation Assessment					
	Case Study Example: Triangulation of multiple data sources (interviews, focus groups)	MSP Study Example: Conducting the Building a Partnership Study	Formal Partnership Assessment Instrument Example: Administering formal assessment instruments	Embedded Example: Conducting interviews, site visits, etc.	Informal/Unclear Example: Distributing literature to read re effective partnerships	Total
1. One IHE with one school district ($n = 3$)	0	1	0	1	1	3
2. One IHE with multiple school districts ($n = 4$)	0	1	0	3	0	4
3. Multiple IHEs with one school district ($n = 4$)	0	2	1	1	1	5
4. Multiple IHEs with multiple school districts ($n = 18$)	3	3	7	10	5	28
Total	3	7	8	15	7	40

Note. From MSP Annual Reports and MSP Evaluation Reports.

likelihood of accessing additional resources and participating in joint ventures. Some of the partnerships maintain a large network of contacts to participate in MSP activities, such as experts from the field who mentor students. Using this network, the partnerships have generated awareness about potential career paths for students. Other partnerships are working to increase awareness among potential supporters such as university alumni, foundations, and for-profit entities. The partnerships have reported support in the form of office space, parking, materials, and monetary resources.

Of all the types of MSP partnership configurations, overall about 60 percent utilized STEM business professionals. Those partnerships configured as multiple IHEs with multiple districts engaged STEM professionals at the highest rate proportionately. The MSP partnership configured as one IHE with multiple districts had the lowest level of involvement by external STEM professionals.

Education Activities

A framework developed by Yin and Long (2007) will be used to examine how partnership configuration impacts education activities undertaken by the MSP partnerships. The framework arrays all of the education activities conducted by the MSP partnerships (as opposed to MSP partnering activities, which were described in the previous section). The framework (see Table 4) displays the education activities in a logic model format organized by the locus at which the activities occur: IHE, K-12, between these two, or in another venue. It further illustrates the interface or relationship of the education activities to each other and to student achievement.

At the K-12 level, MSP partnerships worked on activities in three broad education activity categories: 1) working with K-12 students, classroom, or curricula; 2) working with K-12 teachers, administrators, or staff; and 3) working with K-12 policies and institutional structure (see Table 5). Nearly three times the number of education activities occurred in the second category, working with K-12 teachers, administrators, or staff. Education activities in this category include providing in-service (professional development) to existing K-12 classroom teachers; training teacher leaders, coaches, and mentors to work with classroom teachers; and training school administrators or staff. On average, each of the types of partnership configurations conducted three activities with the partnerships configured as multiple IHEs with multiple school districts conducting an average of four activities per partnership. This higher level of activity within this partnership configuration may be due to the fact that this configuration simply has the greatest number of partners who both provide and receive professional development services.

The first K-12 education activity category, working with K-12 students, classroom, or curricula, showed the second highest number of activities. Education activities included supporting student enrichment activities and implementing new curricula, curriculum guides, or classroom technologies. With the exception of those partnerships configured as one IHE with one school district, on average the MSP partnerships

Table 4

MSP Activities Framework

Locus	Type of Activity	Type of Subactivities
K-12	Work with K-12 Students, Classrooms, or Curricula	1. Support student enrichment activities 2. Implement new curricula, curriculum guides, or classroom technologies
	Work with K-12 Teachers, Administrators, or Staff	1. Provide in-service (professional development) to existing K-12 classroom teachers 2. Train teacher leaders, coaches, mentors, etc., to work with classroom teachers 3. Train school administrators or staff
	Work with K-12 Policies and Institutional Structure	1. Define and implement new standards, curriculum frameworks, or educational policies 2. Develop new assessment or other tools
IHE (Undergraduate and Graduate)	Work with Undergraduate and Graduate Students, Classrooms, or Courses	1. Support student enrichment activities 2. Modify individual courses for existing undergraduates or graduates 3. Modify individual courses for existing K-12 teachers, administrators, or staff
	Work with Faculty, Administrators, or Staff	1. Provide professional development to existing IHE faculty 2. Train faculty leaders, coachers, mentors, etc., to work with IHE faculty 3. Train IHE administrators and staff
	Work with IHE Policies and Institutional Structure	1. Alter field of concentration or graduation requirements 2. Start or revise degree programs 3. Change IHE policies or encourage interorganizational collaboration
Families and Community and Commercial Organizations	Community Building	1. Organize family education or enrichment activities 2. Increase public awareness of mathematics and science education and its importance
Educational Activities with a Distinctive Interface Between:	K-12 and IHE Students, Classrooms, or Courses	For example, K-12 students working on a project with an IHE student
	K-12 and IHE Faculty, Administrators, or Staff	For example, teachers and faculty teaching a course together
	K-12 and IHE Policies and Institutional Structure	For example, work on vertical alignment issues

Note. From Yin & Long, 2007.

Table 5

Type of K-12 Education Activity by Type of Partnership Configuration

Type of Configuration	Type of K-12 Education Activity			
	Work with K-12 Students, Classroom, or Curricula	Work with K-12 Teachers, Administrators, or Staff	Work with K-12 Policies and Institutional Structure	Total
1. One IHE with one school district *n* = 3	2	9	2	13
2. One IHE with multiple school districts *n* = 13	15	36	11	62
3. Multiple IHEs with one school district *n* = 7	11	21	9	41
4. Multiple IHEs with multiple school districts *n* = 25	35	101	23	159
Total	63	167	45	275

Note. From Yin & Long, 2007.

participated in one to 1.5 activities. Proportionately speaking, the MSP partnerships configured with multiple IHEs conducted a slightly higher number of activities than the partnership configured with one IHE and multiple school districts. The partnership configured as one IHE and one school district performed on average less than one education activity per MSP.

The third K-12 education activity category, working with K-12 policies and institutional structure, had the fewest education activities and followed a similar trend of participation as the first education activity category. This category included such education activities as defining and implementing new standards and curriculum. The two partnership configurations that feature multiple IHEs participated in a slightly higher number of activities per MSP than those structured with single IHEs.

At the IHE level, MSP partnerships worked on activities in three broad education activity categories: 1) working with undergraduate and graduate students, classrooms, or courses; 2) working with faculty, administrators, or staff; and 3) working with IHE policies and institutional structure (see Table 6). Education activity categories one and three had a similar number and the highest total number of activities. The number of activities in these two categories accounts for 89 percent of all of the IHE education activities. These two categories focus on courses, programs, and policies, whereas

Table 6

Type of IHE Education Activity by Type of Partnership Configuration

Type of Configuration	Type of IHE Education Activity			
	Work with Undergraduate and Graduate Students, Classrooms, or Courses	Work with Faculty, Administrators, or Staff	Work with IHE Policies and Institutional Structure	Total
1. One IHE with one school district *n* = 3	4	1	3	8
2. One IHE with multiple school districts *n* = 13	13	3	13	29
3. Multiple IHEs with one school district *n* = 7	14	1	10	25
4. Multiple IHEs with multiple school districts *n* = 25	34	11	33	78
Total	65	16	59	140

Note. From Yin & Long, 2007.

the education activity category with the fewest activities focused on professional development and training at the IHE level. On average each MSP partnership participated in 3.1 activities, with those partnerships configured as multiple IHEs with one school district, performing slightly higher, averaging two activities in education activity category one and averaging 1.4 activities in education activity category three.

The two partnership configurations that feature multiple IHEs participated in a higher number of activities per MSP than those structured with single IHEs. For IHE-centered activities, those partnerships configured with multiple IHEs would likely accomplish a higher number of activities per MSP than those partnerships configured with only one IHE.

At the families and community and commercial organizations level, MSP partnerships worked on 27 activities in two broad education activity categories: 1) organizing family education or enrichment activities; and 2) increasing public awareness of mathematics and science education and its importance. Those partnerships configured with multiple IHEs and multiple districts conducted the highest number of education activities per MSP (approximately 0.8 activities per MSP) followed at a distance by partnerships configured with one IHE and multiple school districts (0.38),

and partnerships configured with multiple IHEs and one school district (0.29). The partnership configuration of one IHE with one district showed no education activities in the community building category. Due to the low number of partners within this configuration, perhaps education activities in this category were not required or not a priority.

Some of the education activities pursued by the MSP partnerships happened within one of three distinctive interfaces. Yin and Long (2007) labeled these interfaces as: 1) K-12 and IHE students, classrooms, or courses; 2) K-12 and IHE faculty, administrators, or staff; and 3) K-12 and IHE policies and institutional structure. The highest number of education activities occurred at the second interface of K-12 and IHE faculty, administrators, or staff. This may be due to the basic composition of the MSP partnerships (which require IHE faculty, K-12 staff, etc.) rather than any particular partnership configuration. An example of an education activity occurring here would be a teacher and a faculty member teaching a course together. Those partnership configurations with multiple IHEs, had the greatest number of activities per MSP at this interface.

The second highest number of education activities occurred at the first interface of K-12 and IHE students, classrooms, or courses. The partnership configuration of multiple IHEs with multiple districts had approximately 0.56 of their activities at this interface. The remaining three partnership configurations ranged from 0.23 to 0.033 of their activities at this interface. The interface with the fewest number of educational activities was at the K-12 and IHE policies and institutional structure. Education activities that occur at this interface include working on vertical alignment issues. Again, those partnerships configured with multiple IHEs participated in the greatest number of education activities, averaging over 1.4 each.

Conclusion

This paper addresses how different types of partnership configurations may influence the types of partnering and educational activities undertaken by the partnerships. With regard to both partnering and education activities, the particular type of configuration of the MSP partnership does not appear to significantly impact the quantity and types of activities the MSPs carry out and accomplish. In some instances, those partnerships configured with multiple IHEs show a higher participation in activities, proportionately speaking.

Why is this so? One possibility is that a majority of the MSP partnerships configured with multiple IHEs formed as a result of pre-existing relationships (as compared to the other types of configuration). Pre-existing relationships provide an advanced starting point for the partnership in that relationships are formed, a sense of familiarity and trust exist, common goals and interests are in common, and operating mechanisms (including communication) have been established and refined. These aspects may help accelerate the rate of implementation. A pre-existing relationship further allows the

partnership to have already formed a plan and process for dealing with a diverse set of partners. If a partnership is too diverse, there is potential for multiple mini-or sub-partnering arrangements occurring. For large partnerships such as those configured with multiple IHEs, a certain level of homogeneity is required. Also, because of the time spent in and effort given to pre-existing relationships, the partners may also have discovered the appropriate amount of alignment among partners. On the partnering continuum, the partnership should not have partners that are too distant or too closely aligned. A too distant partner would not make the contributions needed for a successful partnership; a too closely aligned partner may work to implement courses (as but one example) that would not serve a purpose beyond the grant period.

Second, size matters. Those MSP partnerships configured with multiple IHEs have access to a breadth and depth of resources the other configurations do not. These resources include an increased number of possible project participants, the amount of time project participants can contribute, facilities, existing knowledge about relevant topics, and other intangibles such as networking capabilities. These lead to an enhanced capacity to conduct a greater number and richer array of activities.

Third, the type of partners engaged in the partnership may impact its activities. As mentioned above, the partnerships configured with multiple IHEs have community colleges, vocational technical colleges, or tribal colleges within their partnership. In some cases, this provides the potential advantage of more IHE STEM faculty participation because of the different responsibilities of faculty positions at these types of institutions as opposed to universities and colleges.

How do those partnerships configured with one IHE differ? Those MSP partnerships configured with one IHE with one school district could result in the partners working in alignment with one another on agreed upon activities or it could result in the partners pursuing independent sets of activities in isolation. This would depend on the nature of the relationship between the two partners (equal, unequal, or some other relationship). The partnership configured as one IHE with multiple school districts, could have a dominant, strong IHE partner that mandates all of the partnership activities with little influence from the other partners. Alternatively, if the school district partners are not in unison they may all be pursuing different activities that may or may not be aligned with the goals of the partnership.

Endnotes

[1]See Scherer, 2006, *Partnership Implementation in the MSP Program* for further description of these factors.

[2]There is no intended value in the continuum (e.g., from good to bad or vice versa).

[3] At least one MSP awardee did not enact the partnership with the partners originally proposed. Instead, it added one district-level partner that was not proposed and dropped one district-level partner that was proposed.

[4] This table categorized comprehensives, targeted, and institute partnerships. RETA partnerships are not included.

Acknowledgments

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