

# **Evaluating the Impacts of Partnership:**

An Electronic Panel Study of Partnering and the Potential for Adaptive Management

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# **Evaluating the Impacts of Partnership:**

An Electronic Panel Study of Partnering and the Potential for Adaptive Management

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## **For Shorty**

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(October 4, 1912 – February 29, 2008)

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# Table of Contents

<b>Dedication.....</b>	<b>iii</b>
<b>Acknowledgements.....</b>	<b>iv</b>
<b>List of Tables.....</b>	<b>ix</b>
<b>List of Figures.....</b>	<b>x</b>
<b>List of Abbreviations and Definitions.....</b>	<b>xi</b>
<b>Summary .....</b>	<b>xii</b>

## Chapters

### Introduction

Motivation and Theoretical Base .....	5
Research Questions .....	10
Research Methodology .....	14
Organization of this Dissertation .....	15

<b>1 Partnerships, Policy and Adaptive Management .....</b>	<b>17</b>
1.1 The Policy Context for Math Science Partnerships .....	18
1.2 Adaptive Management and Public Policy .....	21
1.3 Partnership Sustainability .....	30
1.3.1 Developing a Working Definition of Partnership .....	31
1.3.2 Formation / Lifecycle .....	37
1.3.3 Partnership as an Identity .....	40
1.3.4 Partnership Structure .....	41
1.4 Partnership Adaptability .....	47
1.4.1 Implementation / Operation Factors .....	48
1.4.2 Collaboration / Decision Making .....	52
1.4.3 Evaluation / Outcomes of Partnership .....	55
1.5 Bounding, Measuring and Evaluating Partnership .....	62

<b>2</b>	<b>Theoretical Framework, Variables and Hypotheses</b> .....	<b>69</b>
2.1	Theoretical Framework .....	69
	2.1.1 Toward a Measure of Value-Added .....	73
	2.1.2 Adaptive Management an Improved Policy Process .....	74
2.2	Variables and Model Formulation .....	78
	2.2.1 Variable Development .....	79
	2.2.1.1 Initial Model of Partnership .....	80
	2.2.1.2 Rivals To The Initial Model .....	85
	2.2.1.3 Reformulated Model of Partnership .....	86
	2.2.2 Model Variables .....	91
2.3	Testing Hypothesis .....	92
	2.3.1 Sustainability Hypothesis .....	92
	2.3.2 Adaptability Hypothesis .....	97
2.4	Adaptive Management .....	99
<b>3</b>	<b>Research Design and Methods</b> .....	<b>103</b>
3.1	Qualitative Methods .....	103
3.2	Data Collection .....	104
	3.2.1 Participant Selection .....	106
	3.2.2 About the Survey Instruments .....	108
3.3	Data Selection and Organization .....	111
	3.3.1 Drivers of Partnership Sustainability .....	111
	3.3.2 Drivers of Partnership Adaptability .....	115
	3.3.3 Measures of Sustainability and Adaptability .....	117
3.4	Data Analysis and Validation .....	122
<b>4</b>	<b>Results</b> .....	<b>125</b>
4.1	Partnership Sustainability .....	125
	4.1.1 Defining Partnership .....	125
	4.1.2 Impact of Embeddedness .....	134
	4.1.3 Partnership Structure and Decision Making .....	144

4.2	Partnership Adaptability .....	148
	4.2.1 Strategic Needs .....	149
	4.2.2 Environmental Effects .....	154
	4.2.3 Rules and Inducements .....	157
4.3	Hypothesis Tests and Adaptive management .....	160
	4.3.1 Sustainability Hypothesis .....	161
	4.3.2 Adaptability Hypothesis .....	166
	4.3.3 Adaptive Management in Partnerships .....	170
<b>5</b>	<b>Conclusions and Policy Implications .....</b>	<b>174</b>
	5.1 Partnerships, Adaptive Management and Reform .....	175
	5.2 Reconceptualizing Partnership as a Policy Tool .....	181
	5.3 Evaluation of Partnerships .....	189
	5.4 Limitations and Future Research .....	192
	5.4.1 Pros and Cons of Delphi .....	192
	5.4.2 Future Work .....	194

<b>Appendix A:</b> Georgia Tech STEM e-Delphi Panel Protocol ....	198
<b>Appendix B:</b> Quantitative Data Summary Tables .....	224
<b>References</b> .....	236



## List of Tables

Table 1. Variable Development .....	75
Table 2. Conceptual Framework in this Study .....	79
Table 3. Drivers of Partnership Formation, Operations & Outcomes .....	89
Table 4. Partnership Model Variables .....	90
Table 5. Partnerships with Four Levels of Sustainability .....	94
Table 6. Partnerships with Four Levels of Adaptability .....	99
Table 7. Predictions about Adaptive Management in Partnerships .....	101
Table 8. Sample Frame Used in this Research .....	107
Table 9. Model Variables in this Study .....	114
Table 10. Partnership Sustainability and Adaptability .....	118
Table 11. Partnership Sustainability Defined .....	119
Table 12. Scale of Adaptability .....	121
Table 13. Framework of Partnership Types .....	130
Table 14. Time Required to Establish Effective Working Relationships .....	138
Table 15. Partnership Sustainability .....	162
Table 16. Partnership Adaptability .....	169
Table 17. Partnerships as a Venue for Adaptive Management .....	172
Table 18. Two Approaches to Modeling Partnership .....	184

## **List of Figures**

Figure 1. Initial Partnership Model .....	81
Figure 2. Final Evaluation Model of Partnership .....	87
Figure 3. The Online Survey Instrument Scaled and Narrative Responses .....	109
Figure 4. Examples of Four Conceptual Definitions of Partnership .....	132
Figure 5. Examples of Reported Relationships Prior to the Current Partnership	135
Figure 6. Examples of Responses Related To Trust .....	140
Figure 7. Examples of Responses Related Goal Alignment .....	150
Figure 8. Two Phase Model of Adaptive Management .....	179
Figure 9. Issue Networks and Partnership Development .....	187

## **List of Abbreviations**

**MSP** – Math Science Partnership

**STEM** – Science, Technology, Engineering and Math

**NSF** – National Science Foundation

**RETA** – Research, Evaluation and Technical Assistance

**IHE** – Institutions of Higher Education

**PIP** – Policy Inducement to Partner

## **Definitions**

### *Policy Inducement*

Policy inducements generate or support activity. They typically take the form of grants or tax incentives that drive action by actors who are both willing and able to do so. Inducements are a less strict mechanism policy makers use to encourage changes in behavior (e.g., rules, laws, and mandates require action whether actors are willing, prepared, or have the ability to comply).

### *Policy Inducement to Partner (PIP)*

Policy inducements to partner are now seen in many grant-based federal programs with specific conditions in aid that require the participation of multiple organizations. For example in current NSF funded math and science programs these PIP's require local schools or districts to partner with institutions of higher education in order to qualify for program funding.

### *Administrative Network*

Actors with decision making power in a partnership constitute the Administrative Network. This may take a more centralized bureaucratic form (with decision makers separated from those tasked with program implementation) or it may be dispersed with some actors local to the programmatic activity. In addition administrative networks may be freestanding, having some autonomy from partner organizations, or they may be held within and primarily accountable to one of the organizations. The administrative network is responsible for coordinating activity and making choices about what activities will be conducted. This network is also most closely linked and accountable to the federal or other funding agency.

### *Operation Network*

Actors responsible for program implementation constitute the Operation Network. These are the people who do the programmatic work. For a particular partnership the operation network is at least partly supported by the policy inducement's funding.

## Summary

There has been an increase in the use of partnerships as a policy prescription for improving education since the mid 1980's. This trend builds on nearly a century of reform movements in education, has been noted in the professional literature and can also be seen in the growing trend to add partnership requirements to federal grant programs in a variety of fields as reported in the *Federal Register*. Policy makers include partnership requirements as a condition for receiving the funds in grant programs, as an inducement to engage in collaborative behavior, assuming that there will be some benefit to the inclusion of partners in program implementation that will lead to improved policy outcomes. The motivation for this study is the desire to answer the question of whether the partnership requirement included in these federal programs constitutes good public policy. In particular, this study focuses on whether these partnerships as typically constituted provide the necessary conditions for the adaptive management (sustainability and locally adaptable action) of education problems by the local community partners.

The results of this study suggest that the implementation and content requirements built into grant programs, that include partners as a condition in aid, most often result in a narrow programmatic focus among the participants. Organizations choose to participate in disjointed serial interventions that support organizational needs or goals based on the availability of funding and partners for particular programmatic activities. They choose partners from among those who are interested in similar or complementary activities. The primary focus of STEM education partnerships is therefore on implementing and sometimes evaluating the funded programmatic activities and not on building a broader learning community. Activities or education problems that are not funded tend to be excluded from the activities and dialog of the policy-induced partnership. By limiting the scope of the collaboration we are limiting the value of these partnerships.

An important theoretical benefit of partnerships, found in both the social capital and learning community literature, is as a venue for sustainable dialog and adaptive decision making (i.e., adaptive management). In our current environment of programmatic accountability, education evaluators are underutilizing this large established literature. Building off this older literature, this study reminds educators and

evaluators that partnerships can be a meaningful end and not simply serve as an implementation tool. Investment in partnerships, and the social networks that they are developed from, creates valuable a resource that can be used to enhance future programmatic work.

Public policies that focus too narrowly on programmatic goals, even when they require partnered implementation, are unlikely to provide a stable, sustainable, value generating core that will last beyond a funded intervention. Wise grant seekers naturally look for funding opportunities that may or may not include current partners. Instead of building from a stable partnership core, organizations interested in a policy problem or choice of intervention seem to form a loose issue oriented network, parts of which are activated as available funding is identified. Once an intervention's funding is exhausted the participating organizations gradually slip back into a loosely connected network of potential partners. This finding has led to conceptualizing policy-induced partnerships as relational events that are bounded by funding cycles. And, any attempt at adaptive management within the partnerships developed under these conditions will be far less deliberative, less adaptive, less sustainable, and more opportunistic in nature.

Policy prescriptions, with a wider focus, are more likely to provide a positive return on our education investment in the form of greater opportunities for sustainable collaborative relationships. Education partnerships as currently implemented are unlikely to provide a stable venue for adaptive management and the consideration of broader education problems. As long as the policy focus is on delivering desired interventions or programs, partnership will be just one of many implementation options. Further, the requirement for specific kinds of partners as a condition in aid for grant programs has the potential to crowd out other beneficial collaborative interactions. However, the broader networks of those interested in a policy issue do seem to be engaging in a loose form of adaptive management. Elements of a wider issue network continually explore local needs and options becoming focused and activated around opportunities to address problems through partnered interventions. Policy makers need to reconsider the literature on building learning communities and support the development of a venue for greater network connectivity when designing education policy and programs.



## Introduction

*It is easy to exaggerate the amount of intelligence and ability demanded to render such judgments fitted for their purpose. In the first place, we are likely to form our estimate on the basis of present conditions. But indubitably one great trouble at present is that data for good judgment are lacking; and no innate faculty of mind can make up for the absence of facts (John Dewey, 1927/1954, p.209).*

A review of a broad range of new policy initiatives shows that the goals of greater accountability and broader participation (often implemented under the label “partnership”) are increasingly being added to federal programs.<sup>1</sup> This shift toward greater inclusiveness seems to reflect a natural evolution of policy strategies driven by conflicting public values and goals, the increasing complexity of modern policy problems, uncertainty about how to solve these complex problems, and the need for greater transparency and accountability from government. For this reason, partnerships and adaptive management principles (involving the management of uncertainty by making iterative collaborative decisions based on empirical evidence) have drawn the attention of researchers. Building upon this trend toward greater general interest in partnerships as a solution to public policy problems, Georgia Tech’s Research, Evaluation and Technical Assistance (RETA) project<sup>2</sup> was focused on developing a model and theory of Science, Technology, Engineering and Math (STEM) partnership to

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<sup>1</sup> See for example, Jones, J. (2008). Exploring Federal Government Use of Partnerships. In Final Report on Alternative Approaches to Evaluating STEM Education Partnerships: A Review of Evaluation Methods and Application of an Interorganizational Model. G. Kingsley, D. O’Neil, M. Usselman, M. R. Waschak and J. Jones. Washington, DC, National Science Foundation.

<sup>2</sup> This work derives from and was supported by the National Science Foundation sponsored RETA project, see Kingsley, G., O’Neil, D., Usselman, M., Waschak, M. R., and Jones, J. (2008). *Final Report on Alternative Approaches to Evaluating STEM Education Partnerships: A Review of Evaluation Methods and Application of an Interorganizational Model*. (NSF 02-061 Award #: 0231904). Washington DC: National Science Foundation.

be used for evaluating public policies in the context of math and science education policy (see Kingsley et al., 2008). In this study, I combine and connect elements of the RETA work on STEM education partnerships to ideas about managing uncertainty through adaptive management drawn from the literature on environmental philosophy and management (providing a benefit in increased social capital) to evaluate whether STEM partnerships as typically constituted provide the necessary conditions for sustainable adaptive management of local education problems.

In policy studies, we are broadly interested in whether a particular public policy has its intended impacts on policy goals, whether policy prescriptions included in the policy contribute to or reduce the success of the policy, in developing improved metrics for evaluating the success of public policies, and for exploring alternatives if a policy fails to meet its goals. We want policies that are effective, efficiently implemented and provide benefits in an equitable fashion. In this study the policy under review is the use of federal funding to encourage the creation of math and science partnerships between colleges or universities and local school institutions (for example those recently funded through the National Science Foundation's Math and Science Partnership (MSP))<sup>3</sup>

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<sup>3</sup> The National Science Foundation funded Math Science Partnership (MSP) program has five key features: 1.) Partnership-Driven - Partnerships between universities and K-12 institutions are required. 2.) Teacher Quality, Quantity and Diversity - The projects are intended to enhance the quality, number and diversity of K-12 math and science teachers. 3.) Challenging Courses and Curricula - The projects are intended to provide courses and curricula that improve the math and science understanding of students while teaching a range of problem solving and analytical skills. 4.) Evidence-Based Design and Outcome Measures - Programs are to be designed based on the best current research and link evaluation with indicators of partnership success. 5.) Institutional Change and Sustainability - The core partners are to commit to strengthening teaching practices on the university side while K-12 institutions commit to providing an environment in which teachers, administrators and other staff can grow for the long term. Further, the partnership (and its impacts) should last beyond the funding of the MSP.



program under the No Child Left Behind Act of 2002). The specific policy prescription under consideration is the requirement for grant recipients to work with very specific kinds of STEM education partners when implementing their federally funded programs as a condition for receiving grant funds.

The use of partnerships is an implementation choice. Federal policy makers could use a more directive program implementation method if they did not believe that there were benefits to requiring partners, e.g., some value added due to increased collaboration or better coordination of resource use (Huxham, 1996; Thompson, Story & Butler, 2003; Mattessich, & Monsey, 1992; Mattessich, Murray-Close, & Monsey, 2001) due to improvements in social networks (Burt, 1982, 1992; Human & Provan, 1997; 2000; Provan & Milward, 1995; 2001) or due to an increase in social capital (Lin, 2001, Lin, Cook & Burt, 2001). Important “key features” most recently included in the National Science Foundation’s Math and Science Partnership program are using evidence to design and measure programmatic outcomes, driving institutional change through the interaction of partners, and providing a mechanism for sustainability after the funding ceases (National Science Foundation, 2009)<sup>4</sup>. These key features provide a framework for improving educational outcomes that combines regular interaction and the use of empirical evidence to adapt to changing circumstances in a sustainable fashion. The lack of certainty about what is needed or wanted to improve educational outcomes requires a management approach that is both adaptable and sustainable to improve the system’s capacity to learn and make informed choices. Thus the application of the principles of

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<sup>4</sup> Two additional features of the MSP program refer to #2.) Teacher Quality, Quantity and Diversity and #3.) Challenging Courses and Curricula refer to the specifics of the programmatic content of the partnered work and are beyond the scope of this research.

adaptive management developed to manage uncertainties in environmental protection may provide benefits to partnerships in policy domains like education.

In this work, I focus on the question of whether policy-induced partnerships, as typically constituted, can provide two important conditions for adaptively managing local education problems: 1.) *Sustainability* - a sustainable platform for dialog, learning and decision making and 2.) *Adaptability* - the willingness and ability to adapt as acquired knowledge, environmental conditions, local values, or needs change.

In order to better understand partnership *sustainability*, I explore what “partnership” means in the context of federal grant-based programs, how these partnerships form, operate and ultimately end and how they are structured. Grants by their nature are a temporary infusion of resources. What then, is the nature of sustainability given this constraint? To better understand the potential *adaptability* of these partnerships I explore, what conditions motivate partners to adapt or change, how the partnerships operate, how they use program evaluation, and how they make decisions. By exploring how or whether these two conditions are met in the case of education partnerships and the potential for adaptively managing educational improvement through partnerships, I will improve our understanding of the benefits and costs of public policies requiring partnerships. In addition, this work contributes to the literature on education program evaluation, social network legitimacy and the impact of network structure, and pushes the literature on the practical use of adaptive management concepts into realms beyond environmental management (See for example, Wise, 2006).

## Motivation and Theoretical Base

Partnerships as an institutionally supported space for interaction, collective learning and locally based decision making are an extremely attractive tool for implementing public policy.<sup>5</sup> Partnerships have the potential for creating more direct democracy, increasing the perceived legitimacy of policy choices and allowing local communities to learn from and take more direct responsibility for the results of their choices. The typical definition of a partnership requires that participants and their interactions meet certain criteria (as specified by the definer) in order to be classified as a partnership (e.g., Teisman & Klijn, 2000). These criteria typically include some desire to work together to address an identified problem, complementary needs or goals, a framework for negotiating actions and some desire to maintain the relationship. In an ideal sense such a partnership would be able to sustain itself and adapt its activities to changing needs or circumstances.<sup>6</sup> In particular, partnerships that are based within specific communities (whether by location or of practice) have the potential to become the central focus for a broad network of individuals and organizations interested in a local policy issue or set of problems and to support a process of adaptively managing those problems in ways that are relevant to the community. The partnership might provide a community-based venue for iterative interaction and deliberation, values elicitation, the

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<sup>5</sup> Adaptive management of local policy problems requires a place-based community venue (a *table* around which community members can meet) to serve as the point of contact for local problem solving. Developing such a venue is an important first step to building a local process for adaptively managing policy issues.

<sup>6</sup> In this study I contrast this ideal formulation of partnership with one I borrow from the RETA work. In this alternative, partnerships are defined as “relational events.” A *relational event* is bounded in time (sometimes confined to a funding cycle) and by a set of participants to accomplish a specified goal. Once the goal is reached the partnership may dissolve without any associated sense of failure.

construction of multi-scalar approaches to defining and resolving problems, evaluation, and democratic decision making or more precisely adaptive management.

My work builds on a long tradition of educational reform movements that include government encouraging community-based approaches to solving problems so that critical needs of local communities are addressed. John Dewey wrote, "In its deepest and richest sense a community must always remain a matter of face-to-face intercourse" making the point that direct interaction in a particular place forms the basis of legitimate governance (Dewey, 1927/1954, p.211). This would suggest that anything policy makers can do, to increase civic discourse and get more local people working together focused on solving problems, increases the legitimacy of and potential for finding good solutions. However, building new relationships can be messy, taking up time and effort. Further, in many policy arenas there are fundamental uncertainties about the nature and scope of problems that can or must be dealt with (e.g., Lee, 1989; 1993; Gunderson, Holling & Light, 1995; Gunderson & Holling, 2002; Norton 2003; 2005; Wise, 2006). To deal with these uncertainties, decision makers need to understand the specifics of local conditions: the motivations, constraints and interests of the local population.

There are few public institutions in the United States that have been so closely connected to local communities, as have schools. In the United States education has primarily been funded and managed locally as public education is not a constitutionally authorized role of the federal government. For example, of the approximately \$1 trillion spent on education in the United States in the 2007-2008 school year 91% of the funding for elementary and secondary education came from local, state and private sources (U.S. Department of Education, 2009). However, over the course of United States history the

role the federal government has taken in shaping education policy has been gradually increasing beginning in 1867 when the original federal Department of Education was established to collect information on teaching and schools; continuing with the second Morrill act of 1890 which supported land grant colleges; the Smith-Hughes Act of 1917 and the George-Barden Act of 1946 focused on industrial, agricultural and home economic training in high schools; the Lanham act of 1941 and the Impact Aid laws of 1950 were established to help local communities with the burdens brought on by the presence of military or federal installations; in 1944 the GI Bill provided college funding for nearly 8 million American veterans after WWII; and the civil rights and anti-poverty laws of the 1960s and 1970s had specific provisions to increase educational opportunities (U.S. Department of Education, 2009).

The federal government continued to extend its reach into education in 1980, reforming the U.S. Department of Education whose current “mission is to promote student achievement and preparation for global competitiveness by fostering educational excellence and ensuring equal access” (U.S. Department of Education, 2009). The publication of *A Nation at Risk: The Imperative For Educational Reform* in 1983 by President Reagan’s National Commission on Excellence in Education pointed out the growing concern that America’s schools are failing and touched off a series of federal, state and local reforms.<sup>7</sup> This excellence movement built upon two earlier attempts at

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<sup>7</sup> In the 20<sup>th</sup> century Presidential commissions have regularly produced reports on the status of the U. S. education system for example, The Truman Report in 1947, President Eisenhower's "Committee on Education Beyond the High School," (1956), President Kennedy's Task Force on Education (1960), and President George W. Bush's Commission on the Future of Higher Education report, "A Test of Leadership" (2006). These commissions and the reports they generate contribute to the policy debate on the best way to educate children and the broader American workforce.

educational reform beginning in the early twentieth century with the progressives and later in the sixties with a push toward social equity and increased access (Berube, 1994; Annenberg Foundation, 2002). More recently, the No Child Left Behind act of 2002 included federal school quality and student testing requirements that have begun the shift toward even greater federal involvement and accountability in education. In addition, provisions of the American Recovery and Reinvestment Act of 2009 provide \$100-130 billion for the calendar years 2009-2010 to fund a variety of education projects.

While providing funding for and managing schools has in the past been a private or local responsibility, it is clear that the role of federal policy makers is growing. However, because they are closer to the local environmental conditions, and should therefore best be able to understand the situation and more accurately gauge public needs, it is important that local educational institutions increase their capacity to develop and manage solutions to complex problems. Local institutions can be adaptable, while being inclusive and scaled at a size appropriate to focusing on the specific policy issue or problem. They can be sustained locally over time when outside interests have moved on to other initiatives. Thus local, collaborative, and democratic institutions, or partnerships, should be an excellent tool for implementing federal policies tailored to local conditions. Federal support for such institutions might provide a space for sustained attention to gauging community values and developing effective solutions to local policy issues in a way that allows stakeholders to take responsibility for the choices that will affect them.

In an environment of financial stress and with calls for increasing accountability federal policy-makers have a responsibility to be good stewards of public money and to make sure that policy goals are met in the best way possible. While it can easily be

argued that pluralistic implementation approaches are better if we value diversity, or that legitimacy requires the broadest possible inclusion and local participation in community decisions, how can we know that a pluralistic collaborative approach to program implementation (e.g., through a partnership) will yield a measurably better policy outcome than one generated by more direct implementation? How do we know that a collaborative effort will not be less efficient or provide worse or less equitable decisions? Put plainly, what can we point to and say “This partnership approach is better because...”

No matter how philosophically attractive partnering is, to justify public policies that include partnerships, we must still find ways to demonstrate that collaborative policy interventions are worth the time and effort. My research with Gordon Kingsley has focused on evaluating the partnering aspects of programs implemented by government funded math and science education partnerships (MSP's)<sup>8</sup> that combine the resources of institutions of higher education (IHE) and K-12 institutions. This research is important because the value added specifically attributed to partnering is poorly documented in the literature and yet, some value of collaborative partnerships is implied in the requirements to partner increasingly included in federal and other grant programs (See for example, Jones, 2008). This work contributes to the growing body of research on partnerships, network studies, adaptive management, and on the evaluation of partnered federal interventions by increasing our understanding of how policy makers might better deal with uncertainty by adaptively managing policy implementation within partnerships. It also sets the stage for future work on adaptive management in other policy domains.

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<sup>8</sup> For example, the National Science Foundation funded Math and Science Partnerships between universities and K-12 institutions that funded this work are included as a specific policy prescription of the No Child Left Behind Act of 2002.

## Research Questions

The motivation for this research is the search for tangible benefits of policies requiring partnerships when implementing government grant programs (Is requiring a partnership good public policy?). These policies have two kinds of potential benefits. First, they supply the programmatic content. And second, they support the development of the partnership and education infrastructure. One infrastructure benefit is the potential for coordinated decision making and sustained deliberation about local policy problems. In particular, this study explores the question of whether policy-induced partnerships in education provide the conditions that allow for adaptive management (a sustainable platform for ongoing dialog and decision making and also the ability to adapt programs to changing or uncertain conditions – newly learned information, environmental conditions, or shifting local community values and needs)?

It is hypothesized that policy-induced partnerships can provide a stable venue for adaptive management of math and science education issues if two conditions are met (*Adaptive Management Hypothesis*). First, these partnerships would have to be sustained over time so that regular iterative interaction can take place (*Sustainability Hypothesis*). And second, a venue for adaptive management would require partnerships that form in a way that participants are permitted to explore problems from multiple perspectives and have the flexibility to develop and adapt collaborative solutions appropriate to local conditions (*Adaptability Hypothesis*). In this study, I explore the potential for *Adaptive Management* by testing the *sustainability* and *adaptability* of the policy-induced math and science education partnerships. Establishing that the conditions that make adaptive management possible exist within these partnerships sets the foundation for future work.



### *Sustainability Hypothesis*

The *sustainability* hypothesis is built upon an underlying set of questions. First, what do we mean by *partnership* and then what do we mean by *sustained*? In order to provide a baseline for understanding what it is that is being sustained we need to establish a common understanding of what partnership means in the context of math and science education. Second, we need to understand what it is that is being sustained and what makes one partnership more sustainable than another? And finally, we need to explore the drivers of this partnership sustainability.

The literature suggests two important mediators of partnership sustainability (embeddedness and partnership structure). From the work of Granovetter, I draw the concept of embeddedness (1985). Embeddedness refers to the quality of interpersonal or interorganizational relationships. The more positively embedded the set of relationships are (e.g., higher levels of trust, longer history of working together successfully, higher frequency of interaction) the more likely a partnership will be to form (1985, 2005) and presumably be sustained. It is hypothesized that higher levels of embeddedness, will enhance the quality of partnering, and will thereby improve partnership sustainability.

In addition to supporting good relationships, partnerships may also provide a central focus for decision making. If the core of the program management and decision making is done within the partnership, then we would expect the partnership to be the stable core around which activities are conducted. If however, the locus of decision making is somewhere else (e.g., within one of the organizations or in some venue beyond both) then we would expect the partnership to be less sustainable (Human & Provan, 1997; 2000; Milward & Provan, 1998; 2003; Provan & Milward, 1995; 2001). We also

need to explore how centralized the decision process is and who is making those decisions. Localized decision making is likely to increase agility while more centralized control is likely to enhance coordination (Human & Provan, 1997). These conditions should improve the outcomes of partnered work and should increase the sustainability of the partnership. Partnerships with high levels of embeddedness and with the capacity to make decisions should have the highest level of *sustainability*.

### *Adaptability Hypothesis*

The second condition that must be met to allow for adaptive management is that partners must have the motivation and ability to adapt as information, conditions, values, or local needs change. Simply knowing of another organization is unlikely to motivate any organization to choose to engage in a new working relationship. Organizations have goals and are therefore motivated to react to conditions that affect their ability to meet their needs (Oliver, 1990). They act to increase the likelihood of their continued survival. Therefore, organizations are more likely to partner and maintain a relationship when they are highly motivated and able to act. In this study I explore three classes of drivers of adaptation: organizational strategic needs (needs internal to the partner organizations), environmental conditions (conditions external to the organizations like local poverty), and the policy inducements (the incentives that policy makers devise to encourage specific kinds of behaviors or to drive desired outcomes). It is hypothesized that participants in policy-induced education partnerships are sufficiently motivated by strategic needs, local environment and the policy inducements to want to adapt.

In addition to motivation, partners also need the opportunity to adapt. If participants cannot adapt to local conditions because of the rules contained in a policy inducement or by other internal or external constraints then they will not adapt no matter how important the motivation (Basica, Cumming, Datnow, Leithwood, & Livingstone, 2005). When decisions are made and what may be considered are two significant constraints on adaptability. If significant decisions are made throughout program implementation then the potential exists for adapting to changes in learning, values, environmental conditions or needs. However, if significant decisions are made in advance, or from outside of the partnership, there will be serious limitations to any potential for adaptation. It is hypothesized that the rules that constrain decision making in policy-induced partnerships are flexible enough to allow for sufficient collaboration, evaluation, learning and values elicitation to support adaptive management. Partnership adaptability is a function of higher levels of motivation (driven by strategic needs, environmental conditions, and policy inducements) coupled with flexibility of the rules or constraints they operate under. It is hypothesized that higher levels of the motivating factors and higher levels of rule flexibility will lead to greater partnership *adaptability*.

#### *Adaptive Management Hypothesis*

It is hypothesized that policy-induced education partnerships can be sufficiently sustainable to support adaptive management and that the motivating factors under which education partnerships operate are sufficiently high and that the rules that might constrain adaptation are sufficiently flexible that partnerships are adaptable enough to support adaptive management.

## **Research Methodology**

This study is based on the qualitative analysis of a subset of the data collected during a 4-round electronic application of the policy Delphi method designed to model math and science education partnerships (Kingsley et al., 2008). This technique is based on the Rand Corporation's paper and pencil Delphi method originally developed by Dalkey and Helmer, refined through the 1950's and 1960's (Dalkey, 1969; Dalkey, Brown, & Cochran, 1970; Helmer, 1983) and continues in use to date (e.g., Chambers, Mullick, & Smith, 1971; Murry, & Hammons, 1995; Rowe, & Wright, 1999; Rayens, 2000; Curtis, 2004). The Delphi method involves a multi-round iterative survey of experts with the intention of developing a better understanding of problems, approaches, or future trends. The results of each round are fed back to the panel for further refinement until consensus, a model, or a range of options is developed.

A panel of 32 experts in the field of math and science education was surveyed on their collective experiences with partnerships between institutions of higher education (IHE) and K-12 institutions (Kingsley et al., 2008). The data were then used to develop a model of education partnerships for use in further research. This study builds from that earlier work. The four round iterative survey was conducted beginning in the summer of 2004 and the final round was completed in the spring of 2005. Microsoft Access, Excel and QSR NVivo qualitative analysis software were used to organize the data and aid in the analysis. In this study the data collected to model partnerships are applied to understanding how sustainable the partnerships are, how readily they adapt to local conditions and if or how these partnerships might serve as a venue of collaborative learning and the adaptive management of local education problems.

## **Organization Of This Dissertation**

This dissertation begins with an exploration of the empirical literature on partnerships as a venue for coordinating and managing publically funded programs, sets these partnerships in the context of current education policy, and then explores adaptive management as a mechanism for dealing with the uncertainties of complex policy problems. It explores two core hypotheses related to the potential for math and science partnerships to support adaptive management. Two hypotheses (a Sustainability Hypothesis and an Adaptability Hypothesis) derived from the literature are empirically tested with data drawn from a four round electronic-Delphi study. Then these results are applied to a discussion of how partnerships can serve as a venue for adaptive management (an Adaptive Management Hypothesis). In Chapter One, I review the partnership literature focusing on the policy context of education partnerships, the lessons that can be drawn from environmental adaptive management, and on the use of partnerships as a mechanism for implementing education policy. Also, the review grounds this study in previous empirical work on program evaluation and network theory.

In Chapter Two I explain the theoretical basis for this work, how the models and hypotheses were developed and show how it builds from and adds to the existing body of work on partnership, adaptive management and program evaluation. In Chapter Three, I explain the research methods used in this study. I explain the electronic-Delphi method used to collect the data for this study (including its history and validity) the selection of the data, and the qualitative methodological approach used for data analysis. In Chapter Four I report on the process of data reduction for the question of sustainability, the process of data reduction for the question of adaptability, and the results from the

hypothesis tests (Sustainability Hypothesis, Adaptability Hypothesis, and Adaptive Management Hypothesis). In Chapter Five, I discuss the results of this study, the policy implications for partnerships and adaptive management and the contributions of this work to existing literature. I also introduce a network model that sets policy-induced partnerships within a wider adaptive network of those interested in a policy issue. Finally, I discuss the limitations to this research and proposals for improved future work.

## **Chapter 1 Partnerships, Policy and Adaptive Management**

In the field of education, practitioners, consultants, evaluators, and researchers are constantly challenged with the need to model and assess the performance of publicly funded programs aimed at addressing a wide range of policy problems. Ideally, funded programs would have a limited scope with clear goals, certainty about the correct mechanism (programmatic intervention) for reaching the desired goals and sufficient knowledge and resources to implement the program or policy effectively. However, implementing public policy through a programmatic intervention can involve multiple organizations, unclear goals or considerable uncertainty about whether or how a program or policy will create desired changes. In order to effectively manage the uncertainty and to coordinate activities we need a venue for coordinating programmatic activity and a process for decision making in an environment of uncertainty. In this chapter, I review the literature on partnership as a venue for coordinating and managing publically funded programs and adaptive management as a mechanism for dealing with the uncertainties of complex policy problems.

Partnerships among individuals and organizations can evolve naturally (as a consequence of some mutual benefit or need) or intentionally (through the action of an outside inducement). In this study we are most interested in partnerships that evolve from policy inducements (grants that require organizations to partner with specific institutional or individual actors as a condition for receiving the funding) in the field of public education. The need to evaluate the effectiveness of policy-induced partnerships and to improve measurement of partnership impacts has led to a growing body of research and evaluation studies. In order to develop a broad understanding of the topic and to learn

from a variety of professional communities, partnerships in a variety of policy domains (from both the private and public sectors) are reviewed.

Adaptive management is an approach to public management that has evolved from a variety of theoretical sources (e.g., philosophy of science, psychology of learning, business management, professional practice in education and elsewhere, and most importantly from ecosystem management) to aid in decision making when a problem is complicated by conflicting values or when there is insufficient information to make correct decisions obvious. Adaptive management can be best characterized as a process of exploring problems at appropriate scales, utilizing reflective learning and iterative decision making based on practical experience, and conducted in a particular place. In an attempt to bridge the partnership literature in both the public and private sectors, this study is focused on developing a better understanding of motivations to partner (a theme drawn from the private sector research), on the kinds and quality of relationships that develop (themes drawn from the public sector and social network research), and on the results of partnered work (a theme drawn from the environmental management and evaluation literatures). This chapter reviews the literature taken from these fields in an effort to synthesize the concepts and measures used in the study of partnership with those of adaptive management in the context of education.

### **1.1 The Policy Context For Math and Science Partnerships**

The term partnership has been used in recent years to describe a mechanism for increasing collaboration among various stakeholders, leveraging resources, and coordinating work in many policy arenas. The increasing use of partnerships by public



organizations in general occurs in the context of budgetary constraints and calls for privatization and outsourcing coupled with demands for greater accountability and performance (e.g., Savas, 2000). Rules or policy inducements that encourage the creation of networks of actors spanning sectors and / or levels of government are increasingly being included in programs at the federal level (Hall & O'Toole, 2004; Jones, 2008). In public education, this trend builds on a long history of reform movements including those aimed at leveraging networks in the seventies (Cohen and Lorentz, 1977) and building progressive communities of educators in the eighties, nineties and beyond (Chubb & Moe, 1990; Moe & Chubb, 2009; Dufour & Eaker, 1998).

The Math and Science Partnership (MSP) program developed under Title II of the No Child Left Behind Act of 2001 is one recent attempt to address problems in teaching practice and accountability in public education and proposes close partnerships between K-12 schools and Institutions of Higher Education (IHE) to create a better learning environment for children.<sup>9</sup> While neither K-12 schools nor IHE need such partnerships to survive, there is a long tradition in education of fostering learning communities among educators that is built upon the assumption that participating institutions will benefit from increased connectivity and interaction. The specific policy tool used to stimulate partnership under MSP is a set of eligibility criteria within the federal grant application. Applicants are required to demonstrate that a substantive partnership between K-12 schools and IHE will be formed to engage in the proscribed programmatic improvements in math and science education (e.g., teacher training, curriculum development, remedial

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<sup>9</sup> MSP is one example of a class of partnerships sponsored by the federal government through grant programs. Other examples in education include, for example, the Manufacturing Extension Partnership sponsored by the National Institutes for Standards and Technology.

after school or Saturday programs).<sup>10</sup> These relationships must include faculty from the Arts and Sciences, faculty with content knowledge in math and / or science. The grant requirements encourage the participants in the newly constituted partnership to change their past behaviors and to engage in reciprocal learning and organizational adaptation (on the part of both the K-12 and higher education partners).

However, regulatory mandates (in the case of the MSP program these are in the form of eligibility criteria for the grant) are a weak tool for encouraging organizations to change behavior when compared to requiring specific actions by rule or law (Salamon, 1981; 1995). While K-12 schools face regulatory requirements (stemming from the No Child Left Behind Act and other state and local mandates) that may stimulate their interest in trying new partnered approaches, it is less certain that the IHE confront similar pressures. This difference has important implications for understanding the types of partnerships that might develop from grant programs (The IHE will need some compelling external reason to participate in partnered interventions).

Partnerships typically form when two or more organizations know *and* in some way need one another. The intensity and quality of the connection is therefore likely to differ by how valuable the partnering is perceived to be by the participants (or in the case of a grant-based partnership by the perceived value of the outside inducement). One common understanding of a high quality partnership is one in which the partners are closely bound to one another, share common goals, share liability and risk, and have a

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<sup>10</sup> The application for a MSP grant under the National Science Foundation's request for proposals requires specification of a program that is "partnership-driven" where the core partnership is between universities and K-12 institutions. The core partners are to commit to strengthening teaching practices on the university side while K-12 institutions commit to providing an environment in which teachers, administrators and other staff can grow. Further, the partnership (and its impacts) should last beyond the funding of the MSP.

mutual interest in adapting behavior to one another in the pursuit of shared objectives. However, studies have found that organizations tend to require compelling environmental pressures to engage in such potentially invasive and integrated relationships (e.g., Aldrich, 1976; 1999). Typically, they must really need each other (knowledge or resources) or believe that their survival chances are improved by working together. Absent such needs we might anticipate a broad range of inter-organizational relationships under the label of partnership ranging from highly engaged collaborations to less engaged resource coordination (Kamensky & Burlin, 2004). The variation in organizational structural arrangements, behaviors and partnering intensity (how the partnership operates) is likely to lead to variation in the kinds of programmatic approaches explored and attempted by the partners and in the potential for adaptively managing policy issues.

## **1.2 Adaptive Management and Public Policy**

Adaptive Management,<sup>11</sup> and more generally concerns over how best to incorporate scientific knowledge into exploring complex problems and then making sound policy decisions draws on a growing and diverse body of literature including the philosophy of science (Kuhn, 1962), social learning (Argyris, 1982; 1999; Argyris & Schön, 1974; 1978; 1996), business management (Senge, 1990; Formica, 2003), ecosystem management (Costanza, 1994; Gunderson & Holling, 2002; Gunderson,

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<sup>11</sup> In this study, references to ‘adaptive management’ use the term loosely, in the philosophical context of experimental public management (e.g., Norton, Lee, and Gunderson & Holling). However, while the author recognizes that the term can be used to mean a specific type of experimental ecosystem management (e.g., Walters), it is the more general definition that I apply to the broad context of public management. It seems that this broader application of the term is more in keeping with the philosophical ideas handed down from early pragmatists and writings of Aldo Leopold.

Holling, & Light, 1995; Holling, 1978; 1996; Kentula et al., 1993; Lee, 1989; 1993; Norton, 1982, 2003, 2005), professional practice in a number of fields including education (Schön, 1967, 1991), environmental planning (Friedman, 1987; Davidoff, 1962; 1965) and is currently expanding into new areas of policy development (see for example, Cayer & Weschler, 2003; Wise, 2006). The method of adaptively managing involves deciding in a place through some pluralistic process what actions to take and then evaluating those actions according to community goals and values before taking further action. Community utility, program effectiveness, economic efficiency, and social equity are all potentially valid concerns. Deciding how the balance is to be met at a particular time in a local community requires decision making institutions that can evaluate the best scientific information, develop and implement plans and then take responsibility for consequences and future actions (See for example, Ostrom, 1990). However, the development and application of science has changed dramatically throughout history.

Human societies developed a range of approaches to solving problems that have been sometimes more and sometimes much less scientific. In the 17<sup>th</sup> century, the western world's approach to understanding our world began to change from one based on superstition and religion (in which values and beliefs dictated scientific reality) to one that applied reason to understanding the natural world (Descartes, 1952). Others derived the notion that scientific knowledge could be gathered from the experience of the natural world or empiricism (Locke, 1690; 1693; Hume, 1748). Through science, it was theoretically possible to reduce the world's problems to a point where, with enough data, they could be understood, predicted, and ultimately controlled. Scientists focused on

reducing problems to their observable constituent parts, examining the pieces and looking for straightforward and correct answers (truth) and this approach seemed to yield results for a while. Generated by man's perceived ability to objectively observe, rationally understand and predict the complexities of the world, objective *value-free* science became the approach to solving all problems (Popper, 1959). The rational and scientific approach to problem solving separated discussions of fact from normative discussions about what ought to be done (e.g., logical positivism). However, as problems become more complicated, the separation of facts from values has become more and more difficult to maintain.

Today, our science is struggling with value-laden, "wicked problems" in which the nature and scope of the problem is uncertain and defining the problem becomes a part of solving it (Rittel & Webber, 1973). Therefore, we must reject any approach to problem solving that tries to divide our analysis of facts from our discussions about values. Complex problems like those found in making environmental management or education policy decisions do not lend themselves to the older dichotomous process (expertise becomes just one element in finding a best solution). The wickedness of these problems evolves out of conflicting values and an environment of uncertainty about the effectiveness of our policy prescriptions. Our problem solving calls for a more holistic, inclusive and adaptive process to manage this uncertainty.

An historical example illustrating how a relatively simple resource conservation problem from the 19<sup>th</sup> century became complicated by changes in modern environmental values in the 20<sup>th</sup> century will illustrate the need for a more holistic problem solving and management process. In the 19<sup>th</sup> century construction, transportation, and home heating

all relied on a constant supply of wood. Therefore, the greater number of board feet of wood that could be produced, the better it was for society. It was also recognized that there were limits to natural resources, waste was bad, and that conservation was needed (Pinchot, 1910; Leopold, 1933; Miller, 2004). The U.S. Forest Service applied a rational scientific approach to providing as large a sustainable harvest of valued lumber as possible. This meant scientifically managing the forests with a single optimizing value, the utilitarian goal of economically efficient lumber production. Foresters using the best practices they could develop were quite successful at this. However, by the middle of the 20<sup>th</sup> century American society had come to value other aspects of the nation's forests (e.g., diverse wildlife, natural scenery, recreational camping, hunting and fishing, an appreciation of wild places). These other uses and values have conflicted with the goal of efficiently producing board feet of lumber. We now have multiple and often-incompatible goals, which are valued by different people in different ways. Two historical figures, John Muir and Gifford Pinchot dramatically illustrate these differences in values.

Gifford Pinchot was a utilitarian conservationist in the late 19th century (who at one point worked as a forester on the estate of George Vanderbilt). He was integral to the founding of the School of Forestry at Yale University and eventually became the first chief of the U.S. Forest Service (Miller, 2004). Pinchot was a conservationist. He believed that America could manage its forests either as sustainable renewable resources or the forests would be exploited to extinction (Pinchot, 1910). He chose the former approach and applied the best scientific reasoning to understanding, managing and conserving forest resources so that future generations would have lumber. In contrast, Pinchot's contemporary John Muir was a staunch preservationist (Ehrlich, 2000). He went

to wild places and saw trees and birds and forest animals, and he felt something profound. Muir wanted to preserve for future generations not lumber, but the experience he had when he first saw the American wilderness. He convinced then U.S. President Theodore Roosevelt to allocate western lands for national parks like Yosemite, founded the Sierra Club, and Muir Woods redwood forest a few miles north of San Francisco is named after him. Throughout his career he battled for protecting the environment. Muir and Pinchot both valued the forests but for different and incommensurable reasons; what Muir would preserve, Pinchot could not utilize and conserve.

Aldo Leopold eventually suggested a theoretical resolution to the principled dispute between the two differing ideologies (Meine, 1988). Leopold was a forester like Pinchot but came to see wild places in a way more similar to Muir. He graduated from the Yale School of Forestry and worked for the U.S. Forest Service. The bridge between the ideologies of conservationism and preservationism can be found in Leopold's often written about essay, *Thinking Like a Mountain*, which recounts the story of his coming upon a family of wolves while working as a forester (1949). To increase the deer population and to protect livestock forest managers (and ranchers) routinely killed any wolves they found and so it was with this wolf family. When the deer population dramatically expanded due to the lack of wolf predation and finally crashed due to overgrazing, Leopold remembered the wolf family. He realized that his choice to kill the wolves only seemed like a good idea at the time from his limited perspective. From a longer temporal scale, a mountain's scale, it was a mistake. He did not have a long enough perspective or the necessary information to make the right choice. His policy decision was flawed by insufficient information about the long-term consequences of this

irreversible action.<sup>12</sup> Therefore, he realized that policy interventions (especially those with large or irreversible consequences) should be treated as experiments the results of which can be evaluated so that modifications to the intervention can be made as needed.

Leopold's ideas on ecosystem management were further conceptualized by the Canadian forester C.S. Holling, who coined the term "Adaptive Management" to describe a process of experimentally managing a forest ecosystem (1978). In later work Gunderson and Holling suggest that the strength of the adaptive construct when applied to experimental policies is that it follows a natural cycle of "birth, growth and maturation, death" and ultimately renewal (2002, p. 317). Problems can be assessed, policies and interventions can be developed, the results can be evaluated and the policy can die (if unproductive) or be reborn if changes need to be made. This construct is particularly appropriate to considering policy interventions that are implemented through partnerships as they also have similar lifecycles bound by programmatic funding.

The pragmatic environmental philosopher Bryan Norton has built on the work of Leopold, Hollings and others to further refine and conceptualize adaptive management so that it can be applied to ecosystems and to other areas of policy interest. Norton defines

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<sup>12</sup> What Leopold realized was that we might never have enough information in our present time to make truly good decisions from the perspective of the future. Therefore making irreversible large-scale decisions should be done with great care. Because the future will judge our actions we should take a more careful and experimental approach to policy choices. If we have survived till then, in sum, our actions were good. This idea parallels Hadley's concept of Truth as that which survives (1913). Echoing the thought of the founder of pragmatism, Charles Sanders Peirce, this evolutionary conception of truth is at the core of the remarkable philosophy of ecosystem management conceived of by Leopold (This is not surprising as Hadley was the President of Yale while Leopold was in school there). Since we can never have enough information to absolutely overcome all uncertainty, we try something and see how it works. We learn from policy experiments and then let real-world experience be our guide. This approach can be applied in any area of policy whether the environment, or education.



the key tenets of adaptive management as Experimentalism, Multi-scalar Analysis, and Place Sensitivity (Norton, 2003). Adaptive management is not an abstract experimental philosophy of environmental management but a method of learning through doing that can and has been applied to real world problems (Gunderson & Holling, 2002; Gunderson, Holling & Light, 1995; Gunderson, Holling, Pritchard, & Peterson, 2002; Walters, Gunderson, & Holling, 1992). The focus of adaptive management is around a problem or policy issue that is identified in a particular place.<sup>13</sup> The goal of adaptive management is to develop consensus on the nature and scope or scale of a problem (problem definition), approaches to solving the problem as defined, and specific indicators of success. With this information in hand an intervention is chosen and tried. Ultimately the results are evaluated and the intervention approach is repeated (perhaps at a larger scale), modified, or eliminated. Thus policies can be revised by learning from experience or in response to changes in local needs or desires.

Lee argues that ecosystem management and learning can and should be linked (Lee, 1989, 1993). For example, in the Columbia River case the natural reproductive cycle of the salmon was disrupted by power production (dams built along the river broke up and reduced the natural flow of water and prevented salmon from freely traveling up and downstream) (Lee, 1993). Therefore scientists need to have a role in trying to find ways to meet human needs while providing for the salmon and the broader environment. Lee points out the need to build a “civic science” that is based in community experience, so that we might interact with our local environment in a more thoughtful, intelligent, and

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<sup>13</sup> I argue that this place can be bounded by a physical location as is typical with environmental protection but can also be more broadly bounded by an area of policy interest (for example watersheds and public education).

inclusive way (1993). Lee's idea of a civic science fits well with Goodlad's arguments in favor of communities of professionals in education blending the work of practitioners and academics to improve education.

John Friedmann described what he called a conceptual model for planning behavior (1967). Friedmann's model is a single iteration problem solving model. He excluded institutional forms of planning and a time dimension, and only dealt with a single intervention that he called "planning for change" (Friedmann, 1987, p.3.). Problem identification was taken as a given. However, his work points out the need for a process for developing consensus about the specific scope and nature of a problem and then the development of policy solutions that align with community goals and values. His conceptualization of planning moves planners beyond the role of experts to one of facilitating dialog between scientists and the broader community. Building on this idea, Paul Davidoff argued that appropriate actions in planning couldn't be undertaken from a position of value neutrality (1965). Further, "values [what the stakeholders think is important] are inescapable elements of any rational decision making process" (Davidoff and Reiner, 1962). These authors make a case for stakeholder involvement and values elicitation in developing solutions to local problems. The stakeholders form a community of interest around a policy issue.

While some stakeholders may be willing to rely on scientific management and experts as appropriate decision makers, other sufficiently interested people with more collaborative attitudes prefer to have a say in a participatory process (Weible, Sabatier, & Lubell, 2004). Provisions for public participation as part of the policy process are already incorporated in some laws (e.g., Clean Water Act). And, since the days of the Boston Tea

Party, Americans have demanded that those affected by a government policy should have a say in how it is crafted and enforced. The public at some level wants to and therefore ought to be involved. For example, Light found that public participation is an important dimension in evaluating ecological restoration (2000). However, public participation can be as limited as a governing body simply passing on information in one direction (e.g., a typical public hearing) or as complex as a consensus building, multidirectional, transfer of information encompassing both goal setting and values formulation.

Unfortunately, conflicting beliefs over the nature of problems tend to hinder consensus building processes, as Lubell argues; people tend to believe in ways that serve their self interest (Lubell, 2000). Thus the development and implementation of programmatic interventions is slower and more complicated when partners are involved. Also, participants in collaborative processes tend to undervalue nonscientific data or data gleaned from experience (McLain & Lee, 1996). Therefore, even when there is a rich two-way conversation it may be difficult to reach consensus in a policy dispute. Adaptive management can provide a improved structure to the collaborative process.

Lee has argued that adaptive management treats public policies as large-scale experiments (1993).<sup>14</sup> These experiments are rooted in places and managed by local people at a scale appropriate to the problem at hand so that that sustainable future actions can be based on previous experience. Without such experience we are often only guessing what effect our actions will have. Also, without thoughtful evaluation and learning, an iterative process that makes serial decisions and takes serial actions, is

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<sup>14</sup> It seems to me that NSF is potentially conducting a large-scale version of an adaptive management experiment through the MSP program treating each of the partnership projects as a small-scale experiment. This set of experiments can later be evaluated to determine which represent the most successful strategies for improving education.

subject to repeating the same mistakes over and over (as in the case of Lindbloom's (1959) disjointed incrementalism). What is required is a venue or space to, explore the intersection of scientific expertise, local values and needs, define problems, review and evaluate past work, and make decisions about future work. Partnerships can offer that space, providing a table around which stakeholders can gather, learn and decide.

While the strengths and weaknesses of pluralistic approaches are well established in the literature (e.g., Dahl, 1967, 1989, 1994; Garson, 1978; Fischer, 1993) approaches to environmental and education policy problems are becoming more collaborative (Lee, 1993). Lee argues that negotiation and conflict within the political process are a needed characteristic of environmental, and by extension, all decision making (1993). Learning within a process of adaptive management may provide an identifiable value added to the process of partnering. Lee argues for an institutional space for ongoing interaction such that there is a reliable place for ongoing iterative learning to occur (1993). Such a space looks a lot like that what we might find in an education partnership.

### **1.3 Partnership Sustainability**

An understanding of partnership sustainability requires first that we develop a definition of partnership in the context of education and second that we identify the important variables that affect partnership sustainability. The variance in the definition of partnership will affect the way we understand partnership sustainability (what is being sustained?). In Section 1.3.1, I review studies that explore how the term partnership is defined. Section 1.3.2 explains the theoretical basis for understanding how partnered and other interorganizational relationships form, operate, and ultimately end. I consider the

development of partnership as a unique identity in Section 1.2.2. And finally, I explore the structural forms of partnerships and how these forms contribute to the sustainability of programs implemented within partnerships in Section 1.3.4. In the course of this discussion, I further develop two ideas about what partnerships are (partnerships can be seen as interactions among a larger set of individual or institutional actors or they can be viewed as quasi-organizations in their own right).

### *1.3.1 Developing a Working Definition Of Partnership*

Before we can begin to understand the impact partnerships have on policy outcomes we must develop a working definition of the term. A particular working definition will guide important questions about how partnerships are structured or behave, what benefits we might expect to derive from the partnering, and how adaptive management might improve the implementation of education policy. Studies across several policy domains tend to agree on the elements that motivate the creation and structuring of a partnership. Teisman and Klijn (2000)<sup>15</sup> provide a useful summary of these elements: a) for an individual or organizational actor to achieve its goals requires activities by other actors; b) the resources and knowledge for achieving desired goals are distributed across multiple actors so that no one actor has enough to act alone; and finally c) the systems and processes that develop under partnership are complex because they are dependent upon the negotiations of participating actors.

However, beyond this basic description, research designs in the study of partnering splinter in a variety of directions emphasizing a large array of distinctive units

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<sup>15</sup> Teisman and Klijn (2000) use the term actor in an inclusive fashion to refer to organizations or interested stakeholders.

of analysis and models. These differences stem in large part from definitions applied to the term partnership. The wide variety of approaches has led some researchers to view the term as having limited utility. Atkinson (1999) suggests that partnership cannot be defined outside of specific contexts. Burgos (2004) argues in a similar vein that partnership is a floating and empty signifier that varies in meaning between contexts. Unfortunately, the most common approach studies take is to skip the messy business of formally defining partnership all together. However, several studies have taken up the challenge and can be useful to an understanding of school-university partnerships.

In the context of public education, Boyer (1981) gives us a starting place, arguing that partnership is the condition of moving beyond organizational collaboration to a point where common problems are agreed upon, mutual rewards are understood, there is leadership, and a project focus. Goodlad (1988) defines partnerships as collaborative events that grow out of networks of professionals (in education) creating platforms for programs, activities, and projects. Partnerships are both a particular structure and a process through which partners can draw on each other's strengths. Clark furthers this definition by contrasting partnerships with the more general term networks explaining that networks are not a "deliberately designed, collaborative arrangement between different institutions" (1988, p. 37). He distinguishes networks from partnerships by their deliberate design, goal orientation, and collaborative nature. Thus a partnership could be used to implement a particular funded program while the broader community or educational network would lack the focus to do so.

According to Wenger (1998; 2007), there are three elements that distinguish a *community of practice* from other individuals and groups (Domain, Community, and

Practice). The *domain* refers to a specific area of interest (for example math and science education). The members of a community of practice share an interest in a specific issue, problem, characterization of a problem, or preferred policy solution. The *community* refers to the set of relationships that members participate in that enable them to acquire new knowledge or procedures. And finally, the *practice* refers to the shared practice of community members (the lens through which they commonly view problems, skills, and experiences and more basically the common activity in which they as a community are engaged). For example, K-12 teachers are members of a community engaged in teaching.

Members of a community of practice engage in the same class of activities (e.g., teachers in education are more closely aligned to other education professionals or university faculty than they are to say carpenters). However, members of such a community will come from a range of organizations that have a common interest in the practice (e.g., improving teacher content knowledge). Thus acknowledgement of a community of practice that spans organizations can provide a range of benefits to community members for example, providing peer support for senior administrators or others without peers in their home institutions (Wenger, 1998; 2007). For the outside analyst, the additional layer of complexity created (by seating organizations within a network of interested community members) should provide a foundation for explaining phenomena that go beyond the bounds of any one organization (or single partnership).

Bennett and Krebs (1994) also make a distinction between project-oriented networks [partnerships] and more general collaborative networks with interests in issue specific policy areas. Collaboration is the most common term used in definitions of partnership to distinguish them from other forms of group interaction. Researchers

frequently apply a romantic ideal when defining partnership as consisting of “mutually collaborative arrangements between equal partners working together to meet self interests while solving common problems” (Sirotnik & Goodlad, 1988a, p. viii). However, partnership definitions anchored in collaboration will often include additional elements.

For example, partnership can be described as a platform for programs and activities (Tushnet, 1993). Rather than acting as a focused, well coordinated and organized entity, partnerships often enable a range of programs and activities, many of which are generated or influenced by local interests that have varying levels of affiliation with the core activities of the partnership. Tushnet (1993) finds that a single education partnership may serve as a platform for a portfolio of activities with different programmatic foci, distinguishing between professional development, curriculum development and client participation. Therefore, the boundaries of such a partnership must extend beyond the scope of any single policy inducement. Firestone and Fisler (2002) and Gross (1988) find that collaborative partnerships are often formed to create a platform for fundraising to support specific programs and activities sanctioned by participants. Sellgren (1990) takes a similar point of view in referring to economic development partnerships as funding schemes formed around infusions of resources into the local network and given organization through a funded project. Partnerships are thus bounded to and by the funding stream but are embedded within a larger policy network that includes state and federal regulations, mandates, and grants.<sup>16</sup>

Sellgren’s view of platforms parallels Goodlad’s who sees professional networks as the platform from which partnerships emerge (1988). In Goodlad’s view a successful

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<sup>16</sup> This is an especially important idea in the context of policy-induced education partnerships and I build on it in my conclusions.



partnership is likely to have three characteristics “(1) a moderate degree of dissimilarity between or among partners, (2) the potential for mutual satisfaction of self interests, and (3) sufficient selflessness on the part of each partner to assure the satisfaction of self interests by all involved” (Sirotnik, 1988, p. 178). Thus partnerships would naturally develop from intensifying professional connectedness within the network based on complementary interests (and not simply available funding).

Some definitions of partnership stress agreement among participants. Brinkerhoff, writing to the international development community, defines partnership in terms of an exchange between partner organizations (2002a; 2002b). She argues that partnership is “a dynamic relationship among diverse actors, based on mutually agreed objectives, pursued through a shared understanding of the most rational division of labor based on the respective competitive advantages of each partner” (2002b, p. 14). For her it is important that partner organizations maintain their organizational identity and that the intersection of these identities will provide benefits to the partnership. However, like Goodlad before her, Brinkerhoff also notes that this is an ideal characterization and that actual partnerships rarely mirror the complete definition. In practice, Firestone and Fisler (2002) argue that collaborative partnerships are at their core deliberately designed formal agreements between organizations. Harding is more direct, calling, “any action which relies on agreement of actors,” a partnership (1990, p. 110). Thus, the meaning and structure of the partnership is found in the terms and conditions of the agreement.

Another view of partnership is as a venue for interaction. Rose argues that there exists a “third space” that lies between the state or public and the family or individual (Rose, 1999). Within this space there is an opportunity for interaction that is neither

coerced by authority nor based solely on personal influence. It is a space based on mutually beneficial alliances in which negotiations can take place to develop goals, set agendas, and to coordinate actions (Whetten, 1981). Sirotnik and Goodlad (1988b) also use the idea of a venue in a series of case studies to describe partnerships in actual and metaphorical terms. The management of the partnership is based in a particular place like a unit within an IHE designed to coordinate interactions with and among schools or other actors. But a venue is also a metaphor for describing how ideas can come together from various sources, be mixed and mingled, and give birth to new initiatives.

Partnership is also defined as an evolving public governance structure comprised of a network of actors bound by a web of institutional rules, routines, and customs. These structures may be community or place-based (Bloch, Lee, & Peach, 2003) or they may be based on a network structure or community of practice that links professionals in their patterns of work (Goodlad, 1988, 1990; 1991; 1994; Human & Provan, 1997, 2000; O'Toole, 1997; Sirotnik & Goodlad, 1988a; 1988b). Popkewitz (2004) has such networks in mind when defining partnerships as reform structures that link schools, communities, and, in some cases, IHE. A theme that links all of the previous definitions together is the idea that a particular partnership is a single event that can be pointed to, bounded and recognized as a specific interaction (partnership is shorthand for the event).

As an alternative to definitions that describe partnerships from only a single perspective with one correct normative set of characteristics, we might consider the dual nature of such networked arrangements as, for example, they can be viewed from both within and without. Human & Provan (2000), using the analytic tools of social network analysis, find that it is important to consider both “outside-in” and “inside-out” views in

approaches to generating legitimacy and a cohesive identity among partners. An observer looking from the outside in will perceive the partnership as a single bounded entity with which funders and other outsiders interact. These outsiders see the partnership as a particular point of contact, potential recipient of funds, and the party to be held accountable for the use of granted resources. The external legitimacy of the partnership is thus based on a notion of it as a singular entity.

Alternatively, the partners (individuals and organizations) observe legitimacy from an inside-out perspective. Buy-in (or lack of it) from network [partnership] members is important to maintaining and thus defining the group identity over time. Members look to the partnership as a venue for dialog in which their concerns and desires must be addressed. Failure to maintain inside-out legitimacy among partners is therefore likely to result in network ineffectiveness, instability, and eventual dissolution (Human & Provan, 2000)<sup>17</sup>. In the following two sections of this work I organized studies according to factors affecting the lifecycle of an entity-based ideal partnership and how partnership can be seen as an identity.

### *1.3.2 Formation / Lifecycle*

Embeddedness refers to the history of the relationships among the partners and their key agents from their formation and throughout their lifecycle. Case studies have

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<sup>17</sup> Human and Provan (2000) is a follow-up study to earlier work on two wood product industry networks (i.e., Human & Provan, 1997). Two approaches to building legitimacy are explored and both work during network formation (they are described as outside-in and inside-out). The authors noted that legitimacy built from the inside out provides a base from which external legitimacy might be built. However, networks that are built on external legitimacy are hollow and are prone to collapse absent internally generated legitimacy, especially when outside funding ends, as was the case in their study.

found that the inter-organizational and / or professional relationships observed in partnerships can be very long-lived, exhibiting varying levels of activity and dormancy depending upon whether the partners have been successful in attracting funds (Barber and Borman, 2004; Fendler, 2004; Gross, 1988; Sirotnik and Goodlad, 1988a). It is not uncommon to see reports in the literature where the partnership or the underlying network has had working relationships for decades. While embedded relationships can be positive or negative, Granovetter (1992) argues that embedded relationships are the building blocks that allow organizations to work together. In addition, researchers from various fields have also argued that mutual goals are more likely to be met when partnerships and similar forms of interorganizational relationships are built upon embedded relationships (Goodlad, 1994; Gulati, 1998; Gulati & Gargiulo, 1999; Sanders & Epstein, 2000). Therefore, the starting point of any partnered interaction is some level of positive embedded relationship (connectivity).

In addition to connectivity there must be some motivation for organizations entering a partnership. Burt (1992), writing on networks and increasing social capital, argues that organizations enter partnerships for rational reasons (e.g., to gain resources, increase control or coordination, to gain knowledge or expertise). Thus pursuing fulfillment of an organizational strategic need is one motivation for forming a partnership. Goodlad (1988) for example, pointed out the need for better coordination among teachers, colleges of education, and of the arts and sciences and suggested a new inclusive partnership fulfills that need. However, Gulati argues, that a purely rational approach to choosing partners is less important than the existing environment and

socially embedded set of relationships (Gulati, 1998); embedded relationships are based on the particular goals and interests of the potential partners.

In a study of one educational partnership, Borthwick (1995) reported that, in the beginning, members sought to focus on long-range goals and included individuals at all organizational levels in the process. At formation, they also expected that while their goals might evolve over time, they would continue to work together, and that outcomes would ultimately be consistent with the initially developed and stated vision. The frequent long-term interactions based on trust would be focused on addressing specific problems in the context of their local planning and decision making. Firestone (2005) argues that partnership formation can be predicted by an overlap between complementary strategic needs emerging from a set of embedded relationships. However, coercion or other environmental conditions may also be factors in the formation of partnerships.

Brinkerhoff (2002a; 2002b) posits two alternative motivations for partnership formation: mutuality in exchange, which encompasses ideals of fair trades and mutual benefits in partnering, and enhancement to organizational identity, which provides the motivation for choosing particular partners. The greater mutuality in exchange achieved in operations, the greater the likelihood of agreeing to partner and thereby potentially achieving a positive outcome. For example, in the Borthwick case study, members expected activities to be “mutually beneficial” and involve “give and take” (1995, p. 8). Complementary partnership goals at the formation stage of the partnership are likely to enhance the development of effective and sustainable partnership operations. And, when partners perceive that their stand-alone identity is being enhanced there is a greater

likelihood of continuing operational commitments and a greater likelihood of desired outcomes being achieved, both increasing the potential sustainability of the partnership.

### *1.3.3 Partnership as an Identity*

The thing that most often distinguishes a partnership from other characterizations of organizational interaction is the goal-based orientation held by the participants. Wolff (2001; 2001a) argues that this goal orientation goes beyond organizational or even individual self-interest and translates into a common desire for action to address a mutual objective. The development of a partnership's identity is therefore a process of developing a set of objectives and action plans that will define the partnership in terms of what it does (or wants to accomplish). This can mean that the partnership will create its identity around a specific activity limiting itself from participating in activities that do not support that identity (for example a partnership developed to provide professional training to teachers is unlikely to engage in curriculum development unless that activity furthers their primary mission. These activity-based identities would limit the range of interventions that could or would be explored thus limiting a process of adaptive management.

In Human & Provan (2000), the authors analyze partnership identity from both an "outside-in" and an "inside-out" perspective. Those working inside a partnership will experience the partnership through their relationships with other participants (from the inside looking out). However, those looking at a partnership from the outside will see either the intersection of organizational or individual actors or they will see a unique identity built around the activities conducted under the label, "partnership." Developing

this stable unique identity will be one element in building or measuring the impacts of a sustainable partnership. Without a relatively stable identity there is nothing to bound or separate the partnership's participants and activities from the normal work of the interacting organizations. This separation is needed to evaluate the unique contributions the partners provide to the successful implementation of partnered policy interventions.

#### *1.3.4 Partnership Structure*

Partnerships can emerge from a set of professional relationships among educators in the K-12 and IHE communities. Goodlad (1988) argues that these relationships are best understood as a network of education professionals.<sup>18</sup> The network can vary in the size of the geographical domain but in most cases it has a geographical bound. Members of the network may share a common professional interest in improving school performance, but they are not involved in a “deliberately designed collaborative arrangement” (Clark, 1988, p. 37). They are however, the basic infrastructure that might support the formation of goal-directed partnerships. This has led Goodlad and others to advocate that professionals and funding agencies pay attention to developing professional networks in order to create a richer foundation for the growth of partnerships.

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<sup>18</sup> Goodlad (1988) provides the most complete discussion of the structural elements associated with school-university partnerships. The partnerships in his examples create new institutions (Professional Development Schools or Centers of Pedagogy) typically based at an IHE. Goodlad's centers of pedagogy serve as venues for collaboration and learning and for improving teacher training in the United States. National Network for Educational Renewal (NNER) sites have impacted K-12 schools (250+) but little impact on IHE has been documented (see Cole et al., 2002 and Cole & Ryan, 2001 for an exception). Under Goodlad's model, there is a controlling authority typically based at an IHE that would manage contact among K-12 teachers, arts and sciences, and teacher education faculty.

Studies have found that partnerships are more likely to emerge from professional networks as partner organizations use their relationships as a means for dealing with environmental conditions and mitigating uncertainty (Stearns, Hoffman, & Heide, 1987; Provan, 1984). Thus education partnerships might develop as an adaptive response to outside stimuli (e.g., environmental conditions or policy inducements). Many authors make similar observations but do not pick up the explicit language of networks. Instead they favor broader descriptions of the environment in terms of common set of interests, broadly envisioned goals and/or policies (Gross, 1988; Le et al., 2004; Popkewitz, 2003; Williams, 2002), a set of problems requiring a response from multiple organizations (Bloch, Lee, & Peach, 2003), or a set of strategic decisions affecting multiple organizations in complementary ways (Teitel, 2003).

When partnerships are created, studies describe a variety of ways in which the resulting programs and activities are controlled and coordinated. Some practitioners advocate for limiting the formal structure of partnerships. However, Smock (1999) reviewed partnerships that varied in their formal structures concluding that partnerships without structure have more problems forming, recruiting new members, implementing programmatic activity and with accountability. For example, Goodlad describes a partnership from a single organizational perspective as if it is a new institutional entity.<sup>19</sup> He describes a core group that performs administrative and coordination functions for the

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<sup>19</sup> Goodlad's entity orientation is easy to understand as the partnership form he is most often referring to is a professional development school set up as a new organization to manage the three-way connections between K-12 schools, arts and science faculty, and education faculty. It is important to note that education faculty (who train teachers in teaching) are distinguished from arts and science faculty (who train college students in their specific fields of study). This distinction in education practice lends itself to requirements that grant recipients draw specifically from arts and science faculty.



partnership labeling it a “governing board” comprised of senior administrators (e.g., deans and school superintendents) from the partner organizations (1988). This board manages the partnership activities and forms the basis for its interactions with those outside of the partnership. Similarly, Firestone and Fidler (2002) refer to a “steering committee” formed by a school principal and the IHE liaison after it was recognized that an inclusive decision process was needed. Gross (1988) explains that to be successful a partnership needs a central focus with firm and substantial time commitments from partners, financial and secretarial support, top level support from senior administrators, set decision making processes, and links to others in the network. All of these authors view the management of the partnership as something internal and centralized as if it is something separate from the partnering individuals and organizations. In contrast, Human and Provan (1997, 2000) describe the establishment of an administrative network to provide control and coordination. At times the administrative network is comprised of resources drawn from across multiple organizations and at other times within a single partner organization to manage relations between partners (in their case a partnership among numerous wood product manufacturers for economic development purposes).

Variability in control and coordination structures raises the important question: Who benefits from such structures? Human and Provan’s (2000) work points to internal and external legitimacy benefits for networks. In this case the benefits can accrue to the partnership as a whole or to the individual organizations that comprise it. Provan and Milward (1991) point to a distinction between another two kinds of outcomes from

network interactions. First there are the impacts to the partner organizations<sup>20</sup> (In the case of IHE and K-12 institutions these impacts are mitigated by how much of the partner organization is actually committed to or involved with the programmatic engagement). The second type refers to impacts on policy goals or to clients as transmitted through programmatic activity. In IHE and K-12 partnerships these clients might be teachers receiving in-service continuing education or students participating in education programs.

It may be difficult to understand what partnerships do and what impact they have by looking at or defining them as a single event, organization, or activity. Tushnet (1993) concurs noting that the underlying set of professional relationships and varying policy environments are difficult to conceptualize as a single phenomenon. While Tushnet does not make the argument explicitly, her study suggests that education partnerships inhabit various environments by engaging different networks and / or policy environments depending upon the tasks that they pursue. Thus, a partnership that begins with a professional development focus may experience the need to reach into a new community of professional expertise to engage in community development or curriculum development depending on the changing task or target audience.

In MSP, and other grant-based programs, benefits to a target population or policy goal are the primary focus of the partnered activities.<sup>21</sup> Thus an integrated structure (as seen from the outside-in) that accepts external resources must be able to use them both internally and more importantly pass them through to the programs being delivered by those outside of the highly integrated components of the partnership. When

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<sup>20</sup> These impacts are referred to in the MSP program as elements of organizational transformation.

<sup>21</sup> This is in contrast to private organizational partnerships in which the organizations themselves are the most likely intended beneficiaries.

administrative functions are separated from programmatic functions and their clients or target populations, thus reducing integration, some activities (the programs) are supported by the structure but are not directly connected to all other actors within the network.<sup>22</sup> Taking this just a bit further, when the separate activities are managed by partners and not actors who report directly to the administrative network there is no longer a single homogenous structure to observe but one that clearly has distinct components that potentially operate in very different ways (e.g., STEM partnership administrators vs. education program implementers).

Having separation and distance between operational functions of a partnership or broader network can have both positive and negative consequences. Provan & Milward argue networks will be most effective under “structural conditions of centralized integration and direct non-fragmented control” (1995, p 23). They argue that networks that are centrally controlled and organized administratively, and loosely connected at the organizational level, will be more effective than organizations that are both centrally controlled and highly integrated at the organizational level. Dual integration they argue leads to excess complexity and to inefficiency (Provan & Milward, 1995). Therefore, when we look at partnerships structure, an increasing network density measure reflecting more interaction or collaboration may not be a good indicator of goal enhancement or partnership quality (White, 2003).

Granovetter (1983) found that it is the weak ties, rather than strong ties at the individual level, that influence policy. Multiple weak ties can influence large groups and

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<sup>22</sup> Additionally, in grant based service delivery programs we have clients receiving programmatic services who may never interact with or be aware of the administrative core of the partnership.

therefore spread policy ideas more generally. However an individual's far fewer strong ties (direct and regular contacts) have a much shorter reach. Ideas are transferred through a person's entire web of contacts. The work of Granovetter is similar to the Lin's work on social capital in that Lin argues that the richness of a social network is generator of the excess value or social capital (Lin, 2001). Simon (1962) points out another reason to be wary of overly strong connectivity arguing that tightly linked networks are "deviation amplifying" meaning that tight links spread problems to other units faster than more dispersed or weakly connected units; this increases the dangers of 'group-think.'

Another benefit to creating some distance, as Firestone and Fisler argue, is that the, "professional community ideal is more feasible in subunits of a partnership than for a whole partnership" (2002, p450). Communication among all units within a partnership, especially a very large one, is likely to consume too many resources to be of great benefit, but communication within programs or among similar programs can be used to coordinate and aid implementation.

Partnerships vary with regard to the amount of central direction that they exert over programs and activities. This is dependent in part on the stimulus that draws or supplies the financial support. Often partnerships are formed in the hopes of attracting resources (see Firestone and Fisler, (2002) or Gross (1988) for detailed case studies of such endeavors). In other instances there are outside funds driving the creation of the partnership (Teitel, 1996, Tushnet, 1993; Rice, 2002; Williams, 2002, Le et al, 2004). When the partnership is the fiscal agent for a grant, it enhances (though, as many case studies have demonstrated, it does not ensure) the capacity and apparent legitimacy of the partnership to act in a directive manner with regard to the associated programs and

activities (Yin, 2005). Control over the money gives the partnership's administration power that it would lack if one of the partner organizations had financial control.

While individual institutions also have a role to play, the assumption of some value-added to partnering suggests that the system (including all participating individuals and organizations) will produce benefits that the individual organizations are not capable of providing on their own. The presence of these benefits should increase the ongoing stability and sustainability of the partnership. People in "formal boundary spanning roles have special potential" as leaders that can contribute to the formation of, and facilitate communication between, professional communities and between the administrative core and program elements of a partnership (Firestone and Fidler, 2002, p.451). The role of the boundary spanner even when not formally empowered is particularly important (they increase social capital) as they can fill in the gaps, making connections where formal communication or control structures are absent (Burt, 1982). Thus education partnerships (including their administrative and operational actors) and the networks in which they operate are connected through special individuals serving as boundary spanners to serve their clients (Stevens, 1999).

The preceding discussion has outlined five broad, interrelated categories of actors within partnerships including: the partner organizations and their representatives, the partnership's administrative core, the programmatic or service implementation network, individual boundary spanners and the clients or the intervention's target population. The discussion has focused on the way various researchers have explored the relationship between structural arrangements and impacts to organizations and/or a program's target

population. The following discussion will explore partnered program implementation and the operation of partnerships from a behavioral perspective.

#### **1.4 Partnership Adaptability**

The two conceptualizations of partnership discussed above lead to very different sets of questions about how partnerships and their activities are bounded and how the partnerships might react to evolving organizational strategic needs, environmental conditions, or policy inducements. A more organizational approach to partnership limits the boundaries of the partnership and its activities to things within the scope of the partnership or those directly controlled by the decision makers of the partnership. An interorganizational relationship conceptualization of partnership leads to a broader network of connections and activities and to greater difficulty bounding the partnership and the partnering. In this chapter I explore the ability partnerships have to adapt. I begin with an exploration of partnership Implementation and operations in Section 2.4.1. In Section 2.4.2 I discuss the importance of collaboration to the notion of partnership. The decision making processes utilized and the use of evaluation in partnerships are discussed in Section 2.4.3).

##### *1.4.1 Implementation / Operation Factors*

From a behavioral perspective, partnerships can be conceptualized as entities (by what they agree to do), as processes (by what is done through them), or as places or venues for interaction (by what is done within them). Partnerships can administratively take action, facilitate action or be the venue for interaction among other actors (Firestone

& Fisler, 2002; Tushnet, 1993; Van de Ven, 1976). The likelihood of taking action is mitigated by the participant's motivating factors (e.g., Rachel Carson's book *Silent Spring* (1962) created a strong motivation to address toxic pollutants in the environment).

Programmatic adjustment assumes that there is room for actors to make changes in their operations. However, externally funded programmatic interventions are designed, implemented and evaluated with specific tasks and expected outcomes in mind. The process of implementing a program assumes that the choice of intervention is already made. Looking at alternatives is not something that would be done at the program level. Therefore, a successful program is simply one that is effective as well as efficiently and equitably delivered. Taking opportunities to explore alternatives in the face of performance-based initiatives is often overlooked (Moynihan, 2005), however within a partnership context, there are opportunities to learn, debate and make different choices.

One factor found to influence the success of partnerships is the degree of interdependence that actors have among one another in conducting the agreed upon program of work (e.g., Thompson, 1967; Clark, 1988). Education researchers such as Clark (1988) have drawn from Thompson's (1967) conceptualization of work interdependence. Pooled work refers to low levels of interdependence as each partner contributes work to partnership outcomes independent of one another. Work is sequential when one partner (or even a program) is dependent upon the work of another partner (or another program activity). This work, in turn, may later be an input for another partner or program's work. Sequential work has a higher level of interdependence than pooled work. The final level is called reciprocal, which refers to a pattern of work that exhibits the highest level of interdependence. The work of each partner (or even program) is

shared back and forth with other partners in a collaborative fashion, each depending on the other to make their contributions in order to create a final outcome. The coordination of partnership work becomes more invasive and more costly as the level of interconnectivity increases. Creating standards can provide coordination under pooled interdependence, and planning will suffice for sequential arrangements but mutual adjustment (adaptation) is required for reciprocal working relationships (Clark, 1988).

Choice-making by organizations is broadly discussed under the heading of organizational learning (Argyris, 1999; Isaacs, 1993; Jacobson, 2001; Senge, 1990). Single-loop learning involves measuring a singular linear operational process. Within partnering, it is trying to find a better way to implement the current program. It is comparable to a process of continuous quality improvement. Double-loop learning however, goes a step further and asks why are we implementing the program in the first place? Are we getting the results we expect? We engage in double-loop learning when we take an opportunity to look at other options, to make choices and possibly change what we are doing if we are not seeing progress. This type of learning involves an iterative interaction in a venue (like a professional community or within a partnership) where values, expectations, goals and options are evaluated and new choices are made based on evidence gained through practical experience.

Webb defines alignment as “the degree to which expectations and assessments are in agreement and serve, in conjunction with one another, to guide the system toward students learning what they are expected to know and do” (Webb, 1997, p. 3). Alignment is also a measure of how expectations of programs, materials or curriculum translate into assessments of desired outcome measures. For example, poor alignment would refer to



assessment measures that do not accurately reflect the topics taught in the curriculum. In addition to gauging the alignment of curricula to assessment tests, alignment might also be taken more broadly to include the behavior of the partnership's individuals, groups, and organizations interacting at varying levels. For example, Provan and Milward (1995) refer to the alignment of services with the needs of clients in a system of healthcare providers. In their study, they noted that in addition to system structure, control mechanisms, environmental conditions, and sufficient resources (measured at varying units of analysis) were important to partnership effectiveness.

A thorough review of the behavioral approaches to the study of partnership is made difficult because there are so many potential units of analysis (including the partnership itself, subunits within the partnership, the partnering organizations, and individuals). Partnerships have been conceptualized as entity-based, collaborative decision making institutions (Leach & Pelkey, 2001; Leach, Pelkey, & Sabatier, 2002; Wondolleck & Yaffee, 2000). In essence, the entire partnership serves as the unit of analysis. The work of Tushnet and Human and Provan make clear that there are distinctive groups at work inside partnerships; some focused on coordinating the efforts of the entire partnership, others focused on specific programs and activities. From this perspective groups and teams of actors may provide the best perspective for observing partnerships. And, from the perspective of organization theory, the organizations and their interorganizational relationships provide two more points of view (e.g., Thompson, 1967; Whetton, 1981; Provan & Milward, 2001).

As we learned in Section 1.3.4, the relational structures of a partnership that may lead to organizational change or programmatic outcomes can be observed in an aggregate

way through the networks of professionals and organizations. Thus, partnerships can be seen as engagements that emerge out of loosely coupled networks of professional affiliation (Weick, 1976). Alternatively, they can be viewed as entities that behave in ways that are quite different from the organizations that developed them, may have their own legitimacy, and may pursue goals that differ from those of the parent organizations. However, educators have also thought of networks and partnerships more broadly as interactive learning communities, and thus as venues for idea exchange and leveraging information gathered from outside their operational base (Cohen & Lorentz, 1977).

#### *1.4.2 Collaboration / Decision making*

Recent literature has reviewed and summarized the results of collaborative processes (e.g., Switzer, 2001; Potoski & Prakash, 2004). Broad public participation in the policy process has met with mixed results. Potoski and Prakash (2004) concluded that environmental groups can pressure regulators to be hard on polluters but they often do not distinguish between companies that are trying to do better and those that are not. They found that this pressure has kept some firms from participating in voluntary government programs. Thus, environmentalists may actually be slowing the progress of environmental improvement by participating in the process. Alternatively, the potential threat of regulation may give the regulator additional bargaining power thus increasing the effectiveness and efficiency of voluntary agreements as a policy tool. Voluntary compliance is highest when there is a credible threat and good monitoring of compliance. However, if incentives for participation are weak or entail a limited commitment, the

voluntary approaches to environmental improvement are neither effective nor efficient (Alberini & Segerson, 2002).

Another limitation to collaborative processes is the lack of certainty over what will happen. When a government body or funding agency makes a rule and enforces it, all players know what to expect and how to act. However, when a collaborative process begins, there is some fear on the part of stakeholder groups that the rules all change. Either information given in confidence will be used against a participant or that no rules will be enforced while everyone is talking. To address this problem, Potoski and Prakash point out the effectiveness from a game theory standpoint that repeated face-to-face interactions among parties has on building the trust needed to continue working together (2004). Thus, iterative collaborative interaction increases positive embeddedness.

Collaboration is also thought to make government rulemaking more responsive to stakeholders. Langbein argued that rulemaking agencies often delegate implementation and enforcement activities but rarely delegate rulemaking authority (2002). A process of regulatory negotiation is an exception to this tendency. However, fairness can become a problem as those with more resources can get greater responsiveness from rule makers. They found that rulemaking was more responsive to stakeholders when negotiated but that the results may be more unequal than conventionally written rules (Langbein, 2002). However, game theory predicts that such inequality is likely to improve as extended interactions [games] occur (Axelrod, 1984, 1997).

Participation seems to work better within persistent incremental processes. Strong leadership around a specific policy issue or location (e.g., a district, watershed or stream) helps to keep the process on track (Wondolleck, 1985; Wondolleck & Yaffee, 2000).

Wondolleck & Yaffee advise that fostering ownership and commitment is key (2000). In a set of environmental planning cases from the Great Lakes region, Beierle and Konisky found gains through public participation and also found that communication, trust, and commitment are important to the collaborative process (2000). Yet, some authors point to the tenuous and sometimes contentious nature of collaborative partnerships (e.g., Scheberle, 2000).

Partnerships are made up of people. They require a balance of trust, fairness, mutuality, communication, and commitment for success (Lewis, 2000). In another example, Leach, Pelkey, and Sabatier (2002) chose to evaluate the effectiveness of watershed partnerships. The authors discuss what watershed partnerships have accomplished in the in California and Washington, suggesting that stakeholders' perceptions of success are mixed. The authors believe that collaborative partnerships have been most effective at addressing local problems. However, they found some partnerships actually aggravated problems involving the economy, regulation, and threats to property rights (Leach & Pelkey, 2001; Leach, Pelkey, & Sabatier, 2002; Sabatier, 2002). Still, on balance collaboration is philosophically attractive, and may be the best hope for solving complex problems in a variety of policy arenas. The key lessons are: keep the scale appropriate to current local problems, create an institutional space or partnership for iterative experimental learning and interaction, and maintain regular communication. As noted in Section 2.2, adaptive management is a community-based process that has all of these characteristics.

From a learning community perspective we want to observe the relational, knowledge, and resource exchanges within the education community and, in turn,

measure their impact on either partner organizations or program goals. However, one cannot assume that the processes and behaviors exhibited by smaller groups will be the same or even similar to behaviors observed and aggregated across an entire network of partnership actors. The partnership literature is silent on this issue. This is largely an artifact of the evaluative nature of the literature, which privileges case study methods and research designs limited to one program or site. Case studies allow for observations that blend the behaviors of networks, organizations, work groups and individuals in a common narrative thereby obscuring their distinctions.

One concept in the study of partnerships that seems to transcend this multiplicity of potential social actors is collaboration. Most research assumes that partnerships are collaborative in nature. However, partnership studies for the most part do not specify what constitutes collaboration or whether the use of the term is distinctive from near neighbors such as cooperation or coordination. A variety of scholars have tried to make sense of these terms by developing continuums for classifying and measuring partnerships (Clark, 1999a; Clarke, Davis, & Rhodes, 1998; Crawford, 1998; Goldman & Intriligator, 1990; Pirkis, Herman, Schweitzer, Young, & Grigg, 2001). The continuums use a variety terms such as “communication”, “contribution”, “coordination”, “cooperation”, and “collaboration” to distinguish levels of relationships among partner organizations (e.g., Taylor-Powell, Rossing, & Geran, 1998, p5.). However, no field of inquiry has developed a standardized set of definitions or measures for these dimensional properties. While there is little agreement between researchers on the precise definitions or ordering for these terms, there is a sense that an ordering exists, that it is based on intensity of interaction among partners, and that more interaction leading toward

collaboration and institutional integration is better and results in a more fully functioning and therefore better partnership.

#### *1.4.3 Evaluation / Outcomes of Partnership*

School-university partnerships have become an important part of the education community; however, the methods used to evaluate these partnerships varies. Few educational partnerships use rigorous scientific-based methods to evaluate specific outcomes of their programs, although that number is increasing. Most program administrators favor descriptive case studies, analysis of perceived benefit, or, in a few cases, the continued existence of the programs as methods / metrics for partnership evaluation. The reasons for the different evaluation methods, difficulties in evaluating the outcomes of an education partnerships, and the lack of consensus on evaluation are each significant to understanding the impetus behind this study.

The literature on professional development school activities does include scientific-based evaluation methods and clear outcome measures. It draws from a structured field of research in education: teacher instruction and professionalism. In this field, gender studies and critical theories have been influential in pushing approaches towards empowerment and action/participatory research approaches (Darling-Hammond, 1994), so the collaboration implied in partnering appears conceptualized more broadly within that frame. Wiseman and Knight (2003) identified two themes in evaluation literature focusing on different outcome types. One proposes changes in the instructional practices of teachers as an outcome (Teitel, 1997; Firestone, 2002; Borthwick, 1995). The

other theme attempts to pioneer studies that measure improved educational achievement of students as an outcome (e.g. test scores, drop out rates) (Wiseman and Knight, 2000).

There are studies that are based on the Holmes Group Partnership (1986) publication that focus on processes, pre-service and in-service teacher perceptions, and program features such as the work done by Abdal-Haqq (1998) and Book (1996) studying professional development in schools. The work on partnership formation led to identifying some differences in the ways schools and universities go about their work. It was found that partnership formation increased opportunities for teachers to be involved in school settings (Shen, 1994; Teitel, 1997; Yerian & Grossman, 1993) and that partnering allowed for more collaborative professional development activities for both teachers and university faculty (Book, 1996).

Program evaluation literature seems to be drawing from stakeholder evaluation and the need for formative evaluation more generally (Baum, 2001; Brinkerhoff, 2002; Jacobson, 2001; Stevens, 1999; Popham, 1993)<sup>23</sup>. In particular, Stevens (1999) highlights the fact that some of the outcomes used in partnership evaluation may be merely superficial achievements and that most literature on partnerships focuses on mature settings, not on how the program developed and what it overcame. For example, Darling-Hammond (1992) authored a study of the perceived benefits of participation in joint inquiry for school and university faculty that examined the impact on teachers, future teachers, and, to lesser extent, university professors as well as how schools and

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<sup>23</sup> I think it is important to note that basic research and evaluation studies are similar but for different purposes. As evaluation studies are engaging in assessing the impact of a particular program in a particular place, their results more closely resemble the data gathering needs of adaptive managers. However, empirical research has the broader goal of generalizability not required of evaluation studies.

universities change as a result of their collaboration. Alternatively, Popham (1993) refers to goal attainment models of evaluation referring to Tyler's work in the 1930's on behavioral approaches to evaluation. In this approach the specific goals need to be finely detailed and measurable to determine if the goals are met. The focus is on the level at which desired and prespecified goals are met, not on other benefits due to happenstance. However, a common theme throughout educational evaluation studies is that measuring outcomes is quite complex since outcomes are different for the different partners involved (Popham, 1993). Additionally, goals can be different for the different partners.

Another characteristic common to studies at all levels of analysis is a curious gap in the research between factors influential for the formation of partnership and factors influential in the operations of partnership (Kingsley & Waschak, 2005). The literature on inter-organizational relations (IOR), has focused on the formation of relationships between and among organizations (Aldrich, 1976, 1999; Isett & Provan, 2005; Whetten, 1981). The evaluation literature on partnerships tends to focus on the operation of partnerships particularly the programs and activities given sanction by the partnership and spends less time on connecting partnering to program outcomes (Tushnet, 1993).

Changes in an intervention-driven outcome measure, (e.g., improved student test scores) are difficult to trace back to a specific education program. Environmental noise makes drawing a clear line of causation close to impossible. However, to help us sort out the varying impacts generated by different partnered and non-partnered arrangements I make the distinction between process-based outcomes and performance-based outcomes. *Process*, refers to the panels reporting of how (or if) they did their work, while *performance*, refers to conventional performance measures of changes in educational



outcomes (e.g., test scores), numbers of clients impacted (e.g., teachers receiving professional development training), or whether specific benchmarks were met.

By its nature, a partnership asks participants to step out of their normal patterns of work. However, not all partnership participants are stepping beyond their normal activities. It is not uncommon for partnerships to be populated by professional development personnel or members of soft money organizations such as research centers and consulting organizations whose work is aimed at bridging their institution with resources available from the environment outside of the organization (e.g., federal, state or private grants).

Beije and Groenewegens' (1992) study of networks in the private sector among commercial actors makes a useful distinction between transformational (organization changing) and transactional (resource exchange) network activities. Human and Provan (1997) applied this approach to their study of small manufacturing networks. They defined transformational outcomes as “changes in the ways the managers of network firms think, act, or both” and in contrast, transactional outcomes “are enhanced resource acquisition or gains in performance” (1997, p386).

The concept of transformational outcomes translates well to the setting of STEM education partnerships. To win a grant award from NSF or the Department of Education, proposals demonstrate that actors entering into a STEM partnership will be drawn into efforts to expand professional networks, learn new approaches to teaching, enhance teacher knowledge of their subject matter, adopt new curricula as appropriate, and show that there is a plan to sustain institutional relationships. Transformational outcomes imply a change in the normal patterns of work by individual participants and their home

organizations. However, the concept of transactional outcomes does not translate as well to education since the types of relationships and values among actors and organizations are different (educators produce value for clients, students or teachers not products that are exchanged for organizational profit).

Partnerships are often identified by what they do or are bound by the funding that supports them. In the literature on community and school partnerships, monetary resources gained through partnership opportunities continue to be used as an outcome measure by local educational institutions (Borthwick, Stirling, & Cook, 2000). Thus a partnership is successful if it brings in additional resources. Also, participants tend to identify the benefits of partnering broadly in terms of enhancing the quality of life within a community. Therefore, instead of a standards-based evaluation, prospective programs implemented through partnerships are deemed effective simply by serving the community or by providing opportunities to interact.

One measure of partnership success, the importance of which is difficult to evaluate, is the continuation of or the sustainability of the partnership itself. Determining whether it is important to sustain the partnered relationships or the partnership's programmatic activities complicates this difficulty. However, a positive outcome for a partnership can be the continuation of the partnering process (whether within the original context of planned activities or within a broader network of potential activities). Since desired programmatic outcomes are often vaguely identified or difficult to measure, evaluations can become trapped in their reflection upon partnerships.

The literature suggests that partnerships between K-12 and IHE bring changes to the usual operating rules for the actors involved, as K-12 schools and universities have

different hierarchies. Several studies argue that K-12 and IHE partnerships face obstacles for true collaboration since the organizational cultures of both are very different, resulting in a high potential for conflict (Goodlad, 1988; 1990; and Goodlad & Sirotnik, 1988; Stevens, 1999; Sandoval, 2001; Tierney, 2001; Timpane and White, 1998). Even the calendars that universities and k-12 institutions operate under are different. These differences help to explain why programs may fail or cease to continue even if both partners are committed to the same goals.

There has been a recent political movement to change from the traditional methods and philosophical approaches used to evaluate STEM programs to instead pursue more experimental methods for evaluation. STEM program evaluation is favoring experimental designs that have the potential to demonstrate causation that can be attributed to programmatic activities. Lawrenz and Huffman (2006) attribute this emphasis on scientific evidence to a larger national educational accountability movement, including the No Child Left Behind Act of 2001. They also argue that recent advances in STEM evaluation go beyond randomized controlled experimentation and include mixed methods evaluation, multi-site evaluation, and include elements of cultural competency. Methodological pluralism is inherent in STEM educational evaluations according to Lawrenz and Huffman. Although specific “scientific” approaches to evaluation should be considered and clear outcomes need to be measured, these tools are most effective when paired with additional assessments such as participant surveys or case studies that allow evaluators to look at the complexity of a program. Without these richer assessments it will be difficult to explain how the complex interworking of the partnership led to specific changes in outcome measures. In the next section, I discuss how the distinctions

in the concepts and measures used to measure and bound partnerships flow from differences in the definition of partnership and what these partnerships do.

### **1.5 Bounding, Measuring and Evaluating Partnership**

One of the greatest difficulties in evaluating the impacts of partnerships is figuring out how to bound the partnership activity and to then measure its impact on programs or desired policy goals. We need to separate the partnering impacts (the excess value) from those of other programmatic activities, environmental factors or from the activities of one or more of the partner organizations. It is not uncommon for partners to attempt to seek synergies from the internal operations and innovations of one partner organization. A common form of this is to “piggyback” partnership programs and activities onto existing programs and working relationships within partner organizations. There are distinct advantages to building within existing organizational operations and infrastructure as the barriers to entry for a new program can then be much lower.

However, when we blend partnered work with normal organizational work it becomes much more difficult to develop measures that distinguish the influence of the partnership program from the normal work patterns of the partner organizations. It is, therefore, not surprising researchers often avoid the causation question, as authors from several fields have pointed out, by rarely evaluating partnership outcomes (Gulati, 1998; Gulati & Gargiulo, 1999; Kingsley & Melkers, 2000; Provan, & Milward, 2001; Riggin, Grasso, & Westcott, 1992). The links between partnerships and effective programs and between program level activities and desired outcomes are poorly understood. Many studies focus on measures of process because such data is easier and much more

straightforward to collect. Since conventional wisdom suggests that partnering will have a positive impact on program level goals we might simply look for evidence of partnering and assume that impacts will be positive. However, because partnerships need resources to operate it may be that the costs of this interaction are greater than the benefits.

Current approaches to observation are better for establishing whether a partnership exists and the level interaction among the partners, rather than for serving as a vehicle for measuring the excess value created through partnering or any actual improvements in programmatic outcomes from partnership. Among the most common strategies for capturing and conveying the dynamics of partnerships is the narrative case study (Franklin, Bloch, & Popkewitz, 2003; Sandoval, 2001; Sirotnik & Goodlad, 1988a). Case study narratives describing the creation and operation of a partnership skirt many of the unit of analysis problems noted above by treating the entire partnership as a case and describing the interaction between networks, organizations, groups, and professionals within the partnership (see collections of cases by Franklin, Bloch, and Popkewitz, 2004; Bodilly et al, 2004; Sirotnik & Goodlad, 1988a; Tushnet, 1993). Descriptions tend to be practitioner and evaluation oriented, focusing on whether a partnership existed, how it operated, and, if it can be shown, its impact.

Another common approach can be described as a tool-box or checklist aimed at facilitating practice (Ramaley, 2003; Ravid & Handler, 2001). In this approach practitioners identify a series of factors indicative of partnering or desired outcomes and then collect data from participants, teachers, students, or administrators (Borthwick et al., 1999). Once the lists of common characteristics are created, efforts are made to determine whether a factor is present in the current project or not (Borthwick, 1995). This approach

is accompanied by a list of criteria organized as a checklist for “good” partnering activity. Thresholds are often suggested so that measures can be used to see if the project fits a normative definition of successful, equitable, excellent, or efficient. Alternatively, a matrix of criteria can be developed and used across the lifecycle (e.g., during planning, implementation, and assessment) of the intervention so that all factors may be evaluated over time (Kemshall & Ross, 2000).

Expanding on the simple checklist approach to measuring partnerships described above is developing a scale for measuring the level of partnering in an intervention (e.g., Borden & Perkins, 1999). This scale will be a measure of the differing levels of engagement that partner organizations have with one another. The most common approach of this sort is to ask participants of a partnership to rate the level of engagement or satisfaction they have experienced on a five or seven point Likert scale. For example, the Center for the Advancement of Collaborative Strategies in Health has developed a web-based Likert scale resource for partnership assessment (2006). This tool will develop an index which sums up the number of factors present and is used to create a numeric predictor of whether a partnership will (a) operate and (b) be effective. The Likert-based approaches make the implicit assumption that there is a continuum of levels of engagement that is observable. The mean is interpreted as the average level of engagement for the partnership and variance captures distribution of experiences across the partners. These measures assume that respondents have a clear understanding of the meaning of the terms used to differentiate levels on the continuum and that the definitions provided by the research team are internalized and used in responses to the Likert scale.

For example, partnership has been conceptualized as an organizational relationship, comprised of many tasks and forms of interaction that can be evaluated (See for example, the Health Partnership Index built during the Plymouth Study, Halliday, Asthana, & Richardson, 2004). Instead of conceptualizing partnership as the high end of a continuum of engagements (e.g., competition, coordination, collaboration), it is argued that all of these forms of interaction are likely to be present. Likert scales were used to assess the degree to which respondents perceive that different forms of interaction are taking place (Halliday, Asthana, & Richardson, 2004). From these responses an index is constructed of the level of interactivity occurring in the partnership for different tasks or in different locations. The advantage of this approach is that it avoids making normative judgments about what kind of interaction is best or ought to be used and focuses on differences that can then be compared.

The evaluation methods discussed so far lack mechanisms to measure the interaction effects of partnering as distinct from the regular operations of the local educational environment. One potential benefit of partnering that goes beyond the development of a particular performance measure is found in the theory of social capital (Lin, Cook, & Burt, 2001). Capital is the excess value captured by those who control the means of production (Marx, 1995). Thus social capital in the context of partnership is the excess social value created and therefore the potential investment that can be spent on new activities created through partnering. Lin argues that social capital can be measured by the intersection of three elements (structural embeddedness, opportunity or timing, and action-oriented use (Lin, 2001). The creation of social capital is thus governed by the variance in these elements.

Social network analysis based on the assumption that the structure of networks affects how they work, is an attempt to fill that gap (Burt, 1982; Scott, 2000; Wasserman & Faust, 1994). This method uses relational measures and is supported by analytic tools and formal concepts that allow us to observe and represent the connections and interactions of networks of actors. It can be used when the partnership includes small and large networks of actors (individuals, groups or organizations) and focuses on relational data.<sup>24</sup> Actors are nodes; ties between actors are edges or links. Here the intention is to describe the social structure of the partnership or the partnership within a larger community in terms of the density of the ties and the centrality of various actors (Brandes, Kenis, & Wagner, 1999).

Density refers to the number of links between actors while the number of connections passing through a certain node determines its centrality. Ties can be considered strong or weak based on the density of the connections (Granovetter, 1973). This approach is just beginning to be used in education partnership studies. However, network studies and organizational chart approaches tell us only so much. They show us how and through whom partners interact and therefore where to look for partnering impacts but do not help us to measure them precisely. Qualitative terms like *social capital* are used as proxies for hard quantitative measures of performance (Lin, 2001).

Game Theory has the potential for helping us test certain assumptions about partnership formation and operation and about potential outcome advantages. This method has not been applied in studies of education partnerships. However, the approach

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<sup>24</sup> Relational data include, for example, frequency of contact between actors, length of association, intensity of interactions, and the centrality of an actor with respect to a set of interactions with others.



has shown promise in other policy domains (McQuaid, 2000). There is a long history of games being used to study cooperation, competition, and coalition building (Ford, Wells, & Bailey, 2004; Nash, 1951, 1953; Roth, 1979; Sandler, 1999). Games seek to explain whether actors cooperate (partner) or defect and focus on incentive compatibility. They can also be used to explain how networks expand through contact with others as in disease / infection models (Schroeder & Rojas, 2002). Potoski and Prakash (2004) point out the effectiveness from a game theory standpoint of repeated face-to-face interactions on increasing trust among partners (thus increasing one measure of embeddedness).

Langbein (2002) found that rulemaking was more responsive to stakeholders when negotiated in a collaborative venue but that the results may be more unequal than conventionally written rules (as powerful interest groups accrue a greater share of the benefits). Such inequality is predicted by game theory to improve [become more equal] as extended interactions [games] occur (Axelrod, 1984). Using game theory, Cooper used simulations to show that fixed partnerships enable coordination for efficient outcomes but that the partnerships will break down if they lead to inefficient outcomes (Cooper & Wallace, 2000). Therefore sustainable partnerships are likely to engage in adaptive management of educational programs if the policy solutions developed are more efficient.

One common approach to educational program evaluation that has potential application to partnerships and adaptive management is the CIPP model (Popham, 1993). The acronym represents four approaches to evaluating different aspects of a program (Context evaluation, Input evaluation, Process evaluation and Product evaluation). Different techniques are used depending on whether we are interested in the baseline environment, the available inputs to the program, how the program is implemented, or

what happened as a result. By being precise about whether our intent is formative (to guide implementation) or summative (assessment for accountability) we also improve the content and usefulness of our evaluation (Stufflebeam, 1974). Adaptive management within the program implementation operational network would be aided by formative evaluation while summative evaluation would support a reassessment of policy options available by an administrative decision making network. Chapter 2 will provide an explanation of how the literature just reviewed was synthesized into the model of STEM partnership, the theoretical basis, development and details of the studies variables and models, and an explanation of how these are applied to the question of if or how adaptive management can be applied within these partnerships.

## Chapter 2 Theoretical Framework, Variables and Hypotheses

In three sections, this chapter lays out the theoretical foundation and framework for this study, introduces a set of models developed and previously used to explore partnerships and their potential value added (increased social capital), and explains the hypotheses developed and tested in this study. In Section 2.1, I present a synthesis of the literature review that explains the theoretical underpinnings of this work drawing from the literature on educational learning communities including program evaluation and partnerships, social capital and network studies, and adaptive management. Learning communities and *educational partnerships* provide the venue for improving public education. *Social capital* provides a measure of the value generated within these community or partnership venues. And, *adaptive management* gives us a process for maximizing that benefit. In Section 2.2, I explain the development, construction and definitions of the variables used in this study reflecting on the partnership model developed in earlier work. The model building exercise conducted in the GA Tech RETA study (Kingsley et al., 2008) validates the importance of the variables and completeness of the partnership model underlying this study. I explain the two hypotheses tested in this study (Partnership Sustainability and Adaptability) in Section 2.3 and then establish the parameters for testing the potential for adaptive management in Section 2.4.

### *2.1 Theoretical Framework*

The use of partnerships is an implementation choice that implies that there are benefits to requiring partners, e.g., a value added from increased collaboration or better coordination of resource use resulting in improved program implementation (Mattessich,

& Monsey, 1992; Mattessich, Murray-Close, & Monsey, 2001; Thompson, 2003), improvements in local infrastructure through social networks (Burt, 1982, 1992; Human & Provan, 1997; 2000; Provan & Milward, 1995; 2001), or due to an increase in social capital (Lin, 2001, Lin, Cook & Burt, 2001). In addition to what we are producing (some value added) we can also explore how we get the greatest amount of whatever value added we could produce as is done in implementation studies (Scheirer, 1987; Pressman & Wildavsky, 1973; Langbein, 2002) and in adaptive management (Holling, 1978; Lee; 1989; 1983; Norton, 2003; 2005; Gunderson, Holling & Light, 1995).

Clearly the value of collaborative partnerships is implied in requirements to partner increasingly included in federal and other grant programs (see Jones, 2008) but what should we try to measure? The literature reviewed in Chapter 1 above suggests two potential sources of additional value that we might attempt to measure, 1.) improvements in currently active programmatic outcomes as is done in evaluation studies (Stufflebeam, 1974; Boyer, 1981; Clark, 1988; Goldman & Intriligator, 1990; Goodlad, 1991; Borthwick, 1995; Reagan, 2001) or 2.) improvements in local infrastructure that would be a potential resource for, or investment in, future policy initiatives as is done in education learning communities (Sirotnik, & Goodlad, 1988a; Dufour, & Eaker, 1998; Chaskin, 2001; Shapiro & Shapiro, 1999; Smith, 1994; Smith et al, 2004; NSF, 2009) building coalitions, (Wolff, 2001a; 2001b), and in social network studies (Provan, & Milward, 1995; 2001; Human, & Provan, 1997; 2000; Lin, Cook, & Burt, 2001).<sup>25</sup> The first suggests, that partnership is an implementation process that will improve program outcomes, while the second treats building a partnership as a legitimate outcome, in itself.

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<sup>25</sup> What we want is to identify an appropriate dependent variable to make the judgment that a partnership is good or at least in some way beneficial.

In order to maximize their benefits we must ask whether partnerships are a means (a tool for improved program implementation) or an end (a resource for the future)?<sup>26</sup> Where are they likely to produce the greatest value? Evaluation studies as noted above try to look for a clear measures of success (potential dependent variables) based on measures of performance or process. The impacts of programmatic interventions are expected to be closely tied to such measures. While, it is possible that partnerships directly improve program implementation in some cases, during the RETA work panel participants had a great deal of difficulty making the connection between their partnering work and improvements in program outcomes (Kingsley et al., 2008). This suggests that if we are going to demonstrate a value added for partnerships, that we can point to, we should look elsewhere. If partnering is not directly improving education program implementation (is not a great means) then perhaps the greatest theoretical value might be found in the partnership itself (as a positive end).

Going back centuries, public administration has been based on a theory of authority and hierarchy guided by the notion of a single dominant set of public values (Keller, 2008). However, we now recognize that society is made of individuals and groups, with wildly varying sets of values, and that less and less federal public work is actually being done through direct hierarchical control (e.g., due to privatization, outsourcing, and delegation to the States). When modern governance has become

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<sup>26</sup> This question is important with respect to any choice about the appropriate dependent variable for assessing partnerships. Fortunately programmatic outcome measures are difficult to attribute and therefore weakly connected to partnerships as the RETA study did not directly or independently collect data on specific outcome measures. Thus I could not use a performance measure as my dependent variable. However we did collect a great deal of data about the partnerships themselves and the ways they operated. Because the panel of experts reported on their entire range of experiences, I can use their responses to gather a broad picture of how they partnered and the value they put on those experiences.

increasingly complex we must ask how do we best manage public policy implementation given the often conflicting values and lack of clear hierarchical control structures?

Partnership and other collaborative mechanisms have long been an implementation tool used in attempts to improve education (e.g., Cohen & Lorentz, 1977). The notion of a learning community in education that might include multiple stakeholders is at the center of continuing waves of reform movements designed to save American public education (Sirotnik, & Goodlad, 1988a; Dufour, & Eaker, 1998; Shapiro & Shapiro, 1999; Elmore, 2000; Smith et al, 2004; Chaskin, 2001; National Science Foundation, 2009). For example, in 1983 the widespread response to *A Nation at Risk* touched off the Reagan administration's efforts at national educational reform. The National Commission on Excellence in Education (1983) said:

*In a world of ever-accelerating competition and change in the conditions of the workplace, of ever-greater danger, and of ever-larger opportunities for those prepared to meet them, educational reform should focus on the goal of creating a Learning Society. At the heart of such a society is the commitment to a set of values and to a system of education that affords all members the opportunity to stretch their minds to full capacity, from early childhood through adulthood, learning more as the world itself changes. Such a society has as a basic foundation the idea that education is important not only because of what it contributes to one's career goals but also because of the value it adds to the general quality of one's life.*

Given the pressure to improve education, partnerships provide a salvation narrative in which they provide the cure to the education system's problems. Focusing on individual program improvements requires that partnership success focus on specific universally accepted measures of performance (as we often do in program evaluation).

However, partnerships might alternatively be the mechanism or place within which we can reestablish a connection between the regulatory functions of government and civil society (Franklin, Bloch & Popkewitz, 2003).<sup>27</sup> They might serve as the venue in which broader participation in policy discussions and decision making could take place (Stoker, 1997). The development of education policy in general might improve if we change the dialog from a salvation narrative in which partnerships will *fix* education's problems by improving program implementation (as if there is only one set of problems that apply universally) to a process based narrative in which partnership measures of success will vary with the values and goals of local communities. It is in this latter narrative that creating partnerships can be seen as an investment in future improvements to policy goals. A process of adaptive management conducted through or within a partnered venue might add additional value to the partnership that could then be applied to managing a wide range of ongoing policy problems (e.g., Cayer & Weschler, 2003; Wise, 2006). What we need is a way to conceptualize or measure that added value.

### *2.1.1 Toward a Measure of Value-Added*

Whether we label collaborative venues as learning communities, partnerships or networks the general idea is that individuals and organizations create a web of interconnectivity that provides a benefit to those who participate in the system. Social network theory provides a foundation for exploring the benefits of collaborative systems and provides a potential dependent variable for measuring the value of the benefits of partnership (e.g., social capital). The theory of social capital is quite straightforward.

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<sup>27</sup> A slightly more cynical view is that government can shift the burden for making hard decisions and taking action onto local partners and resources.

Capital is the excess value captured by those who control the means of production (Marx, 1995). It is the return we expect on an investment. Similarly, we invest in social relationships (increasing embeddedness) with the expectation that this will generate some reward (Lin, 2001). Creating new relationships requires an investment in time and other resources. Thus, social capital in the context of partnerships is the potential excess social value created and therefore the additional investment that might be spent on new future activities. The greatest return on that investment will go to those who have the most control over how that investment is spent (the policy / decision makers). Therefore, the process of decision making within a partnering venue is a critical factor in determining the value of the partnership (and to whom it is valuable). The greater the decision making power and autonomy of the partnership the greater the likelihood it will survive (Human & Provan, 2000). I am pushing the limits of social capital theory into new territory by suggesting that applying the principles of locally controlled adaptive management will produce a value added for partnerships similar to social capital.

### *2.1.2 Adaptive Management as an Improved Policy Process*

Adaptive management is a place-based, multi-scalar approach to experimental management of policy problems (Norton, 2003; 2005). Adaptive management is theorized to improve policy outcomes when complex problems in which stakeholders with multiple sets of sometimes conflicting values are engaged in decision making. As recently noted, policy problems in rapidly changing or relatively unknown circumstances can suffer when management and decision making systems lack certainty, about what should or needs to be done, or about what effect particular actions will have (Wise,



2006).<sup>28</sup> Therefore, higher levels of adaptive management can be one measure of the positive value of education partnerships. A partnership that engages in adaptive management of local problems would be more valuable, or better, than one that does not. The argument I use builds from and parallels arguments in social network theory about the value of increasing social capital (see for example, Lin, Cook, & Burt, 2001).

Table 1. Variable Development

	Social Capital <sup>29</sup>	Partnership Variables	Adaptive Management
	Opportunity / Action Oriented Use	Flexible Rules / Responsiveness to Inducements / Strategic Needs or Environmental Factors	Partnership Adaptability
	Embeddedness	Locus of Decision Making and Embeddedness	Partnership Sustainability
	Social Capital		Adaptive Management

<sup>28</sup> Wise (2006) argued that adaptive management would have improved federal rescue and recovery efforts following the Hurricane Katrina disaster.

<sup>29</sup> This characterization of social capital is drawn from the work of Nan Lin (2001).

Lin (2001) argues that social capital as a dependent variable can be measured by the intersection of three elements (opportunity or timing, action oriented use, and structural embeddedness). The creation of social capital is thus governed by the variance in these elements. In this study I am exploring the opportunity to engage in a process of adaptive management as a parallel exercise to increasing social capital (see Table 1). Social capital is increased when actors in a network have higher levels of *embeddedness*, a greater *opportunity* to interact and decide, and more *actions* or concerns that they have a mutual interest in responding to.

Similarly, the RETA work on math and science education partnerships (Kingsley et al., 2008) validated a parallel set of explanatory variables drawn from the literature (see Table 1). *Embeddedness* was shown to be important to the formation of partnerships but was also critically important to their successful operations. The *Rules* that govern the policy *Inducements* that partners and potential partners operate under dictate the opportunities for decision making and limit the parameters that might be included in discussions. *Inducements*, *Strategic Needs* and *Environmental Factors* are the action items that participants respond to when engaging in partnerships. Building on this set of concepts I construct two variables (Adaptability and Sustainability) that would theoretically impact the potential for Adaptive Management.<sup>30</sup>

***Partnership Sustainability*** is a qualitative construct consisting of the *embeddedness* of the partners and the *locus of decision making* for partnered activities. High levels of positive connectivity and the power to make decisions should increase the value and therefore the sustainability of a partnership. In the RETA study the panel

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<sup>30</sup> I will discuss the specific hypothesized predictions in Section 2.3 and 2.4.

described the quality of the relationships they had before and after their partnered engagements that included a variety of potentially different sets of partners and multiple projects (Kingsley et al., 2008). The cumulative reflections make it possible to distinguish among four levels of relationship sustainability (those who have worked together positively in the past and continue to do so, those who never worked together but continue on once they start a positive relationship, those who had previous positive relationships that broke up after a particular project, and those who opportunistically partner with new people and move on to the next set of partners once a particular engagement ends). Partnership sustainability is a function of decision making powers (locus of decision making internal to the partnership) and the level of positive embeddedness among partners. Because *Adaptive Management* requires a stable venue for dialog and decision making we should expect to see evidence of *Adaptive Management* from the partnerships with the highest level of *sustainability* (those who have worked together positively in the past and continue to do so).

***Partnership Adaptability*** is a qualitative construct consisting of *rules*, internal and external to partnering institutions, that are flexible enough to allow for adaptive changes and *policy inducements*, *environmental factors* and / or organizational *strategic needs* that are of sufficient importance that partners will be interested in responding to them. More flexible rules provide greater opportunities to interact and make decisions or choices. Too narrow a programmatic focus on the part of funding agencies or other rule makers is likely to reduce opportunities for adaptation. Greater importance on the part of the participants applied to a strategic need or environmental factor will increase the likelihood of adaptation in response. Similarly, well crafted inducements are likely to

motivate potential partners to act. Organizations and individuals with high levels of motivation coupled with a high level of flexibility in terms of institutional constraints are those most likely to take action. Thus, we should expect the highest level of *Partnership Adaptability* from those with the greatest flexibility and motivation to adapt. The greatest opportunity for, and the greatest value from, *Adaptive Management* should be found when there is a high level of *Partnership Adaptability*.

*Adaptive Management* is a qualitative construct consisting of the intersection of *Partnership Adaptability* and *Partnership Sustainability*. Higher levels of *Partnership Adaptability* and *Partnership Sustainability* are predicted to increase the likelihood of finding partners engaging in adaptive management (a theoretical partnership benefit).

## **2.2 Variables and Model Formulation**

The analysis of the data in this study will proceed in three parts (Partnership Sustainability, Partnership Adaptability, and the potential for Adaptive Management). In order to get to this analysis we first need to understand the development of four concepts and a list of variables that can be measured for each. In this section, I begin with the introduction of a set of explanatory variables drawn from the literature that are theorized to affect partnerships explain of how they were organized in earlier work (Section 2.2.1). In Subsections 2.2.1.1-2.2.1.4, I develop four concepts drawn from the literature, explain their sources in the literature, explain the variables identified under each, and how they were explored, measured and modeled in the RETA work (Kingsley et al., 2008) on which this study is based, and finally explain the development of a logic model of

partnership. I then proceed with an explanation of the variables developed and used in this study (Section 2.2.2).

Table 2. Conceptual Framework in this Study: Independent and Dependent Variables

	Partnership	Partnership Sustainability	Partnership Adaptability	Adaptive Management
IV/s	Embeddedness, Strategic needs, Environmental Factors, and Inducements / Rules	Embeddedness Locus of Decision Making	Responsiveness to Strategic Needs, Environmental Factors & Inducements and Flexible Rules	Partnership Level of Adaptability Partnership Level of Sustainability
DV	Partnership Formation / Operation	Partnership Level of Sustainability	Partnership Level of Adaptability	Potential for Adaptive Management

### 2.2.1 Variable Development

In Table 2 above we can see a list of four drivers of partnership drawn from the theoretical literature (*Embeddedness, Strategic Needs, Environmental Factors, and Inducements / Rules*) and validated in a model of partnership in the GA Tech RETA work (Kingsley et al., 2008). Based on this conceptual framework, the data used in this study were organized according to two explanatory dimensions (Partnership Sustainability and Adaptability) as seen in the second and third columns of Table 2. The level of partnership sustainability is shown as a function of embeddedness and the locus of decision making, and partnership adaptability is shown as a function of the responsiveness to strategic needs, environmental factors, and policy inducements coupled with flexible rules or other

institutional constraints. The final column in Table 2 represents the *Potential for Adaptive Management* in policy-induced partnerships.

Partnership *Sustainability* is hypothesized to be a function of embedded relationships **and** the locus-of-decision making (see 2.3.1). Partnership *Adaptability* is hypothesized to be a function of responsiveness to strategic deeds or other environmental factors, and policy inducements **and** rules and other institutional constraints that are sufficiently flexible as to allow the partners to adapt as needs or local environmental conditions change (see 2.3.2). The potential for *Adaptive Management* is explained as a function of the *Sustainability and Adaptability* of the partnership (see 2.4).

#### *2.2.1.1 Initial Model of Partnership*

Researchers from different fields have argued that mutual goals are more likely to be met when partnerships are built on embedded relationships (Granovetter, 1973; 1985; 2005, Goodlad 1994; Gulati and Gargiulo 1999; Sanders and Epstein 2000). Drawing from Granovetter's (1973; 1985; 2005) work on the impacts of social structure, a model of partnership was developed that combined embeddedness and organizational strategic needs (Whetten, 1981, Burt, 1992) as drivers of partnering (Kingsley et al., 2008).

The initial partnership model begins with the hypothesized impact of two important variables drawn from the literature: organizational *embeddedness* (Granovetter, 1985; 2005) and the alignment or complementarity of *organizational strategic needs* (Whetten, 1981; Burt, 1992). Potential partners must either be aware or must become aware of one another **and** they must be motivated (presumably by some need) before they will form a partnership. *Embeddedness* refers to the history of relationships among actors

in a network. Those actors with long and positive histories of interaction are more likely to have lower transaction costs, be more effective in the conveyance of particular types of knowledge (complex, tacit or expert knowledge) (Powell and Grodal, 2005), have a greater understanding of each other's operations, as well as greater trust that something of value will be created without deception or cheating in the carrying out of activities. Of particular importance, organizations with longer working relationships are likely to have previously developed work and accounting routines that would have to be negotiated and developed when relationships are completely new.

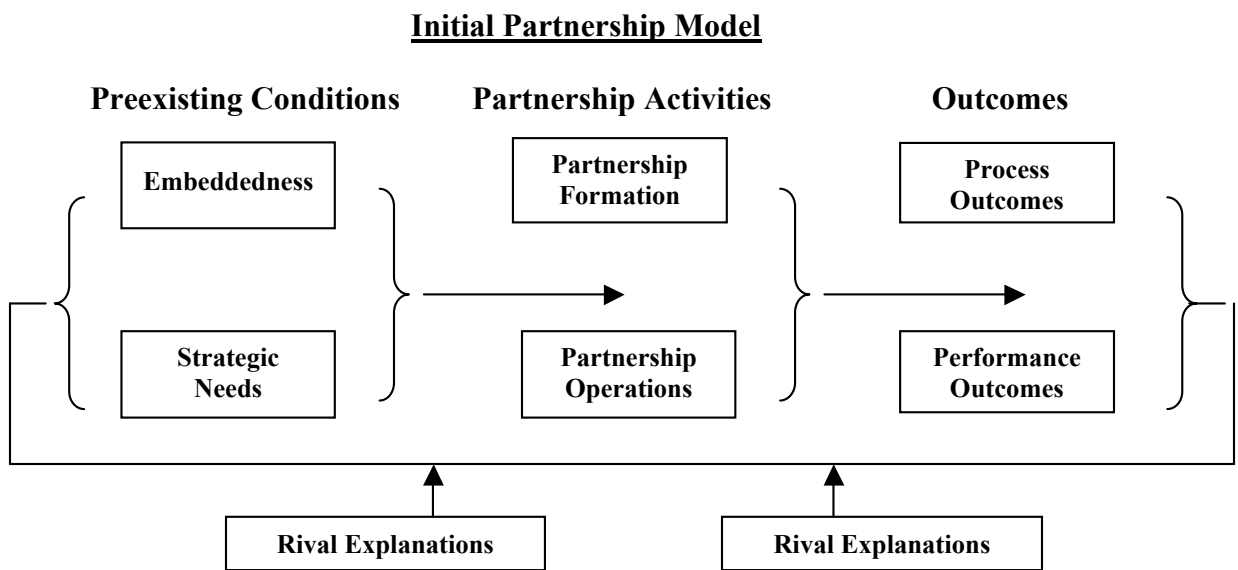


Figure 1. Initial Partnership Model

*Organizational strategic needs* refers to anything outside of the organization that is required to enhance an organization's ability to survive or accomplish goals and therefore contributes to the desire to partner (e.g., information or other resources). For example, Burt (1992) argues that rational organizations choose to enter partnerships to gain resources, increase control or coordination, to gain knowledge or expertise, or to

enhance their reputation. Thus, pursuing the fulfillment of an organizational strategic need coupled with a history of positive embedded relationships are the hypothesized drivers of education partnership. The work of these authors supports the partnership *formation* hypothesis, on which the initial RETA model was developed, that *organizational strategic needs* coupled with *positive embedded relationships* would drive the *formation of partnerships*. The assumptions built into this hypothesis are that these are the only two explanatory variables and that the model is therefore complete. Starting with the base model drawn from the literature, gaps in the initial model were noted during the iterative Delphi surveys of the RETA work (Kingsley et al., 2008).

The ***Initial Model of Partnership*** captures the *preexisting conditions*, *partnership activities*, and *outcomes* aspects (the lifecycle) of a partnered intervention along with a pathway for potential *rival explanations* (See Fig. 1). Under ***preexisting conditions***, *embeddedness* refers to the number, quality (including level of trust) and types of relationships that organizations have with one another prior to the development of a partnership. *Strategic needs* are the resource, knowledge, coordination and legitimacy needs confronting individual organizations prior to partnership formation.

***Partnership activities*** refer to the two phases of activities that develop as organizations engage in partnership: *formation* and *operation*. These phases were designed to describe the process of partnership as a lifecycle. *Partnership formation* includes developing agreements about goals, resource allocations, and responsibilities of each party to the partnership. The actual behaviors in which the partners engage as they pursue their programmatic goals and duties are described as *partnership operations*.



The final stage of the model describes two categories of *outcomes* we might try to measure. First, *process outcomes* are defined as changes in the qualitative and quantitative assessments that measure whether the partnership actually achieved its goals and duties of operation (e.g., under process outcomes we might observe partner interactions, the satisfaction of participants with those actions, whether partners were actually able to work together, collaborate, marshal resources among partners, bring together the support and talents of universities, parents, businesses and not-for-profits, or achieve congruence among policies). Measures of process answer the questions “what happened and how or how well was a program implemented? And, are we happy with the process?” In addition, process measures include the potential additional value added (or costs) partnering contributes to performance measures. This additional value added can be seen as the potential extra investment the partners can later contribute (or the effort that will no longer be available) to improving measures of performance.

*Performance outcomes* are the assessments of changes in measures included in the policy goals that drove the formation of the partnership (e.g., changes in test scores, improvements in teacher content knowledge or pedagogy, organizational transformation). Measures of performance answer the question “were organizational, programmatic, or policy goals met?” Programmatic outcomes refer to those benefits that accrue to participants, clients or others through the partnership’s programs or activities.

In the above model, embeddedness and strategic needs are thought to affect both the formation and operation of partnerships. This model further suggests that all of the partnership operations and outcomes are mediated by the experience and activities associated with partnership formation (starting point effects). The literature does not

support the proposition that either embeddedness or strategic needs alignment have independent impacts on outputs and outcomes that are not mediated by the behavior of partners at the starting, formation stage. While it is clearly possible that organizational interaction might vary over the life of a partnership, and that the drivers during formation might be quite different from those during the continued operation of the partnered intervention it was assumed at the beginning of this work that the set of independent variables that drive variance in formation were the same as those that drive variance in operations and outcomes. This logic model accounts for missing variables or alternative explanations for changes in policy outcomes through a rival explanatory pathway (See Fig. 1). The inclusion of this regular test for rival explanations (those that go beyond the scope of the variables included in the initial model), a necessary component of good qualitative research, resulted in expansions of the initial model.

The panel exercise was designed to explore partnerships focusing on the model drawn from the literature and therefore on the various aspects of embedded relationships and organizational strategic needs that impacted partnering and partnership outcomes. As a base model, it was assumed that this model was complete and that other potential variables were not critical to the formation, operation or outcomes of partnerships (e.g., environmental concerns). However, as building a complete model of partnership to be used in further research was the intention of the e-Delphi exercise, the assumption that the model was complete was tested (and ultimately rejected) in the course of the RETA study (Kingsley et al., 2008). As explained below, it was shown that two additional explanatory factors, two that seemed less than critical during the initial survey of the literature, were in fact important to partnering and were added to the partnership model.

### 2.2.1.2 Rivals To The Initial Model

The panelists reported that their organization's decision to partner and with whom to partner were driven and constrained by several non-organizational factors. For example, high poverty in their local areas was cited as a driver of or constraint on their STEM activities (Kingsley et al., 2008). Poverty is not limited to or controlled by the partnering organizations; thus it is not a strategic need. Gulati argues that the existing environment must be considered when trying to explain how partners are chosen (1998). The hypothesis that embedded relations and organizational strategic needs were the only drivers of partnering is incomplete. Other failures of the initial RETA model included not accounting for the impact of the rules and conditions of the grants, a complete lifecycle of a partnership and alternative units of analysis (Kingsley et al., 2008).

There was a need to represent in more detail the impact *Environmental Factors* have on partnership formation, operation and outcomes because it came up so often in panel responses, is well supported in the literature (e.g., Gulati, 1998; Sandoval, 2001; Florin, Mitchell, & Stevenson, 1993) and the original model lacked any way to control for the environmental context of STEM partnerships. The problem of accounting for the impacts of funding cycles, institutional policies, conditions for receiving funding and other rules requiring specific actions on the part of participants (or grant recipients) also requires special consideration of the *Rules* and *Inducements* under which the partnerships form and operate. While the conditions under which partners operate are part of the broader environment, the specifics of the rules that apply only to grant recipients (the policy inducement that lead to the partnered engagement) makes them sufficiently important that they be considered as a separate explanatory variable.

### *2.2.1.3 Reformulated Model of Partnership*

The primary motivations for expanding the model of partnership were (1) the complexity of the reported interactions (requiring additional units of analysis), (2) the lack of a terminal point to the lifecycle of a partnership (the original model failed to capture the possibility of breakups and reconstitutions of the relationship), and (3) the lack of an obvious place to explore the effects of environmental conditions including the rules imposed on the partners by funding agencies and the impact policy inducements have on partnering (see Fig. 2 below). While the expansion of the logic model increased the scope of the RETA project, a growing understanding of the complexity of partnerships and the variety of actors involved made it necessary.

While the RETA research focused on organizational interactions (thus an organizational unit of analysis), the possibility of exploring additional potential units of analysis is well supported in the literature. Provan and Milward's analytical approach explored individual, agency, and network level impacts on outcomes (K. G. Provan & Milward, 1995). And, a broad application of Yin's work suggests looking at individuals, organizations and their network relationships (intermediate units), and the environmental conditions (total system) (2003). Therefore, the possibility of incorporating multiple units of analysis in order to understand partnerships is well supported in the literature.

However, for the purposes of this work each respondent is being treated as a single case. The panelists' cumulative experiences with respect to the partnerships they have engaged in are used in this study. Therefore the unit of analysis is organizational as the individual panelists reflect upon their experiences from the perspective of their home organizations.

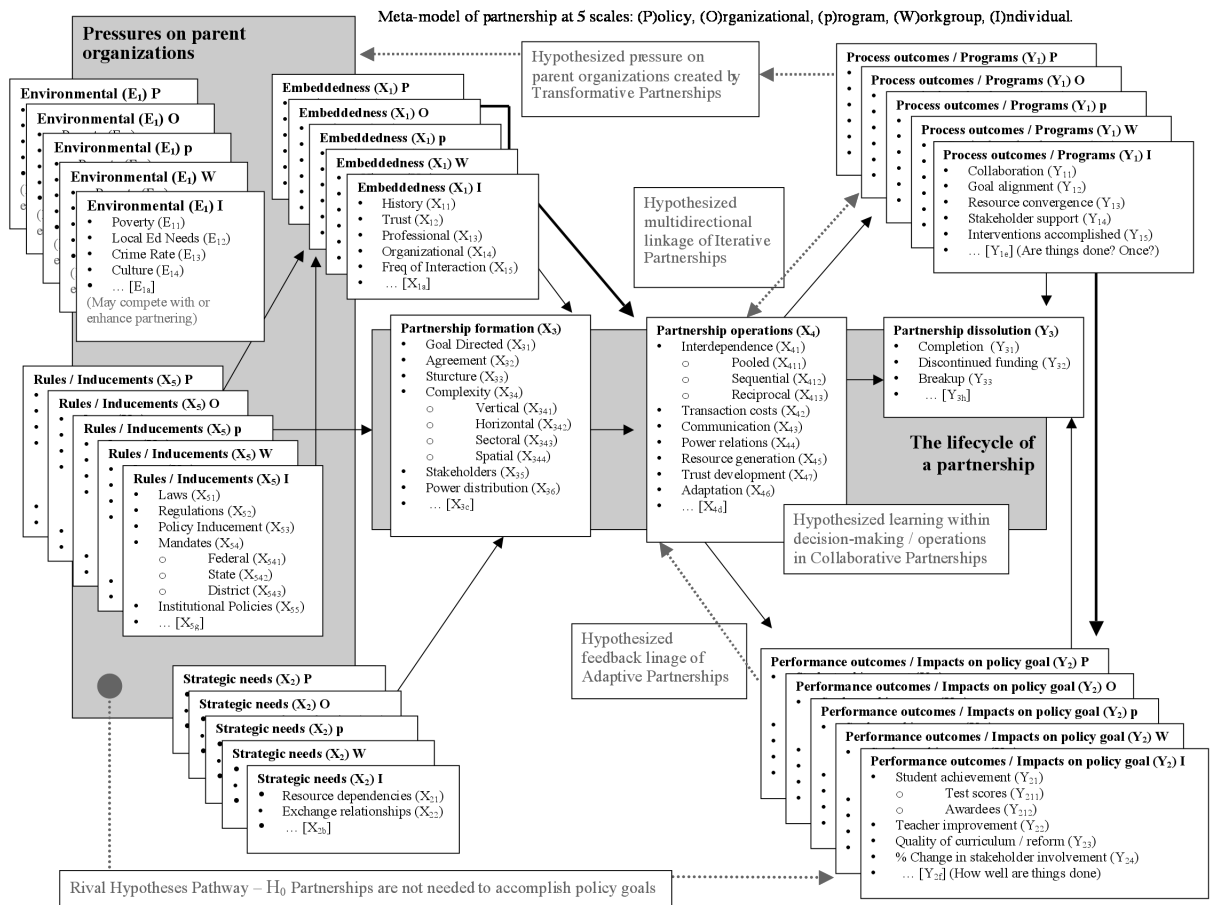


Figure 2. Final Evaluation Model of Partnership

For example, in the first round of the study panelists would often speak from a number of perspectives when describing their partnership experiences (Kingsley et al., 2008). Sometimes they spoke from the perspective of their individual experience or the experience within workgroups. Other times they spoke for their organizations. The model accounts for the five units of analysis that panelists spoke from including the individual, workgroup, organization, interorganizational partnership, and the policy network (see Fig. 2). Responses from the panel also led to the realization that the model needed to capture a partnership's entire lifecycle. The panel might see the dissolution of their

partnership as either the cessation of a completed project or as a failure. Alternatively, if the process of applying for funding is a part of partnership formation, the failure to receive funding might contribute to the failure to form or dissolution of a partnership.

In this study, we really only have one unit of analysis (the individual respondent). However, panelists' were asked to speak from a number of perspectives including their own and their organizations. Therefore the actual unit of analysis is the *idealized partnership* as expressed through the reflections of the panelists. One goal of this analysis is to model partnership behavior in ways that can improve program evaluation. To this end, I have attempted to note when respondents were changing their frame of reference between different levels of analysis (individual, workgroup, organizational, partnership, and policy). By individual, I am referring to individual participants within a partnership without regard for their organizational affiliation. Workgroups can be either subunits of their home institutions, or they can be task-oriented groups that can implement partnership activities outside of any specific organizational boundaries or jurisdiction (these are typically the people who constitute an operational network with the task of implementing the programmatic activity).<sup>31</sup> The organizational level of analysis (the starting point) refers to the partnered parent organizations. These organizations may be more or less connected with or committed to the partnered activities. The partnership refers to the administrative decision making core of the partnership. This core may reside separate from, wholly, or partially within one of the parent organizations. The policy level of analysis refers to the set of actors including those outside of either organization

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<sup>31</sup> For example, if a partnership is very interpersonal, then parent organizations may be partners in name only. The extent to which the organizations engage one another may be limited to a very few individual points of contact.

that may have an impact on the formation, operation or outcomes derived from the partnering. The policy network context gives us a place to model the impact, for example, that various funding strategies or sets of requirements have on partnering.

Table 3. Drivers of Partnership Formation, Operations and Outcomes

	Formation	Operation	Outcomes
Embeddedness	O	++	?
Strategic Needs	+	O	?
Environmental Factors	+	+	+/-
Policy Inducements / Institutional Rules	++	+	?

Table 3 above presents a summary of the observed effects model variables have on partnership formation, operation and outcomes (Kingsley et al., 2008).<sup>32</sup> As about one half of the panel had no prior relationships, the data does not support the hypothesis that *Embeddedness* drives partnership formation. Partnership operations, however, were significantly better among highly embedded partnerships (they started off faster, had fewer operational routines to work out, and had higher levels of trust related to

<sup>32</sup> Throughout this research there has been an underlying null hypothesis that partnerships have no effect, thus falsifying the assumption that partnerships generate a value added.

confidence that work would be done as agreed). These improvements in partnership operations may lead to better program implementation and therefore improved outcomes.

Table 4. Partnership Model Variables

	Partnership		Partnership Sustainability		Partnership Adaptability		Adaptive Management	
	Model Vars	Details	Model Vars	Details	Model Vars	Details	Model Vars	Details
<b>IV/s</b>	Embeddedness	Length of Relationship History Trust Established Routines Frequency of Interaction	Embeddedness	Quality / Length of Relationship Trust Established Routines	Responsiveness to Strategic Needs	Strategic Needs Effects Decision Timing Decision-Making Structure	Partnership Level of Adaptability	Responsiveness to Strategic Needs / Environmental Factors
	Strategic Needs	Financial Knowledge Legitimacy Coordination Goal Alignment			Responsiveness to Environmental Factors	Environmental Effects Decision Timing Decision-Making Structure		
	Environmental Factors	Poverty Crime Rate Institutional Culture Local Educational Needs	Locus of Decision Making	Within Partnership / Outside of the Partnership	Responsiveness to Inducements	Policy Inducement	Partnership Level of Sustainability	Pre / Post Partnership Embeddedness
	Inducements / Rules	Effect of External Inducements & Rules Effect of Internal Institutional Rules			Flexible Rules Internal / External	Effect of External Inducements & Rules Effect of Internal Institutional Rules		
<b>DV</b>	Partnership Formation / Operation / Outcomes		Partnership Level of Sustainability		Partnership Level of Adaptability		Potential for Adaptive Management	

*Strategic Needs* and the related *Environmental Factors* were weakly predictive of partnership formation (partners look for an opportunity that will fulfill their needs) but once partnership operation begins the environmental conditions continue to be a constraint on the partners while organizational strategic needs don't seem to have further effects (strategic needs help drive formation but do not create variability in operational



effectiveness). Local environmental conditions are often cited as indirectly adding to, or detracting from, programmatic outcomes.

The *Policy Inducements / Institutional Rules* have the most effect on partnership formation. Even when the panelist's are reportedly not chasing dollars, they are responding to a policy inducement's rules in their choice of partners or programmatic activities. The conditions or requirements of the inducement also impact partnership operations but to a lesser extent (by guiding partnership participation and program implementation, sometimes requiring evaluation, or restricting the ability to adapt). The panel had a great deal of difficulty connecting either the starting point effects of partnership formation or the operations of their partnerships to specific examples of partnership outcomes.

### 2.2.2 Model Variables

In Table 4 above we can see a list of the *Partnership Model Variables* and their relationships to *Sustainability*, *Adaptability* and *Adaptive Management* as used in this study. To the right of each of the model variables are the detailed elements used to construct them. Under ***Partnership*** the model variables correspond to those used to predict the formation, operation, and outcomes of education partnerships in the logic model explained below (see Sections 3.1.2 and 4.1.3). For example, to the right of *Strategic Needs*, we find the list of organizational needs that the survey panel reported responding to (e.g., *Financial*, *Knowledge*, *Legitimacy*, *Coordination and Goal Alignment*). Under ***Partnership Sustainability*** the two variables are the model variable *Embeddedness* measured at two times (prior to the initiation of the externally funded

partnered engagement and after it has concluded). *Partnership Adaptability* is constructed from the other three model variables (responsiveness to *Environmental Factors* and *Strategic Needs* and the flexibility of the *Rules / Inducements* the partners operate under). The potential for *Adaptive Management* is then a function of the *Sustainability* and *Adaptability* of the partnership.

## **2.3 Testing Hypothesis**

Section 2.3 explains the hypotheses in this study. I explain the *sustainability* hypothesis and model in Section 2.3.1. I explain the *adaptability* hypothesis and model and in Section 2.3.2.

### *2.3.1 Sustainability Hypothesis*

In this study I am building toward a hypothesis that policy-induced education partnerships can be sufficiently sustainable to support adaptive management. Based on the definition of policy-induced partnerships as a label for a bounded intervention two things might be sustained (relationships or programs). While there are legitimate policy goals in fostering new programs with federal funds that will be maintained into the future with other local resources, this study focuses on the maintenance of relationships as critical for the implementation of adaptive management (clearly an unchanging and never-ending program would limit adaptation while a never-ending positive relationship might facilitate change). In this work highly sustainable partnerships will be defined as those that have had some working relationships prior to their current engagement and that relationship is maintained after the current grant-supported project ends. Because some

effort at the level of federal funders is being put into driving the creation of new partnership relationships we should expect to find a great deal of variance, in the level of sustainability into the future, reported by the study participants. I introduce two concepts drawn from the literature that should affect partnership sustainability. First, *embeddedness* refers to the quality of relationships among partners or potential partners (Granovetter, 1985). And second, the *locus of decision making* refers to where decisions about partnership activities are made. Drawing from the work of Human and Provan (2000) on administrative control of social networks, administrative decisions can be made either from within the partnership or by actors on the outside. It is hypothesized that higher levels of positive embeddedness coupled with an internal locus of control (direct internal control over partnership-related decisions) predict greater sustainability for the partnership.

In order to test the *sustainability* hypothesis, this research begins by exploring a set of more precise questions about sustainability. First, what do we mean by *partnership* and what do we mean by *sustained*? In order to provide a baseline for understanding what it is that is being sustained we need to establish a common understanding of what partnership means in the context of math and science education (see 4.1.1 Defining Partnership). Again, based on the work of Granovetter, the more embedded the current relationship (e.g., higher levels of trust, frequent interactions over a long history of working together successfully on other projects) the more likely a partnership will be to form (1985, 2005). Because of the large investment it takes to create a partnership, it is hypothesized that higher levels of positive embeddedness will result in more sustainable partnerships (Table 5, Cells E1 & E2). Thus, partnerships hypothesized to lead to

adaptive management will be those that continue on and develop greater *embeddedness* into the future (see 4.1.2 Embeddedness).

Table 5. Partnerships with Four Levels of Sustainability

	<b>Locus of Decision Making</b>	
	Within Partnership	External to Partnership
Embeddedness High	E1 High Sustainability	E2 Low Sustainability
Embeddedness Low	E3 Low Sustainability	E4 Very Low Sustainability

The second concept hypothesized to be driving the *sustainability* of partnerships is the *locus of decision making*. Partnerships perform two distinct functions (partnership administration and program implementation). These two functions can be performed simultaneously by the same group of participants or separately with the administrative functions being performed by one group and the implementation functions by another. *Administrative networks* are core teams of participants that take on the responsibility for decision making, and organizing and mobilizing partners in implementing programmatic

activities. Using a social network approach, Provan and Milward have argued that organizational effectiveness and efficiency can be improved through specific structural arrangements in the broader interest-oriented network (Provan & Milward, 1995).

Specifically Provan and Milward argue networks will be most effective under “structural conditions of centralized integration and direct non fragmented control” (1995, p. 23). Their work, suggests that networks that are centrally controlled and organized administratively (have a more centralized or concentrated decision making locus with collaboration between administrative and operational units), and loosely connected at the operational level (interactions that are less collaborative between operational units) will be more effective than organizations that are both centrally controlled and highly integrated at the operational level (greater collaboration between operational units) (1995). Greater effectiveness should increase sustainability. Alternatively, loose integration (limited collaboration) coupled with a lack of direct control (less centralized decision making), results in a much less effective system and thus should decrease sustainability. In their study of manufacturing networks, Human and Provan (1997) reported that administrative structures were an important factor in the effectiveness of the network activities. Following Human and Provan, I argue that separating the administration of partnered programs (managed within the *Administrative Network*) from the implementation of their programmatic content (managed within the *Operational Network*) provides the institutional space necessary for collaboration and learning about policy options to take place (potentially improving policy outcomes) without creating excess deliberation during implementation. While the above ideas are undemonstrated in the case of math and science partnerships, they are supported by

several literatures, most clearly the importance of network administration is discussed in network governance / management studies (e.g., Human and Provan, 1997, 2000; O'Toole, (1997); Provan and Milward, 1995, 2001; Moynihan, 2005). Creating a centralized venue for dialog, deliberation and decision making provides the space to make choices without the pressure of immediate and pressing implementation concerns (a space for adaptive management). Because of their functional differences, more collaboration and thus input to administrative decision makers from operational units generates more information, options and the opportunity to create truly excellent (efficient, effective, and equitable) policy interventions. Alternatively, excess communication within or among more similar operational units is likely to take up valuable time without creating additional opportunities to learn.

Partnerships that have direct control over the decisions that affect them will have more power and greater external legitimacy (Human & Provan, 2000). It is therefore hypothesized that partnerships with internal control over decision making will have greater sustainability than partnerships governed by decisions from the outside (See Table 5, Cells E1 and E3). The intersection of these two hypotheses suggests that the highest level of *sustainability* and thus the greatest opportunity for *adaptive management* will be found in Cell E1.

### 2.3.2 *Adaptability Hypothesis*

The second condition that must be met to allow for adaptive management is the ability and motivation to adapt as information, conditions, values, or local needs change. In order to build toward the hypothesis that policy-induced education partnerships are

sufficiently adaptable as to provide for adaptive management I first explore the drivers of partnership adaptability (See Table 6). Strategic needs, environmental conditions and policy inducements are hypothesized to motivate partners to adapt and change. It is hypothesized that greater importance placed on these motivators will lead to more willingness to respond and then to more adaptable partnerships. For example, Brinkerhoff (2002) refers to the dynamic relationship among partners as a driver of changes. Mutually beneficial exchanges based upon organizational needs motivate partners to act. The greater the need and the fairer the exchange the more likely the partners will be to adapt. Teitel (2003) refers to this motivation as involving a set of strategic decisions based on organizational needs affecting two or more organizations in complementary ways.

Similarly Stearns, Hoffman, and Heide (1987) found that organizations adapt and partner to mitigate the effects of environmental pressures. Organizations are more willing to partner when working together will help them manage environmental conditions. The stronger the perceived pressure the more likely organizations are to partner or adapt to a partner in response. Other studies describe environmental pressures in terms of developing common set of interests, broadly envisioned goals and/or policies (Gross, 1988; Le et al., 2004; Popkewitz, 2003; Williams, 2002), or as problems with a large enough scope that they require a response from multiple organizations (Bloch, Lee, & Peach, 2003).

Adaptability also requires that there is sufficient flexibility in the partnership's internal institutional rules and in the rules that govern the inducements the partners operate under (*including the timing of decision making*). Wallander argues, "Whether an institution adapts to change depends on whether its assets--its norms, rules, and

procedures--are specific or general” (2000). Specific rules restrict adaptability while more general or flexible rules increase adaptability. In addition to the specific flexibility of the rules, the timing of decisions is especially critical to adaptive management. If significant decisions are made on an ongoing basis throughout program implementation then the potential exists for adapting to changes in learning (e.g., through program evaluation), values, environmental conditions or needs. However, if significant decisions are made in advance of program implementation there will be serious limitations to any potential for adaptation.

Table 6. Partnerships with Four Levels of Adaptability

	External / Institutional Rule Flexibility High	External / Institutional Rule Flexibility Low
Responsiveness to Policy Inducements / Environmental & Strategic Needs High	A1 Adaptability High	A2 Adaptability Low Due to Institutional Constraints
Responsiveness to Policy Inducements / Environmental & Strategic Needs Low	A3 Adaptability Low Due to Lack of Information / Motivation	A4 Adaptability Very Low



Due to the diverse experiences of the panel of participants in this study we should also see considerable variance in the level of internal institutional flexibility they operate under and the kinds of needs to which they are responding. It is hypothesized that more flexible internal institutional rules (organizational policies and procedures) and flexible rules associated with the policy inducements (about what can be modified or what must be done) will lead to greater partnership adaptability. The highest level of adaptability should occur when partnership flexibility and the motivation to adapt are highest.

#### *2.4 Adaptive Management*

The potential for adaptive management is hypothesized to be a function of partnership sustainability and the partnership's programmatic adaptability in response to appropriate, iterative evaluation measures. More sustainable and more adaptable partnerships will have a greater likelihood of fostering adaptive management while partnerships that are less sustainable or unable to adapt will not (*Adaptive Management Hypothesis*). We should therefore find the strongest evidence for adaptive management when the evidence for both of these conditions is the strongest and little evidence for adaptive management when the evidence is weak.

Policy-induced partnerships should provide a venue for adaptive management of math and science education issues first if they form in a way that they are more likely to be sustained over time so that regular iterative interaction takes place (if the drivers of partnerships sustainability have been correctly identified and the *Sustainability Hypothesis* is confirmed). Second, the partnerships operate in a way that participants are permitted to explore problems from multiple perspectives and have the flexibility to

develop solutions in response to local conditions at all points in time (if the drivers of partnerships adaptability have been correctly identified and the *Adaptability Hypothesis* is confirmed). Tables 5 and 6 above lay out the hypothesized variable relationships.

Partnerships that form in a way that participant's are permitted to explore problems from multiple perspectives in a sustainable venue and have the flexibility to develop and experiment with policy solutions appropriate to local conditions are better able to support adaptive management.

Table 7 below presents four possible combinations of the two levels of sustainability (high and low) and two levels of adaptability (high and low) discussed above. As previously mentioned, sustainability might refer to either sustaining activities or relationships. However, my focus is primarily on the relationships (as the sustainability of activities limits the potential to adapt); partnerships founded on high levels of embeddedness are thus hypothesized to have higher sustainability (they are built on ongoing sustained relationships). Partnerships with the power to make decisions (an internal locus of control) are hypothesized to have greater legitimacy and produce better results so they should have greater sustainability. Partnerships not having or failing to develop ongoing relationships, or those with external decision making structures, are hypothesized to exhibit low levels of sustainability. Partnerships with both of these conditions (the highest level of sustainability) are the ones most likely to exhibit adaptive management.

Similarly, flexible external and internal rules and constraints are hypothesized to result in more adaptable partnerships. Greater flexibility gives partners the room to adapt programs to local conditions as needs or interests change. Greater flexibility is

hypothesized to increase the potential for adaptive management. It is hypothesized that partners are motivated to adapt by strategic needs, environmental conditions and policy inducements. Combining these, it is hypothesized that the highest level of adaptability and the greatest potential for adaptive management will be found when the rules are most flexible (or constraints the lowest) and when the motivations are the highest.

Table 7. Predictions about Adaptive Management in Partnerships

	Adaptability High	Adaptability Low
Sustainability High	H1 Adaptive Management (A1+E1)	H2 Mission Oriented Institutions
Sustainability Low	H3 Opportunistic Engagements w/ Flexible Goals	H4 Opportunistic Engagements w/ Singular Goals

In Table 7, Cells H1 and H2 represent partnerships with high sustainability. These relationships are stable enough and the decision making is internal and centralized enough, to potentially support adaptive management. Cell H1 represents partnerships that

are both sustainable and adaptable enough to support adaptive management (Combine Cells A1 and E1 above). It is hypothesized that if these two conditions are met within a policy-induced partnership the partners will engage in adaptive management. If these two conditions are not met other actions will occur. In cell H2 the relationship is sustained but the ability to adapt or change is in some way constrained. Mission-oriented institutions that provide particular services are a likely example of actors we might find in cell H2.

In cells H3 and H4 low levels of sustainability result in opportunistic behavior on the part of potential partners. They will choose to partner when the opportunity fits with their organizational goals. They are unlikely to engage in adaptive management because there is no sustained relationship to support it. Cell H3 represents highly adaptable actors that have flexible goals and are simply searching for funding or other opportunities to attract resources that support a wide variety of potentially shifting needs or goals. Once partnered, they might continue to explore a variety of options if the partnership is permitted to do so by the funding agency. Cell H4 represents actors with singular goals. For example a school district seeking resources to support teacher training is not going to be exploring activities that do not support that goal. Once partnered, the actors will engage in the activity that supports their goal. Any constraint placed on them by funders will align with their institutional goal so the lack of adaptability will not be burdensome.

## Chapter 3 Research Design and Methods

Theory in the research on partnerships and the potential for the use of adaptive management in education is currently underdeveloped. Clear and broadly accepted definitions for key terms (including the meaning of the term partnership) do not exist. The lack of clearly defined terms and the need to explore weakly theorized phenomena argues in favor of taking a qualitative approach to research design. The present study is based on a secondary analysis of the qualitative data collected from a panel of thirty-two experts on math and science education partnerships.<sup>33</sup> The panelists' reflections on their idealized partnerships constitute the unit of analysis used in this work. The responses of each panelist are treated as separate cases and the analysis focuses on identifying the similarities and differences among the cases to explain the variance in their sustainability, adaptability, and potential to support adaptive management.

### 3.1 Qualitative Research Methods

The three most widely accepted empirical approaches to qualitative investigation are theory building (as was done in the GA Tech RETA work), language based (e.g., text analysis, discourse analysis), and a descriptive-interpretive method (Miles & Gilbert, 2005). This work falls most clearly in the descriptive-interpretive camp.

Descriptive studies try to answer the questions:  
What is it we are observing? What are its characteristics?

Interpretive studies try to answer the questions:  
Why does this happen? What are the contributors to this activity?

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<sup>33</sup> The Georgia Tech RETA project was a multi-stage study of math and science education partnerships. This study is a secondary analysis of the archived data from the Delphi portion of that larger work.

In this study I am conducting a secondary analysis of previously collected data, building on earlier work that I participated in (work designed to understand and model math and science education partnerships), to explore whether or not these partnerships, as they are typically constituted, could serve as a venue for adaptive management. To do this I first had to identify and describe the characteristics needed to support adaptive management. As discussed above, the literature provides two important attributes of a partnership venue that will support adaptive management (partnership sustainability and partnership adaptability). I draw and evaluate the impact of independent measures of the hypothesized contributors to sustainability and adaptability from data collected in earlier work (Kingsley et al., 2008). I then apply these data to understanding the potential for adaptive management in education partnerships.

### **3.2 Data Collection**

Data collection for the original study upon which this secondary analysis work is based began with a broad goal of defining terms and developing a model or models of partnership that could then be used in developing theory. The nature of this kind of research makes quantitative methods unsuitable (as no common vocabulary or accepted theory exists). Therefore a qualitative method to explore the nature of partnership was sought. The Delphi method was chosen because it provided an efficient and validated methodological structure, yet specifically allowed the flexibility needed to explore weakly conceptualized ideas and themes. The broad scope of the RETA work allows for secondary analysis of the archived data to examine how partnerships might help to build social capital and how principles of adaptive management might be applied to education.

The data for this study were collected during the electronic-Delphi or ‘expert panel’ portion of the Georgia Tech RETA project. It was initiated in 2004 and data collection was completed April 7, 2005. The panel study was designed to serve as a model-building exercise: modeling alternative conceptualizations and alternative methods for the evaluation of STEM education partnerships. In addition to the model-building exercise, questions were designed and data were collected from the experts to gauge the relative importance of a number of themes related to partnerships and partnering.<sup>34</sup>

The modified electronic Delphi was based on the Rand Corporation's paper and pencil Delphi method developed by Dalkey and Helmer. The method was refined through the 1950's and 1960's (Dalkey, 1969; Dalkey, Brown, & Cochran, 1970) and continues to be used to date (e.g., Elvidge, 1983; Long; 1990; Chambers, 1992; Rayens, 2000). The Delphi method involves an iterative survey of experts with the intention of developing a better understanding of problems, approaches, or future trends (Turoff & Hiltz 1982).

The computerized approach has been used in many ways beyond the traditional structure of consensus seeking Delphi protocols. For example, a policy Delphi is not used to look for consensus but to develop pro and con arguments about specific policy issues and their potential resolutions (Turoff, 1970). This technique allows a diverse panel of experts to contribute elements to a composite model of a complex situation or process (a type of grounded theory approach to qualitative research). The exercise in model building with the Delphi method in the RETA study took a similar but slightly different approach, as it started with a model developed from the empirical literature and then began testing

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<sup>34</sup> Attempts were made to impose sufficient structure on the survey instruments to use more quantitative methods like Structural Equation Modeling but the lack of a common language made this futile.

the components and looking for missing elements and interactions as the Delphi's four iterative rounds progressed (Kingsley et al., 2008). The data for the current study are a subset of the RETA data focused on measuring the motivation to partner, the structure of partnerships, the value of partnerships, the opportunities and constraints under which partners operate and the factors that keep partners working together.

### *3.2.1 Participant Selection*

The sample frame for this study was 300 Science, Technology, Engineering and Math (STEM) education partnership professionals drawn from three sources: online searches of PI's working on STEM education partnerships, nominations (both of self and others) in response to presentations of partnership research, and lists of attendees to educational conferences on STEM partnerships (see Table 9 below). To be ensure participants were very experienced, nominees had to have experience running multiple partnerships that linked universities with K-12 schools for the purpose of improving math and or science education. This group of professionals generated a total of 133 nominees as prospective panelists. The potential panelists were contacted by telephone and e-mail over the summer of 2004 to determine their availability, willingness to participate in the project, and level of experience. Of these, 121 completed prescreening surveys.

Prescreening telephone interviews were conducted with each potential panelist to gather demographic and background information, the specifics of their availability and to explore the kinds of projects and the range of funding sources they had experience with. As the sample was put together for the purpose of modeling partnerships and evaluation, we screened for people with experience with a number of partnerships or projects from a



variety of backgrounds. Following the interviews, the 32 final panelists were selected based on their level of experience, diversity, and availability.

Table 8. Sample Frame

Population of MSP Professionals	Potential nominators	Nominees	Panel
Total population unknown	Approximately 300	121	32
	Chosen from 3 sources:	Nominated	Chosen based on experience, diversity, availability
	Contacted by e-mail	Given a 30 minute pre-screening interview	Participated in 2-4 rounds of the panel
			30-31 panelists participated in every round

The final panel consisted of thirteen women and nineteen men from nineteen states. Nineteen of the panelists were affiliated with public or private colleges and universities, six represented public K-12 institutions, and seven of the panelists were from other kinds of education organizations. There were twenty-eight Caucasians, one African American, two Native Americans, and one Hispanic on the panel.<sup>35</sup> They averaged 12.7 years of experience with STEM education, and half have worked as K-12 classroom teachers. Most of the panelists have graduate degrees, and about half hold Doctorates. Initially we were concerned about the limited ethnic diversity of the panelists. However, after additional assessment of the source lists and nominations, the panelist's were representative of those organizing federally funded education partnerships. While the panel consisted of 32 participants, several did not participate in every round.

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<sup>35</sup> The lack of racial and ethnic diversity among the experts who had organized and managed the federally funded programs was noted; however, the source of this lack of diversity requires further investigation that is outside of the scope of this study.

The intention of the RETA study was to develop and test a range of possible models of partnership for further research. Thus, no claims can be made that the panel represents all partnerships. The data are at best the opinions and best recollections of a panel of very skilled experts. In addition, by using experience as the first selection criteria a panel made up of very experienced professionals was assembled. Since the panelists all have a great deal of experience, they also tend to be senior level persons in their respective organizations. Thus, the sample is skewed toward the views of senior level participants. However, this bias should have no effect on the current study because these senior participants are those who would be best qualified to speak on behalf of the entire project. The reflections and best understanding of the panelists as experts in their field provides thirty-two cases of idealized partnerships that can be analyzed in this study to explore the potential for adaptive management in policy-induced education partnerships.

### *3.2.2 About the Survey Instruments*

The data collection consisted of four “rounds” of surveys conducted online. Each round was designed to take the panelists about four hours to complete. Panelists were compensated for their time. The four surveys were administered on the Internet over a period of about six months during the fall of 2004 and winter of 2005 using Pennsylvania State University’s HERO e-Delphi system<sup>36</sup>. Panelists were given passwords and login instructions, start and stop times, and my cell phone or email address so they could contact me for help or to answer any questions. The four surveys were structured so that respondents had to approach the topic of STEM partnerships from different perspectives

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<sup>36</sup> Pennsylvania State University’s HERO e-Delphi system: <http://hero.geogpsu.edu/>

in each round (see Fig 3 for a sample view of the online system). At the end of each round the results were summarized and posted online for the panel’s further reflection.

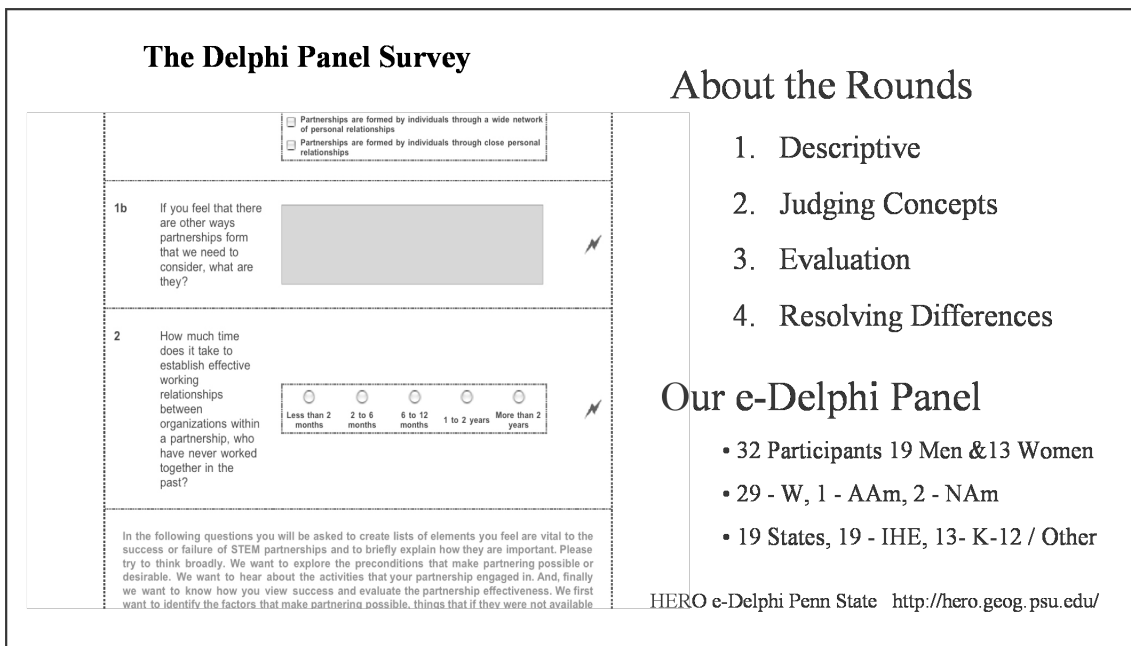


Figure 3. The Online Survey Instrument Scaled and Narrative Responses

Throughout the RETA work there was a conflict over whether to either anchor participants in their current work or to try to draw on their complete range of experiences (Kingsley et al., 2008). The advantages to anchoring would have been greater precision and higher confidence in the accuracy of their opinions. However, the decision was made to explore the full range of the participant’s knowledge about partnering. This choice benefits the current study as a more complete picture of the panel’s experiences can be drawn. In each round participants were pushed to reflect on partnering from different perspectives (sometimes asking them to think about what they would do and at other times asking them to speak as or on behalf of their home institutions). Approaching each

round from a different perspective provides a test of internal conceptual consistency on themes and variables.<sup>37</sup>

In round one, the respondents were encouraged to be descriptive as they discussed their personal history and general experiences working with STEM partnerships. The first round survey asked a set of very structured questions about what partnerships are and how they work (each question was followed by an open-ended opportunity for the panelist to explain or suggest alternatives). In response to the rich, unexpected, and often conflicting information included in the open ended responses, the second round survey was designed in a more open-ended format to allow panel participants to explain their answers in greater detail. The respondents were encouraged to think conceptually and to make judgments as they were asked to react to key factors identified in the research literature and in round one (exploring the initial model) as critical elements in the formation and successful operation of partnerships.

In round three respondents were encouraged to be in a more evaluative mode as they were asked to offer peer review assessments of proposals for forming STEM partnerships (as if they were on a National Science Foundation review panel). This was done to test for consistency in their responses when speaking for themselves and when evaluating the work of others. There were three objectives in round four. First, issues from earlier rounds in which there had been disagreement were revisited. Next, questions

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<sup>37</sup> It should be noted that this study draws primarily from data collected in Rounds 1, 2, and 4. This study is focused on understanding the potential for adaptive management within partnerships as perceived by the panel and based on their personal experiences of an idealized partnership. Round three asked the panel to respond as evaluators of the work of others making their responses a useful check on the consistency of the importance of certain themes (e.g., when commenting on their own work versus judging the work of others). However, these responses do not express their idealized view of their partnerships because they are not directly reflecting on their own experiences.

that the panelists expressed an interest in pursuing were asked. And finally, there were questions about evaluation and learning within partnerships and from partnered activities.

### **3.3 Data Selection and Organization**

The question items used in this study are a subset of the data collected during the GA Tech RETA study (Kingsley et al., 2008) focused on the concepts of partnership sustainability and adaptability. As explained below, the data chosen for use in this study are organized according to these two concepts. The question items are identified by survey round (indicating the perspective – descriptive, judging concepts, evaluative, or resolving differences – from which the respondent was interacting with the question), by the RETA study question number, and by how they are used in this work (e.g., R#Q#). Table 9 below presents a summary of the variables used to explore each concept.

#### *3.3.1 Drivers of Partnership Sustainability*

The concept of partnership sustainability is developed through three themes (the definition of partnership, embeddedness, and the locus of decision making). The definition of partnership was explored in two open-ended questions (R1Q5, R4Q10). Partnership definitions were categorized according to the respondent's view of what constituted their partnership (R1Q5). The importance of the variance in these categories is that different definitions of partnership would lead to different ideas about what is being sustained (see for example Gross, 1988; Tushnet, 1993; Bennett & Krebs, 1994; Firestone & Fisler, 2002; Teisman & Klijn, 2000; Wenger, 2007). The sustainability of

partnerships was further explored through a discussion of the lifecycle of the panels' idealized partnerships (R4Q10).

Embeddedness refers to the quality of the set of relationships from which partnerships emerge and then operate within (Granovetter, 1985). The concept of embeddedness is explored through measures of the history of interactions, trust, the frequency of interactions and legitimacy. It is expected that greater importance placed on partnership embeddedness will be an important indicator of stronger, more sustainable partnerships and thus a higher probability of adaptive management within the partnership.

The history of partnership relationships is measured in an open-ended fashion through the partner's willingness to work with new partners (R2Q8.2a). Partners who are more willing to work with new partners place a lower priority on embeddedness. Other factors such as organizational reputation or the impact of external pressures drive the formation of a partnership. Following Granovetter (1985) partners who are reluctant to work with new organizations or individuals place greater importance on embeddedness or a positive history of working together.

Trust develops as organizations and individuals interact (Granovetter, 1985; 2005; Potoski and Prakash, 2004). A Likert scaled question was used to test the importance of trust among the panelists (R1Q3a.5). Greater importance placed on trusting partners would indicate greater importance of this element of embeddedness among the panelists. Partners who interact more frequently have more opportunities to develop trust and exchange information. Four scaled questions were used to explore the importance of frequent interactions to the panel (R2Q19.a, R2Q19.b, R2Q19.c, R1Q7a.2). Greater importance placed on frequent interactions indicates greater importance placed on

collaboration and increases the potential for more embedded relationships. The Likert score for each question item was summed to create a scale of importance for frequency.

Granovetter's (1985) argument suggests that embedded relationships (long-term positive interactions) are critical to developing effective partnerships. The history of participant interaction serves as a building block for trust and integrated operational procedures. The creation of embeddedness is a vetting process that increases an organization's confidence that potential partners will act as agreed and produce the mutually desired results. One alternative or rival to embeddedness is external legitimacy.

Legitimacy refers to the notion that an organization's reputation might serve to recommend them as potential partners even when there is no history of previous interaction (Human & Provan, 2000). Two scaled questions are used to explore the importance of organizational legitimacy (R1Q13a.11, R1Q13a.13). Higher importance placed on increasing organizational legitimacy suggests that legitimacy might serve as a proxy for embedded relationships. The final element of sustainability is the locus of decision making. Partnerships that have more centralized decision making procedures located within the partnership have greater control over their activities (Human & Provan, 2000). Therefore, greater control and power within the partnership is expected to increase partnership sustainability and increase the potential for adaptive management. Two scaled questions (R2Q12.f, R4Q9.a) and one open-ended question (R2Q13) are used to measure how important centralized decision making is to the panel. Following Human and Provan (2000), the greater the importance of centralized decision making the more likely the partnership will be sustainable.

Table 9. Model Variables in this Study

Partnership Adaptability			Partnership Sustainability		
Concepts	Question Items	Type / Content	Concepts	Question Items	Type / Content
Responsiveness to Strategic Needs	Goal Alignment R1Q3a.1	Scaled / Importance of goal alignment to partnership development	Embeddedness	History R2Q8.a	Open Ended / Willingness to work with new partners
	Financial R1Q3a.8	Scaled / Importance of external grants to partnership development		Trust R1Q3a.5	Scaled / Importance of Trust on
	Coordination R1Q3a.12	Scaled / Importance of resource coordination to partnership development		Frequency R2Q19.a	Scaled / Frequency of meetings
	Knowledge R4Q9.f / R4Q9.g / R4Q9.k	Scaled / Knowledge learned through partnership		Frequency R2Q19.b	Scaled / Frequency of meetings
Frequency R2Q19.c				Scaled / Frequency of meetings	
Frequency R1Q7a.2				Scaled / Importance of regular meetings	
Responsiveness to Environmental Factors	Partnership Drivers R2Q2	Open Ended / Why partnerships are needed to address local needs		External Legitimacy R1Q3a.11	Scaled / Importance of increased public relations
	Partnership Benefits R2Q3	Open Ended / How partnerships improve meeting local needs		External Legitimacy R1Q3a.13	Scaled / Importance of increased prestige
	Community Needs R2Q1	Open Ended / Kinds and magnitude of local community needs			
Policy Inducements	External Funding R2Q9.a	Scaled / Importance of external grants to partnership development		Definition of Partnership	Partnership Lifecycle R4Q10
	Federal Funding R2Q9.c	Scaled / Importance of external grants to partnership development	Partnership Definition R1Q5		Open Ended / Definition of Partnership
	External Funding R4Q9.e	Scaled / Importance of external grants to partnership development	Locus of Decision Making	Centralized Decision Making R2Q12.f	Scaled / Importance of centralized decision making
Rules / Institutional Constraints	Federal Policy R2Q5	Open Ended / Policy environment influences on partnership activity		Centralized Decision Making R4Q9.a	Scaled / Importance of centralized decision making
	External R2Q9.b	Scaled / Grant requirements drive partnering		Inside Partnership R4Q2	Open Ended / Use of governing boards
	External R2Q9.f	Scaled / Grant requirements drive partnership goals		External Participation R4Q9.b / R4Q9.c	Scaled / Importance of inclusiveness in decision making
	Internal R4Q9.a	Scaled / Institutional policy limits participation in decisions	Admin Network R2Q13	Open Ended / Importance of centralized decision making	
Expected Level of Partnership Adaptability			Expected Level of Partnership Sustainability		



Greater control over decisions that affect a partnership is likely to increase the sustainability of the partnership. An open-ended question is used to explore whether partnership decisions are made within the partnership or by some set of outside actors (R4Q2). This question explores the use of governing boards and is scored based on the whether the responses indicate the partnership has such a board within the partnership or is controlled by an outside board or no board at all. Following Human and Provan (2000), internal decision making boards are expected to lead to greater sustainability.

Two questions are used to explore the importance of inclusiveness in decision making (R4Q9.b, R4Q9.c). Partnerships with greater external participation have more diffused decision making procedures. Scheberle (2000) argued that collaboration could increase conflict within partnerships. Thus, it is expected that greater input from outsiders will lead to less sustainable partnerships (greater conflict slowing down the process and causing the breakdown of the partnership.). However, collaboration and inclusiveness are argued to be the primary benefits of partnerships. Human and Provan (2000) suggests a possible rival explanation, that greater inclusiveness might increase the perceived legitimacy of decisions and this perceived legitimacy might increase sustainability.

### *3.3.2 Drivers of Partnership Adaptability*

The concept of partnership adaptability is developed through four themes (Responsiveness to strategic needs, environmental factors and policy inducements, and the flexibility of the rules and organizational constraints partners operate under). Strategic needs refer to the goal, finance, and knowledge requirements of organizations (Whetten, 1981, Burt, 1992). Scaled questions are used to test the importance of goal alignment

(R1Q3a.1), finances (R1Q3a.8), resource coordination (R1Q3a.12), and knowledge learned through partnerships (R4Q9.f, R4Q9.g, R4Q9.k) as drivers of adaptation. Greater importance placed on strategic needs is expected to increase partnership adaptability.

Environmental factors are the conditions within a community that provide the background for local activity. Three open-ended questions are used to explore the environmental conditions partner organizations operate under (R2Q1, R2Q2, R2Q3). Greater importance placed on environmental conditions is expected to increase partnership adaptability (Stearns, Hoffman & Heide, 1987; Gross, 1988; Williams, 2002; Popkewitz, 2003; Le et al., 2004; Bloch, Lee, & Peach, 2003). More evidence, examples or emphasis placed on a response is used as the indicator of the importance of environmental conditions. The open-ended questions are scored based on the reported number and kind of environmental conditions (R2Q1), the quality of the reasons partnerships are required to address environmental conditions (R2Q2), and the explanation of how partnerships make meeting those needs possible (R2Q3).

Policy inducements are the grants or mandates that drive partnered activity (Basica, Cumming, Datnow, Leithwood, & Livingstone, 2005). Several authors have argued that organizations form partnerships to gain access to external resources (e.g., Gross, 1988; Sellgren, 1988; Firestone & Fisler, 2002). Three different scaled questions are used to measure how important policy inducements (external grants) are to the partnerships (R2Q9.a, R2Q9.c, R2Q9.e). The more importance placed on policy inducements the more likely an organization will be to respond or adapt to the inducement. Because of the need for external resources, the more motivated organizations are to respond, the greater their expected level of partnership adaptability.

The rules and institutional constraints refer to rules attached to a grant, or other government policy, and to the internal and external the rules organizations operate under (Clingermayer & Feiock, 2001). The institutional constraints are internal when they refer to organizational policies that limit or guide the activities of the organization's partnerships. Rules or constraints are external when they are imposed from outside of the partnering organizations (e.g., conditions in aid attached to a grant program, Laws like NCLB). The impact of federal policies is explored through an open-ended question (R2Q5). More examples or emphasis placed on a particular response is used as the indicator of the importance of federal policies. Two scaled questions measure the perceived importance of external rules or constraints (R2Q9.b, R2Q9.f) and one scaled question explores the importance of internal constraints (R4Q9.a). The greater the perception of inflexible rules or constraints the less adaptable we should expect the partnership to be (Clingermayer & Feiock, 2001).

### *3.3.3 Partnership Sustainability and Adaptability*

As previously discussed the explanatory variables above are predicted to lead to partnership sustainability and adaptability. Table 10 below identifies the questions items used to measure partnership sustainability and adaptability.

#### *Sustainability*

It is possible to explore partnered engagements at three times (prior to the current engagement, during the current engagement and after the current engagement). In this work, partnership sustainability is defined as a partnership that continues on past the

current intervention. Partnerships that are built upon prior existing working relationships have been sustained from previous engagements. The relationships have survived any problems that would lead the partners to discontinue working together. Therefore partnerships that are built upon prior relationships are defined as more sustainable than those that are completely new. An open-ended question is used to explore the nature of these relationships (R1Q16). By asking whether the panelists had previous relationships on which to build we can group them into those with previous relationships and those without. For the purpose of developing this measure of sustainability I treated all relationships whether based on previous work or personal interactions as the same.

Table 10. Partnership Sustainability and Adaptability

Partnership Level of Sustainability		Partnership Level of Adaptability	
R1Q16	Open Ended / Prior Relationship with Partners	R4Q9.h	Scaled / Programmatic Change
		R4Q9.I	Scaled / Organizational Change
		R4Q9.j	Scaled / Organizational Change
R1Q16	Open Ended / Opportunistic Relationships	R4Q9.l	Scaled / Use of Evaluation
		R4Q9.m	Scaled / Organizational Change
		R4Q7	Open Ended / Changes in Response to Evaluation

Among the new relationships there are two possibilities; they might be sustained into the future; or they might end at the conclusion of the partnered engagement or project. There are two main reasons that a partnered relationship will end. First, if something goes wrong during the implementation of the project the relationship can break down and the partnership will not be sustained. Because the respondents are

reporting on their idealized partnership there is no way to predict that any of the partnered engagements would end because of some breakdown in organizational or interpersonal relationships. However, the respondents might report that their organizations engage in serial opportunistic engagements. Using the same open-ended question (R1Q16) it is possible to determine if the respondent's organization typically acts in an opportunistic fashion seeking out new partners in a serial fashion. These organizations start new projects, complete them and move on to the next project potentially with a completely new set of partners.

Table 11. Partnership Sustainability Defined

	Scale Measure	Potential for Adaptive Management
Partnership Based on Preexisting Relationship	Partnership Sustainability High S1	Most likely to support Adaptive Management
Creation of New Relationship	Partnership Sustainability Medium S2	Neither likely or unlikely to support Adaptive Management
Breakdown of Previous Relationship	No Partnership Sustainability S3	No possibility to support Adaptive Management
Temporary Interaction	Partnership Sustainability Low S4	Not likely to support Adaptive Management

The possible combinations of pre and post engagement relationships lead to four possible levels of sustainability (see Table 11). Cell S1 represents partnerships built upon existing relationships that continue on. In this study these are defined as the most sustainable partnerships. Cell S2 represents newly formed partnerships with no indication that they are likely to end. Cell S3 represents existing relationships that breakdown after the new engagement. Because any partnerships in this cell have had a breakdown in their previous relationships there is no possibility of adaptive management in the future. Cell S4 represents respondents whose idealized partnerships engage in serial interventions. These partnered relationships are created new each time and end with the conclusion of the funded engagement. These partnerships are unlikely to support adaptive management because the relationships that would support ongoing decision making do not exist within the partnership. However, there is the possibility of adaptive management within a looser network structure from which partnered interventions evolve.

### *Adaptability*

Partnership adaptability is measured through a scale derived from one open-ended (R4Q7) and five scaled questions (R4Q9.h, R4Q9.i, R4Q9.j, R4Q9.l, R4Q9.m).

Adaptability refers to changes made in response to a stimulus. In Section 3.3.2 I identified a set of drivers predicted to increase adaptations. The questions used to measure adaptability identify specific changes made in response to partnership activities. Changes made to programs indicate that partners are learning as they implement the programs (R4Q9.h). Higher levels of reported change indicate a higher level of adaptability within the partnership. Organizational changes made in response to

information learned are measured in three questions (R4Q9.i, R4Q9.j, and R4Q9.m). Higher levels of reported organizational change indicate greater adaptability on the part of the organizations that engage in partnering. Partnerships that use evaluation to improve programs are more adaptable than those that do not (R4Q9.l). Higher reported use of evaluation to adapt programs indicates greater adaptability. An open-ended question asks respondents to identify specific changes made in response to program evaluations (R4Q7). More examples or other evidence indicates greater adaptability in response to information learned through the use of program evaluation. Each respondent's answer is scored from one to five with a five for the cases with the most information. This will give this qualitative question the same weight as the Likert scaled items.

Table 12. Scale of Adaptability

	Scale Measure	Potential for Adaptive Management
Top 25%	Partnership Adaptability High A1	Most likely to support Adaptive Management
Middle 50%	Partnership Adaptability Medium A2	Neither likely or unlikely to support Adaptive Management
Bottom 25%	Partnership Adaptability Low A3	Least likely to support Adaptive Management

The responses to the questions are combined into a scale of adaptability from most adaptable to least based on the total score for all question items (the total summed scores). The most adaptive partnerships are those hypothesized to be the most likely to support adaptive management while the least adaptable partnerships are hypothesized to be the least likely to support adaptive management. I divide the cases by quartiles taking the top 25% in Cell A1 as those most likely to support adaptive management (scores equal to the score at the break point are included in the top quartile). The middle 50% in Cell A2 are hypothesized to be neither likely nor unlikely to support adaptive management. The bottom 25% in Cell A3 are the least adaptable partnerships and are hypothesized to be the least likely to support adaptive management (scores equal to the score at the break point are included in the bottom quartile).

### **3.4 Data Analysis and Validation**

The challenges of working with preexisting qualitative data sets are well documented (e.g., Berliner, 2002; Heaton, 2004; Corti, 2007; Hammersley, 2008). Lack of familiarity with the data or existing coding structure and the potentially unknowable frame of reference or bias of those who collected the data are the most often cited sources of trouble. However, since I was directly connected to the earlier work, contributed to the design of the survey instruments, was directly responsible for data collection, and regularly contributed to the reporting and presentation of the findings, these problems do not apply in this case. Use of this archived data is further justified as much of the data from the earlier work was specifically collected to allow for future analysis.



Microsoft Access was initially used to assemble and organize the data after collecting it from the online survey system. The QSR-NVivo computer program was then used to further organize and analyze the qualitative data, as this program allows for several unique approaches to structuring data and testing relationships. The quantitative descriptive data were structured and analyzed using Microsoft Excel and STATA. The qualitative data were combined with the quantitative survey data as appropriate.

The focus of this work is on the sustainability and adaptability of partnerships and on the potential, given the variance of those conditions, for adaptive management. The data were organized according to the factors hypothesized to impact partnership adaptability and sustainability. Independent measures of sustainability and adaptability were developed and the thirty-two cases were sorted by their variance on these measures.

The data were then examined to identify clusters of similar responses that were associated with different levels of sustainability or adaptability. Finally the intersection of higher and lower levels of sustainability and adaptability were compared in a 3x3 matrix to explore the potential for adaptive management in each cell. In the results section of this study I describe the sustainability of a sample of education partnerships in Section 4.1 and their adaptability in Section 4.2. These two sections focus on describing and summarizing the selected characteristics of partnerships (drawn from the collection of cases consisting of the reflections of the panel participants) that are hypothesized to affect the sustainability and adaptability of education partnerships. Then, Section 4.3 shifts to interpretation and focuses on testing hypotheses and explaining the contributors to partnership sustainability and adaptability and explores the potential for adaptive management at various levels of sustainability and adaptability.

The results of this study were validated in two ways. First by triangulating the existing literature with the quantitative and qualitative data it was possible to compare the initial hypotheses drawn from the literature with the structured (confirmatory) Likert scaled items and the open-ended (explanatory and exploratory) questions. Second, the results and conclusions were regularly discussed and compared with the experiences of others in the field to look for potential errors or omissions.

## Chapter 4 Results

The results of this study are presented in the three sections. In the first two sections of this chapter, I present a general summary of the raw data for each of the two explanatory concepts explaining what the panel reported and discussing the implications of these qualitative results. The data are divided into partnership *sustainability* (Section 4.1) and partnership *adaptability* (Section 4.2). Each section includes a summary of the findings across all respondents and a confirmation or rejection of the predictions about the explanatory variables made in chapter three. Then, in Section 4.3, I explain the results of the hypothesis tests of the *sustainability* and *adaptability* of the panel's idealized partnerships and potential for *adaptive management* in policy-induced partnerships.

### 4.1 Partnership Sustainability

The presentation of the results on partnership sustainability will proceed in three parts. In Section 4.1.1, I will explore the various ways the panel approached defining the term partnership concluding with a definition drawn from their responses. In Section 4.1.2, I present the summary data on the importance of organizational and interpersonal embeddedness. And, in Section 4.1.3, I will present the data on the impacts of partnership structure and decision making.

#### 4.1.1 Defining Partnership

A search for a common understanding of partnership assumes that something called a partnership (an entity distinct from its parent organizations) is being formed and can therefore be clearly identified, described and measured. In education this notion of

partnership is reflective of a learning community (e.g., Goodlad, 1988) in which members interact in relationships that span and yet are distinct from their home organizations. Such partnerships are expected to take on a life of their own at least in part measuring success by their ability to continue and grow (they acquire sustainability). It is this entity that could provide the institutional space for a process of adaptive management.

Following this logic, the partnership model used in the RETA study was developed from the literature assuming that a thing called a partnership would form between organizations as an identifiable and bounded relationship or set of activities (Kingsley et al., 2008). It was anticipated that there would be differences in the focus of the partnerships (e.g., content area, choice of programmatic intervention, service population) but that it would be possible to nail down the boundaries and scope of the thing we are calling a partnership. It was further assumed that education practitioners would have a single conceptualization and definition of partnership that could be identified if the right questions were asked. Once that definition was identified it was thought that a more precise logic model or set of models to use in evaluation studies of partnered educational initiatives could be designed. These would represent the lifecycle of a partnership including the range of partnership structures, activities, interactions, and processes that then explain the contribution partnerships make to desired programmatic outcomes (within the set of existing embedded relationships, around specific strategic or environmental needs). However, partnerships and program implementation in education are far more complicated in practice than was anticipated.

The development, implementation, and conclusion of projects constitute the lifecycle of a programmatic intervention. Similarly, partnerships might be conceived of

as having a specific lifecycle (formation, operation, and eventual dissolution). When asked in an open-ended fashion about the lifecycle of their partnership, the most common response among the panel referred to the funding cycle of their interventions (n=17/32). They thought of their partnerships as beginning and ending with the funding. For some the end of the funding means the end of the partnering (n=5/32). However, for many of the panelists, partnership dissolution never occurs as they just transition into the next funding stream. Those who had very longstanding relationships did not see a linear lifecycle as a useful concept at all because, “in most cases where the grant has come to an end, other funding has been secured.” Alternatively, they saw their partnership as cyclical bursts of energy and activity that eventually leveled off to be followed by periods of reflection and rejuvenation. During each cycle some individual or organizational participants might be added while others dropped off. Thus the timing of the formation of what was referred to as a partnership by the participants of this study differed from the predictions in the literature and among the participants themselves.

Given the research literature, it was expected that all panelists would hold similar entity-based, highly collaborative conceptualizations of partnership in which memberships, boundaries, and formal and informal organizing structures designed to achieve specific functions, played a major role. However, this was not the case. The panel did not consistently describe clear boundaries (who was in or out), a definitive scale (partnerships might include individual relationships, be contained within single schools and units or involve whole districts with little distinction), or well-defined routines and procedures for their partnerships. They had very different understandings about what constituted an education partnership. Their responses can be categorized into four

conceptually different definitions of partnership. Through their definitions, respondents provided their dominant conceptualization of partnership (see Fig. 4). The overwhelming majority (n=29/31)<sup>38</sup> did not define partnerships as a single thing so much as set of agreements or as a process. Only two of the panelists viewed partnership in a highly structured, entity-based way, and their organizations were specifically set up as IHE/K-12 bridging organizations or service providers (n=2/31). This process or agreement perspective leads us to recognize a breakdown of collaborative entity-based assumptions of what partnerships are and has two important implications.

First, partnership as a potential venue for adaptive management implies that some sort of partnership entity forms, operates, and generates outcomes. If education partnerships are not conceptualized as collaborative entities that perform a linking or bridging function between organizations, then we need to ask what exactly are they? In the business world a partnership is a joining of two corporate entities in a way that allows them to pursue specific goals. This might result in a joint venture (new entity) or might only constitute an agreement to provide contracted services between the organizations (a much less invasive relationship). Adaptive management within a stable entity that might serve as a venue for collaborative decision making would look different than it would if conducted within a partnership that is essentially a contract. And second, the choice of appropriate measures of partnership success and the potential for adaptive management of education problems will differ by how Partnership is ultimately defined (see Table 13).

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<sup>38</sup> The panel was made up of 32 members however one member did not participate in round one (throughout the several months of panel surveys the number of participants varied from 30-32).

About one third of the panelists described an agreement-based conceptualization of partnership with predetermined goals aimed at improving STEM education (n=9/31). This contractual view might be reflective of the agreement about what will be done and how grant funds will be spent that is developed in the proposal writing process. Similarly, Firestone and Fisler argue, citing Goodlad, (1988), found that the term partnership's, "core definition points to a deliberately designed and formalized agreement [or set of agreements] between different kinds of organizations, without specifying purposes" (2002, p. 450). From their perspective, an education partnership is a goal-focused agreement that might evolve from the interaction of a network of education professionals.

Such agreements do not necessarily require further collaboration after the agreement is made. The implication of this is clear. The partners might be doing all of their collaboration and choice-making prior to engaging in what is labeled a partnership. While any agreement would have to be structured, how it was bounded could differ as appropriate. The important elements of a successful education partnership would thus be found in the delivery of agreed-upon activities or programs to teachers, school administrators and students according to the terms and conditions of the agreement without additional necessary interactions and not in the sustainability of either activities or relationships.

A third group, nearly two-thirds of the panelists related a process-based conceptualization of partnership in which relationships are built up over time to enhance levels of trust and cooperation (n=20/31). A process-based conceptualization has room for dialog and choice-making within the process of partnering. Brinkerhoff described partnership as "a dynamic relationship among diverse actors, based on mutually agreed

objectives, pursued through a shared understanding of the most rational division of labor based on the respective competitive advantages of each Partner” (2002, p. 14). While the broad objectives (improving education) are understood at the outset a process-based approach to partnering would allow for the shifting of programmatic goals or style of implementation as long as the learning, evaluating and choosing process is maintained. Partnership success could then be seen as the continuation of, and adherence to, some process that could adapt as local conditions warrant. The scope and structure of the partnering would be set within weak boundaries that are continually varying as new partners move into or out of the process. Measuring partnership formation and operations from this process view requires that a great deal of attention be paid to patterns of communication and the forms of reciprocity that develop between partners.

Table 13. Framework of Partnership Types

	Entity	Agreement	Process	Venue
Measures of Success	Growth & Sustainability	Adherence to Terms & Conditions	Adherence to the Chosen Process	Community Building & Communication
Scope and Structure	Bounded & Structured	Bounded & Variability in Structure	Variability in Boundaries Structured process	Loosely Bounded Loosely Structured

For example, this is reflective of Brinkerhoff’s two explanatory dimensions; mutuality, encompassing ideals of partnership; and, enhancement to organizational identity, which in her view provided the motivation for choosing partners (2002). Collaboration and goal setting, and then implementing programmatic activities are an



integral part of the partnership process. The advantage of this conceptualization of partnership is that the success of the partnering could be measured by the continuation of the process due to participant satisfaction with the process (e.g., increased sustainability). However, this type of successful partnership measure tells us little about whether the partnership is having a positive impact on desired policy or programmatic goals. The process most often simply refers to a more collaborative process of implementation of a prescribed (and currently funded) program. A process of partnered implementation tells us little about how, when, or around what table broader issues or questions about policy choices might be made. With the majority of the panel reportedly partnering as a process, it will not be surprising, that they have difficulty articulating a clear connection between their partnership activities and improvements in programmatic or policy outcomes.

A final, minority view was of partnerships as a venue or opportunity for people from diverse backgrounds to come together, interact and make choices (n=1/31). The venue concept is represented in the literature by Rose who argues that there exists a “third space” that lies between the state or public and the family or individual (Rose, 1999). The space exists whether it is acted on or not. Within this bridging space there is an opportunity for interaction that is neither coerced by authority nor based solely on personal influence. It is a space based on mutually beneficial alliances in which collaboration and negotiation can take place to develop goals, set agendas, and to coordinate actions (Whetten, 1981). From this venue-based perspective specific goals or activities are less important than the potential value added of the collaboration. The idea of partnership as a venue does not imply a specific programmatic focus nor does it specifically tie the venue to any one funding stream.

**Process Based**

*“Partnership means the networking between education (or a particular level or discipline of education) and another entity, such as government or industry, in order to enhance the value of one or both partners and/or provide information between partners.”*

*"Partnership is a collaborative working relationship in which each partner respects the expertise of the other. The partners plan together and work together to achieve mutual goals, sharing information and decision making responsibilities."*

**Entity Based**

*“An independent non-profit whose mission is to enhance the capacity of people, companies and organizations to develop and apply science and technology and compete responsibly in the global marketplace.”*

**Agreement Based**

*“A partnership is an agreement made by individuals on behalf of their respective organizations, to define joint goals that will likely improve science/math teaching and learning in the region and to commit resources toward reaching the common goal.”*

*“A mutual agreement among partners to achieve specific goals. Each organization has identified clear roles of responsibility and is accountable for carrying out these activities and responsibilities.”*

**Venue Based**

*“A partnership provides the opportunity to bring together individuals often with diverse multiple expertise and with similar interests to address issues of importance to the partners in their endeavor to enhance STEM initiatives”*

Figure 4. Examples of Four Conceptual Definitions of Partnership from the Delphi Panel

The venue-based conceptualization is a place-based view of what Sirotnik and Goodlad describe as a seemingly unattainable ideal partnership consisting of “mutually collaborative arrangements between equal partners working to meet self-interests while solving common problems” (1988). Community building and ongoing communication are the measures of a successful venue-based partnership. Such a partnership would have no clear boundaries as participants might come and go, interacting within the partnership venue as needed. It would have little in the way of clearly established structure or programmatic agenda, as again the shape and scope of the partnership would change as participants became active when there was something of interest to them taking place within the venue. That the venue would continue to exist might be considered a measure of success. However, if a venue continued to exist over time it would ultimately require institutional support, thus becoming a kind of loosely structured sustainable entity.

Clearly, the panelists do not share a common language or perspective when discussing partnership. These variations in the conceptualization of partnership lead to the exploration of partnership from several perspectives. Partnership is a relationship, or set of relationships, but its form and scale varies widely (most typically as a relationship among individuals and to a lesser extent among organizations). In their responses panelists shift from one conceptualization to another with little warning (sometime referring to an interpersonal interaction and then shifting to interorganizational issues).

Given the apparent ambiguity surrounding the term partnership within the panel, and the apparent lack of a clear entity that might serve as a venue for adaptive management, it is difficult to figure out how to usefully bound a partnership. We might default to the argument that partnership is not a useful term at all (e.g., Atkinson, 1999;

Burgos, 2004). However, because the relationships that were being organized in education in response to policy inducements (external funding) are being labeled partnerships and have many of the characteristics of entities using a language of partnerships from the perspective of an entity-based interorganizational model remains useful. Something that the panel identified as a partnership is being formed.

Whatever their specific conceptualization of what a partnership is as an ideal, the panelists could still describe the process by which it got started and operated. And, by exploring their ideas about the process of partnership, we might continue to explore the ways in which partnerships impact STEM education and the potential for adaptive management. One problem with this approach is that because the nature of the partnership is fluid and left imprecisely defined, what must be sustained is also difficult to identify. In this work I will default to defining partnership as *a label we place on the set of relationships and activities currently under observation*. The partners know who is or is not a part of their partnership and what activities their partnership is responsible for or engaged in. At the core, what seems to be the most important with respect to defining a sustainable partnership is the continuation of the relationships among the partners.

#### 4.1.2 Impact of Embeddedness

Granovetter has argued that while relationships can be positive or negative, partnerships are built from a set of positive embedded relationships (Granovetter, 1992). The RETA study included a series of Likert scaled and open-ended questions exploring the importance of a variety of embeddedness variables to the panelists' previous and current partnerships (Kingsley et al., 2008). Following Granovetter, it was expected that

having a prior relationship with potential partners would be a key element in the final choice of organizational partners. Measuring the importance of embeddedness takes on extra significance in an environment of policy inducements designed to encourage the development of new relationships across institutional boundaries (e.g., as is the case with NSF-MSP attempting to bridge the IHE/K-12 communities). Organizations should be unwilling to partner with strangers. However, the actual results were mixed (see for example Fig. 5). Due to the policy inducement some organizations chose to partner with organizations with which they have had no prior relationships.

**Previous working experience**

*“three to six years with Education, Mathematics, and Science Faculty, 10 years with FDOE administrators, all professional or administrative relationships”*

*“I had a close working relationship with one of the Principal Investigators from RCAS for three years and six months before this grant started.”*

**Previous indirect knowledge**

*“Having a track record and reputation for effective partnering is critical when a partnership has to be put together in response to opportunities that arise (i.e. not planned on strategically)... Basically using lessons learned.”*

*“. The faculty at C... I had known for about one year and did not know very well, but we worked together on the proposal. The staff at the MMSA knew each other for several years. I knew the people at the Maine DOE for one year.”*

*“I had met several of the key people from other organizations over the prior 2 or 3 years, but did not have close connections with them”*

**Previous close acquaintance (e.g. friendship, PhD advisor–student, etc.)**

*“I have had a personal and working relationship with faculty members from A.. University for approximately ten years. I did not know the leaders from T.. University nor did I know the project director before becoming a part of the grant writing team.*

*“I had a personal friendship with one of the five key individuals for 4 years prior to the partnership... a mathematician at the same institution in which I am a math educator.”*

*“Over twenty five years, he was a former student and a teaching professional as well as a fellow chairman. He and I are joint members of three professional mathematics organizations. ”*

*"My former doctoral student, with whom I'd had a close working relationship, led the involvement by R.. University. When the project began (1993), we had known each other for about 20 years, though we had not been in touch continuously throughout that time. I'd had professional relationships with individuals at other important partner groups."*

**No prior relationship with the other partners**

*“For the C... grant, none of us knew the university people before writing the proposal”*

*“The University System of Georgia had decided to give seed funding to any of the teacher preparation institutions to start local P-16 councils. I had not previously known people from most of the partner organizations.”*

*“virtually every person involved in the project was new to me.”*

**A Prior Negative Experience**

*“They believed that they should be the lead institution even though they neither had the capacity or the track record. They wanted the funding to go toward their needs, i.e. faculty lines, yet it was clear from the RFP that the was not allowable).”*

Figure 5. Examples of Reported Relationships Prior to the Current Partnership

The length of previous acquaintance among individuals within the partnering organizations can be classified into those who report having had a positive previous working experience (n=12/32); those who report having had a prior negative working experience (n=1/32); those who report a close interpersonal relationship (e.g., friendship or PhD advisor-student) prior to working on the current partnership (n=5/32); those that report an indirect knowledge of one another but no previous direct relationship (e.g. by reputation, through working in the same field) (n=1/32); and those who mention not having any relationship or knowledge of their current partners prior to working on the current partnership's programmatic interventions or activities (n=13/32). Figure 5 includes examples of the specific responses made by members of the panel.<sup>39</sup>

Table 14. Time Required To Establish Effective Working Relationships

<b>How much time does it take to establish effective working relationships between organizations within a partnership, who have never worked together in the past?</b>	<b>Frequency</b>	<b>Percentage</b>
<b>2 - 6 Months</b>	<b>5</b>	<b>15.62</b>
<b>6 - 12 Months</b>	<b>6</b>	<b>18.75</b>
<b>1-2 Years</b>	<b>16</b>	<b>50</b>
<b>2+ Years</b>	<b>4</b>	<b>12.5</b>
<b>Missing response</b>	<b>1</b>	<b>3.12</b>
<b>Total</b>	<b>32</b>	<b>100</b>

<sup>39</sup> The panel reported difficulty in forming totally new relationships and that they are less likely to work with people they have never previously worked with. This finding gave us an early indication that the partnered relationships within the MSP program are not new but are a continuation or reconstitution of previously established working relationships.

More than half of the panelists reported that their organizations were unlikely to choose to partner with people or organizations with whom they had never worked (n=17/32). While it did happen, the difficulty in establishing “good” working relationships was one cited reason that panelists would be less likely to choose partners with whom they had never previously worked. The panel reported that it typically took one to two years for active partners to develop effective working relationships (n=16/32, see Table 14). This length of time represents a considerable use of limited resources. The time spent building relationships might be beneficial to partners in the long run but from the perspective of implementing a particular program it represents a costly delay. Consistent with the literature, participants reported that by working within a set of previously established working relationships they could get to work implementing planned programs more quickly and efficiently.

The establishment of new relationships and maintenance of ongoing interactions requires regular communication. Predictably communication was one of the key factors that might support and yet often slowed partnered implementation across IHE/K-12 boundaries. One panelist said the “the sense of urgency across the two cultures is different.” While another said, “they speak different languages – literally.” One thing that contributes to the difficulty in establishing good working relationships across IHE/K-12 boundaries is the difference between their respective institutional schedules. The university faculty have more flexibility in their schedules, while teachers and K-12 administrators are getting ready for work at “5am and are dead tired by 2pm.” Also, the institutional calendars are usually different and partnership participants at one organization may be on a school break when needed. Following Granovetter we should



expect that these organizational communication challenges make the development of good working relationships more difficult and therefore more valuable once made.

However, several of the panelists' responses led to questions about how important embedded relationships really are to partnership formation. Nearly half of the panel reported that they did not have working relationships with current partners prior to establishing their partnership (n=15/32). For example, one of the panelists reported that he was brought on "to help create the partnership" even though he had no established record of working with any of the partners and "virtually every person involved in the project was new to me." This brokering of relationships by someone outside of the partnership would indicate that there are actors outside of what participants describe as the partnership that still have a role in the partnerships operations and success. There exists a broader network of connections that goes beyond those that are directly involved in implementing the partnered programmatic activities. Members of this network can serve as a proxy for a previous relationship when creating new connections.

Just over half of the panel stated that they had known or worked with the other partners prior to engaging in their current project (n=17/32). This knowledge of an extended network of those possibly interested in partnering gives further support for the importance of a wider set of interconnected relationships. Many of the panelists described knowing people loosely but having not worked with them, and that they needed time (most commonly 1-2 years) to establish a good working relationship. Organizational issues like creating timely payment procedures need time to be worked out. However, the language used by the panelists implies that relationships are more interpersonal than interorganizational suggesting that partnerships are more about the individual people

doing the partnering than about the organizations they represent. People need to trust one another in order to work together effectively.

A higher level of trust (an important component of embeddedness) has been hypothesized to be an important condition for successful partnership formation (see for example Grannovetter, 1985, 2005; Beierle & Konisky, 2000; Potoski and Prakash, 2004). Confirming this, the panel overwhelmingly reported that mutual trust was critical or very important (n=30/31) to their partnering. High levels of trust should therefore increase the sustainability of the partnered relationship.

*“An important factor in providing an MSP project with evaluation assistance is developing a relationship of trust and respect. Many MSP projects are skeptical about the degree to which our project can help them improve their evaluation activities. Reasons for the skepticism include concern about time away from their project activities, concern about what we do with information they share about their project.”*

*“Time is not the only aspect, frequency and length of interactions matter just as much. It is a matter of establishing mutual trust and respect. If partners meet once a month it takes a lot longer than if they meet twice a week.”*

*“Mutual respect, trust, and a shared mission. These are always the deciding factors in any partnerships.”*

*“We require trust and competence when we develop partnerships. All other factors, while important, can always be worked out if a problem arises. We have always been successful by following this rule.”*

Figure 6. Examples Of Responses Related To Trust

People with long-term relationships generally have higher levels of trust whether the relationship is based in work or not. Higher levels of trust develop over time and do not occur automatically when organizations decide to partner. However, because long-term nonworking relationships may contribute to higher levels of trust they may shorten the time it takes to develop good working relationships and thus may contribute to improved partnering. In addition, several respondents mentioned trust and mutual respect as key factors in how they chose their partners, (n=6/32) and that this contributed to the operational success of their partnership. Trust was specifically linked to the frequency and length of the interactions (two other components of embeddedness) among the partners and to establishing good communication among the partners.

The consensus on communication questions was that K-12 and higher education practitioners must work together in mutual respect for the partnership to succeed (again we find interpersonal language).<sup>40</sup> The crossing of and communication across institutional boundaries was thus left to the individual education practitioners. Since personal relationships seem to be the building blocks of good partnerships we might wonder how important prior working relationships really are. When asked what made a particular intervention the best, twenty-five percent of the panel (n=7/32) responded from an organizational perspective. The panelists cited connections to “prestigious labs,” sponsorship by NSF, cross-organization workgroups, and the creation of broad links “among scientists and educators,” as the reasons a particular intervention stood out. However, the overwhelming majority of the panel reported from an individual

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<sup>40</sup> One of the most common points raised was that the higher education faculty are perceived to act with an air of superiority and often fail to involve the K-12 participant’s and teachers in the decision-making process creating a negative working environment.

perspective (n=25/32) saying for example “it is the people I have worked with,” “I have been learning a tremendous amount,” and “Worked on something I cared deeply about.” That so much of their description of the positive aspects of a partnership come from an individual perspective further suggests that, for these experts, partnering is much more interpersonal than it is interorganizational.

Two findings above call into question assumptions about the importance of organizational embeddedness in the model of partnership. First, the notion that working with good people and individual feelings are the benchmarks for the best partnerships according to our panel strongly suggests that partnering is not best understood as an interorganizational relationship. Instead, highly functioning partnerships may be just about getting the right individuals in place to implement particular programs. However, any requirement for specific individual participation will make developing federal policies that can be broadly applied extremely difficult. The second important finding is that many partnerships are being formed without prior embedded relationships. From a policy perspective this finding may be good news if the policy is intent on driving the creation of new relationships (as is the case with NSF-MSP). However, since so many of the panelists are reporting that they are starting partnered projects with all new members (n=15/32), embedded relationships as a critically important driver of partnership formation, operation and outcomes must be a flawed notion. For at least partnership formation *Embeddedness* is not a critical variable.

However, the panel identified the “start-up” getting to know one another phase of the partnering process as important. The people involved meet, agree on common goals and decide on the different types of resources they will need in order to complete their

agenda. During this phase the potential partners “tend to behave independently” as they develop plans, negotiate roles, and secure funding. Therefore there is a relationship described as predating the partnership’s funded activity. A “Request for Proposals” (a policy inducement) can be the critical factor in driving the creation of the relationships from which the partnership emerges. The process of developing an acceptable proposal provides a context for developing positively embedded relationships. Once funding is secured and program implementation begins, there is more of a “feeling of teamwork” because these people have grown to trust one another, and they have “witnessed each member’s commitment to success” of the project.

A great deal of the partnering is maintained through interpersonal relationships. Therefore an important theme that emerged from the responses was the effect of personnel turnover on partnership capacity and sustainability. Interestingly, there were differing opinions about the impact of turnover. Some contended that turnover was significantly harmful to the future success of the partnership (as key people were lost or those with specific skills were hard to replace) (n=6/32); others took a more moderate view saying that turnover had the potential for good or bad (too much and you were lost but some turnover refreshed the group) (n=9/32); while most suggested there was no effect if the partnership was sound (n=17/32). None of the panelists were willing to argue that turnover is wholly detrimental to a partnership, but it was, rather, a complicating factor that “must be handled carefully” in order to succeed. Specifically, a handful of individuals brought up trust and reputation as potential problems with turnover, as many organizations work years to build these two values within their institutions and independently of interpersonal relationships (n=4/32).

The rather unexpected finding that embeddedness is not critical to partnership formation does not damage the predictions about the impact of embeddedness on sustainability in this study. The concept of sustainability is based on continued future interactions. Improvements in operational effectiveness due to embedded relationships (e.g., because of established work routines) argue in favor of embedded relationships increasing partnership sustainability. Therefore we should find that partnerships built upon embedded relationships are more sustainable than those that are based on newly formed relationships.

#### *4.1.3 Partnership Structure and Decision Making*

The panel was asked a series of questions related to structure, decision making, power and control within the partnered relationships and among the partners. In these questions it was important to explore the range of the panel's experiences with other individuals and organizations involved in partnerships. It was initially anticipated that one organization might be the more controlling or that a single individual would be both a driving force and in charge. However, the panel was split with about half reporting more centralized control and disproportionate power (n=17/32), while most of the rest reported an equal sharing of control and balanced levels of power (n=10/32). Interestingly, this broke out along a gender and minority basis.<sup>41</sup> Women and minorities were more likely to report power being shared and less centralized decision making while men were more likely to report that power was concentrated and that decision making was centralized. Older panelists were also more likely to report more centralized power

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<sup>41</sup> While these gender and racial differences are interesting trying to understand or explain them goes beyond the scope of this current project.

and control (perhaps because the respondent's were so senior in their organizations that they were personally in charge).

Two main themes that emerge from the dialogue on power issues among partners: the structural management of the partnership and the status or prestige of the individuals involved. Nearly every complaint or bit of praise from the panelists touched on one or both of these themes. While there were the previously reported differences among the panel's responses based on variables such as gender, race, or organizational affiliation, the overall message was that management structure (clear, open and centralized decision making) and interpersonal relationships are the key elements behind power struggles.

Two general classes of activities that partnerships engage in, partnership administration and programmatic implementation, complicate the administrative structure of the partnership. The programmatic content of the partnership's work is limited to the planned engagement funded from either external grants or from the participating organizations, and is carried out by personnel that do not necessarily have decision making authority. The partnership administration is responsible for making wider ranging decisions about what gets done and by whom.<sup>42</sup> When asked about their administrative procedures, the panel reported on two kinds of administrative bodies differentiated by their power to actually make binding decisions or to simply give advice.

Some partnerships have a level of oversight or support from advisory boards made up of experts whose, "impact on the strategic setting is minimal" but who may provide guidance or advice as needed (n=12/30). The role of these advisory boards can be

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<sup>42</sup> While there may be considerable overlap among those who make decisions (administrative network) and those who implement specific programs (operational network) this is not the typical case.

to provide additional “knowledge” or “political clout” to the core decision makers. Additionally, they may provide credibility “required by NSF,” a venue for “information sharing” or as one panelist noted they allow for a sense of “community participation” even as decision are made elsewhere. It was clear that the panel made a distinction between those in their partnerships who have the power to decide and those who are simply participants. For a small number the decision maker was a single person or a very small group (n=4/30); for others there was a more democratic and representative group making decisions (n=9/30).

Panelists who addressed organization and management of the partnership as a reason for power issues raised several different but overlapping concerns: unilateral decision making and control, top-down management, unequal distribution of and recognition for the work, and a need for external facilitation. The common story that materialized from these concerns was one in which the partnership began with the intent of equal contribution from all involved but ended up with one partner (typically the IHE partner) dominating the planning and decision making processes, doing less of the real work, or receiving more of the credit for the work and accomplishments.

However, most of the panel reported that the work of their organization was done as agreed (n=23/32) and only slightly less enthusiastically reported the same about their partners (n=21/32). Also, there was no consensus over whether legal contracting improved performance. Several panelists acknowledged turf battles as a reason for resentment, distrust, and a lack of communication. Specifically, money-handling decisions were referenced various times as having a negative impact on the partnering environment, in large part because it is difficult to establish trust and an equitable



partnership when “one institution [typically the IHE partner] is seen as holding the purse strings” for all. The rules for managing some grants require that all monies be handled in very specific ways and must be accounted for by specific partners.<sup>43</sup> The capacity of IHE to receive or manage grant funds is one of the draws that attract K-12 schools to choose them as partners.

The question of how changes in organizational capacity impact the work of partnerships over time is one key to understanding their development and sustainability. With that in mind, four main themes were identified: resource exchange (complementary assets), the impact of outside funding, turnover (as discussed previously), and connectivity (or collaboration). Many panelists brought up increased connectivity, networking and community ties as important improvements to capacity, such as the building of “education-business bridges,” greater leverage with larger numbers, and better coordination (n=22/32). One individual commented that the partnership with two school districts directly influenced its positive networking with the local government and universities because the two districts had shown their focus went beyond education to “improving the community” as a whole.

The most common theme among the panelists addressed the exchange of new resources and knowledge among partners. Several individuals specifically pointed to an assumed model of higher education faculty and K-12 teachers in which university-level educators bring the content knowledge, expertise, and research literature to the table

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<sup>43</sup> I had an opportunity to ask the NSF director about this problem and found out from him that it is intentional that IHE partners and only those IHE partners manage grant funds. Reportedly previous experiences with school districts dumping targeted grant monies into general funds led to questions of accountability. It was decided that IHE institutions that regularly handle grant monies would be more accountable.

while K-12 educators contribute their pedagogical experience and direct perspective of the classroom (n=6/32). This model presumes that each group has specific resources to share with the other, and the result is a better approach to teaching and the learning environment. However, that this model is commonly held is not surprising as it is the current basis for NSF's funding decisions.

Partnership structure has an effect on the sustainability of the partnership. Two factors seem to be most important. Internal and centralized control over decisions (within the partnership) increases the perceived external legitimacy of the partnership. In some cases this may be a factor of the position and power particular individual who is in control. In addition greater collaboration within the partnership increases the perceived internal legitimacy of the partnership. These should both increase a partnership's sustainability. Also, because partnering reportedly increases organizational capacity we should expect sustainability to increase as partnership capacity is increased.

#### **4.2 Partnership Adaptability**

The summary of the results of adaptability will proceed in three sections describing and discussing the impact of the hypothesized drivers of adaptation in education partnerships. In Section 4.2.1, I describe the impact organizational strategic needs have on partnership adaptability. I explain the effects of environmental conditions on driving adaptation in Section 4.2.2. A distinction must be made between general environmental factors (conditions that must be endured) and variables associated with externally imposed policies, rules, and inducements (conditions that are voluntarily accepted as a condition for participating in a grant program). The role of external

policies, rules and inducements in restricting or enhancing partnership adaptability and the importance of the timing of participant decisions with respect to the potential for adaptation is reported in Section 4.2.3.

#### *4.2.1 Strategic Needs*

The second of the critical variables in the model of partnership from the RETA study was strategic needs at an organizational level (Kingsley et al., 2008). Following Burt (1992), who argued that organizations enter partnerships for rational reasons (e.g., to gain resources, increase control or coordination, to gain knowledge or expertise, to gain legitimacy), it was initially hypothesized that greater alignment of goals and complementarity of strategic needs would increase the likelihood of partnering and would improve outcomes. When asked what they needed from partners that their organizations lacked, the panel mentioned developing a new curriculum, professional development (for in-service K-12 teachers and administrators), and educational support programs for students (the need for specific products missing from their current environment) and opportunities to acquire new finances, additional legitimacy, knowledge, and other resources to accomplish their operational goals (the need for specific resources). When the panel discussed their partnered relationships, they spoke from an interpersonal perspective; yet when asked in a similar open-ended fashion what they needed from partners, they stuck to detailing what their organizations needed.

Instead of addressing partnership strategic needs in an objective, resource economic, or organizationally strategic manner, most responses described the partnership needs of their organization conceptually. Panel participants expressed a desire to work

together, share benefits, have mutual respect, and a “sense of ownership” within their partnership experiences. The overwhelming consensus around the need for a common vision and set of goals among partners suggests that any lack of such would be a serious constraint to effective partnering. This seems to indicate that, for the panelists, their relationships are personal but the work is organizational. Education partnerships are goal and task centered interactions.

*“Partnerships are not all organizational. Partnerships among organizations REQUIRE strong administrative commitment. Partnerships among individuals require a vision”*

*“The partnership must help the organization advance its goals. Working in partnership in some respects is harder than just doing your own thing - especially in the short run.”*

*“Having to work across multiple institutions and develop understandings of the cultures and contexts in each is hard and slow work. To establish a commitment to do that hard work, the partnership must have a clear and valued benefit to all partners.”*

*“The single most critical component is having mutual goals among potential partners. ”*

*“Agreement that a partnership is needed. Trust between different interests. Leadership of respected individuals. A clear and open process. A shared vision of what might be achieved. Time to build the partnership. The development of compatible ways of working, and flexibility. Applying research to solving problems... Collaborative decision making, with a commitment to achieving consensus. Effective organizational management.”*

Figure 7. Examples of Responses Related Goal Alignment

Half of the responses on the subject of needs concluded that a common foundation in which partners’ interests and contributions overlap is critical (n=16/32).

The overarching consensus around the needs of partners was that unity of vision, goals, and values among the partners is essential. Several panelists even stressed the importance of establishing a set of core principles of the partnered intervention from the beginning so that all parties involved were clear about the purpose and intent of the partnership (see Fig. 7). Others mentioned for example that a “common passion,” “enthusiasm, and commitment” from within the partnership were all-important.

Because having a mutual goal was the only perceived need that rose to the level of critical importance among the panel it is important to rethink needs as a driver of partnership formation. The implication here is that needs do not really drive people to partner but, rather, that they partner with people who have similar goals. This evidence supports Gulati’s argument that a rational approach to choosing partners is less important than the existing environment and socially embedded set of relationships (Gulati, 1998). It also suggests that strategic needs may not drive partners to respond to policy inducements but that the network of interested actors simply seeks out opportunities to further local goals; they then try to tailor their proposals to the conditions for receiving the grant funds. Developing proposals that align with funding opportunities (including the kinds of activities chosen or the partners they engage) limits the range of options considered to those with available funding. From a policy perspective constraining adaptive management in this way limits the potential for developing the best locally appropriate interventions.

The importance of having a common vision prior to partnering reported by the panelists is evidence of, and implies a programmatic mentality among, the panelists. A common vision means that the characterization of the problem, the choice among several

potential alternative solutions, and some plan for implementation is likely to have been established prior to the formation of the funded STEM partnership. For example one panelist stated, “one of the needs our partnerships have aimed to address is providing effective, sustained, professional development to help these districts improve student achievement.” This evidence aligns nicely with an ongoing process of developing funding proposals that are specifically tailored in advance toward a particular kind of programmatic solution and bounded by the requirements of a particular funding program. If we define partnership formation as beginning at the start of a funding cycle (and thus potentially bounding partnership evaluation efforts in the same way) we leave out theoretically important and beneficial elements of the collaborative partnership processes (those that lead to developing grant proposals).<sup>44</sup> In that case the potential for adaptive management lies outside of the actual partnership.

Much of the value of collaboration is gained from discussing various components of a problem, developing a consensus on the character and importance of a problem, developing options, making decisions, and then implementing, evaluating, and reconstituting consensus so that further improvements can be made. In a system bounded by iterative program implementation, in which programmatic choices are based on

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<sup>44</sup> There is an important theoretical question here about when the STEM partnership forms. If specific funding streams are intended to drive partnership formation and if we consider the work needed to develop an acceptable proposal, it is possible that the opportunity for funding drives the formation of as many or more partnerships as does receiving actual funding. However, the operation of these unfunded partnerships may be delayed until an alternative source of funds is successfully secured or they may quickly dissolve if alternative funding is not found. Also, if the partnership preexists the funding then the policy is not driving partnership formation. A funding program only activates elements of some previously existing network of relationships.

available funding sources, participants cannot explore the full range of alternatives or group values as these are outweighed by the parameters of the funding stream.

Pressure to identify outside resources that can support organizationally strategic needs (e.g., institutional programmatic needs like teacher training) is especially strong in economically challenged districts (e.g., Harding, 1990; Alleksaht-Snider, Deegan, & White, 1995). For example, the majority of the panel reported that most of their partnered work was supported by federal monies (n=19/31). Just under half of the panel said they had formed their partnership in response to conditions of a federal grant (n=14/31). When directly asked if their organization would partner if the work were not covered by external funds, two-thirds said yes (n=22/31). However, since they do most of their partnered work with outside support it is not clear how active the partnering would be or the extent to which their organization would be involved without it. One third of the panelists stated that their organization would not be involved in any partnering without all of the money coming from outside sources (n=9/32).

As alternatives to financial needs (chasing new external grants), the panel reported responding to locally specific education needs (n=29/31), the need to address the achievement gap, changing technology, and to locally important environmental issues (e.g., ethnic diversity, poverty). These are not organizationally strategic needs but are a function of local conditions many of which are out of the direct control of community educational institutions.

When asked about the needs in their communities to which their home institutions responded, the panel reported several that related directly to education. For example, they reported the need to “strengthen the education system especially in science and math,”

“provide professional development to teachers,” and to “redesign AP biology.”

Responses like these should be expected from panelists who are primarily interested in improving their local education system. However, about half of the panelists said they were responding to broader community needs in “high minority, high poverty, and low educational attainment” regions (n=14/32). Their interventions were set in an environment in which local needs were high even as resources were constrained.

Clearly, partners are responding to needs well beyond their organizations. This awareness of local conditions and desire to act to address local problems further suggests that they are motivated to act on factors beyond their organizations. The implication of this finding is that organizational strategic needs are less likely to motivate the participants in educational partnerships. One likely reason this might be the case is that, as noted above, much of the activity within education partnerships is conducted among individuals and small groups; significant elements of their home institutions may have little to do with the activities of the partnership making the organization’s strategic needs weaker motivators of adaptation. The types of activities engaged in through partnerships might be seen as completely separate from or only enhancing the core mission of the parent institution. Contrary to the hypothesized prediction, organizational strategic needs should have less impact on partnership adaptability because they are reportedly a weaker motivator to act.

#### *4.2.2 Environmental Effects*

The weakness of organizational strategic needs as a motivator for adaptation leads to a more robust expectation that the environmental context within which partnerships



develop is a prime motivator of partnering behavior. Factors associated with the physical environment (e.g., local economics, crime rate, cultural diversity) tend to be descriptive of the educational challenges confronting professionals. For example, several members of the panel reported working in districts that have high *poverty* rates and that the prevalence of poverty among their students impacted their work (n=11/32). Many of the respondents also reported that these factors are a major motivation for their organization's participation in partnerships (e.g., motivated them to search for external sources of funding or other resources). Poorer K-12 school districts need to bring in additional resources from whatever sources are available. One strategy for doing so is partnering with other institutions to bring in external grants. Thus, local poverty can be a driver of STEM partnering.

Another element of environmental variability has to do with previous attempts at addressing local education problems. While the variable *embeddedness* captures the history of organizations working together, it is also important to understand the nature of previous interventions (what was tried and what happened). Previous interventions can act as an anchor shaping the starting points for most partnerships. A history of failed (or successful) interventions is likely to impact ongoing and future work. Therefore, controlling for what came before is important (several of the panelists reported working on serial interventions with relationships lasting as long as 30 years and averaging close to ten). Recall that over half of the panel reported active working relationships that go back for many years (n=17/32).

The environmental conditions partners operated under also included the *geographic scale* of the partnership. The panel reported a wide variety of geographic

scales within their most recent partnership (local community, n=1/32; a single city or county, n=3/32; region, n=10/32; state and larger, n=18/32). The *geographic scale* of a partnered intervention is a critical consideration when bounding partnered activity and evaluating the impact of the partnership. Adaptively managing educational problems will be simpler and more responsive to local variation at smaller scales.

A final environmental factor, from the perspective of a partnership, is the standard operating procedures of the participating organizations. A *normal work pattern* refers to the routines and content knowledge that education organizations would normally engage in absent the partnership or the external funding. These regular procedures may be leveraged or can inhibit partnering. Understanding *normal work patterns* provides a baseline for assessing the nature of the intervention being offered by the partnership.

For example, the panel reported no consensus on how well their home organizations handled disputes among partners (indicating that several had troubles with their partnering), while most said that there were clearly established procedures for getting paid (something that happens in their regular work, n=19/30). The difference in the extent of overlap between regular, ongoing work with standardized procedures and the newly constituted partnered work (in which standard processes and procedures must be negotiated and developed) must be accounted for when evaluating the impact of the current intervention.

The impacts of environmental factors have been shown to be strong motivators of action in the above results. In particular, local physical environmental conditions like poverty and population diversity require additional effort of potential partners; this work goes beyond the regular work of parent institutions and requires additional resources. In

addition to conditions in the physical environment, internal institutional support (from within the parent organizations) is a limiting factor for partnership implementation while local community involvement has a positive effect.

#### *4.2.3 Rules and Inducements, External and Internal Policies and Constraints*

The need to specifically account for the impacts of the rules and inducements partners operate under, while not initially obvious, became so when the panel started explaining the internal and external control of their projects. For example, when asked why specific partners were chosen, the panelists would sometimes tell us not that the partner was needed, but that they were responding to “various requirements” from government or other funding agencies. Alternatively, within their partnered relationships, issues of organizational and personal control or fairness (especially with respect to labor and resources) impacted the operation and effectiveness of their work.

The panel reported responding to both funding agencies and to governments. The requirements of some funding agencies were less intrusive. For example, panelists reported experiences with federal agencies with partnership requirements that applied to grant participants, and state and local level block grants that gave them a source of funding with fewer strings. Neither of these seemed to place such a burden on the participants that they could be classified as drivers of behavior (except for writing and winning the initial proposal, reporting, and basic accounting). For example one panelist said, “Federal policies are more like exaggerated mandates that can be subverted locally.” Another said, “I don’t see much influence by federal policy. I believe that we are encouraged to do this [partner] because it is more cost effective.” However, another

panelist clearly stated that they partner because “NSF programs [& other similar federal programs] specifically require partnership, or collaboration).”

However, federal government laws (e.g., NCLB), rules, and mandates (especially those without funding) drew a bit of fire because “the policy environment constantly changes.” Clearly the panel reported responding to federal laws, “school districts are responding to” NCLB. A common theme was that, “NCLB has a significant effect on the kinds of things that school districts are interested in.” Schools have legal requirements under the law. Clearly, this broader environmental context extends beyond the partnering organizations and its effects need to be factored into the analysis of partnering and the potential for adaptive management.

Institutional support is an important variable from within the partnering organizations. Nearly half of the panel reported that it was critical to the success of their work (n=12/31), while the rest rated such support as at least important. However, the support from home institutions can vary widely and can differ by institutional type. School administrations for example are typically more connected to partnered work in education because the permission to engage in partnership activity is approved at the level of the school or the district. For IHE partners the participants may be acting in a professional capacity that requires little administrative oversight or institutional buy-in beyond the grants administration and university accounting departments.

Measures of process have their root in the operational capacity of the parent organizations and how partnering impacts their ability to accomplish desired goals. Much of the benefit of partnering is assumed to be in greater communication, collaboration on projects, and learning (Goodlad, 1988; 1994; Brinkerhoff, 2002). However, the improved

coordination or leveraging of resources might also be significant contributors to or benefits of partnering. The panel had little trouble telling us what they did but they had much more difficulty telling us how partnering improved their work. The typical work patterns of STEM partners were explored in the second round of the survey.

The majority of the panel participants reported reciprocal working relationships in which they passed work back and forth as needed (n=21/32), which argues for the presence of collaboration. However, they spend a lot of time talking about programs but little about what they or their organizations add to the work. They did not link the partnership process directly to improvements in programs or outcomes. And while two thirds of the panel described partnership as a process, they did not specifically talk about their organization's role in goal setting or decision making.

When the panel was asked if their interactions with partner organizations changed their approach to working on programmatic activities, the answers were varied in detail but most had said yes (n=28/32). Interestingly, only four of the panelists did not believe that their interactions with partner organizations had in any way changed their approach to working on programmatic activities. Of these four respondents, all were from IHE. It may be that the connection between the partnered work and the IHE is too tenuous to drive much adaptation on the part of the broader institution.

Most of the panel reported using formative program evaluation to modify their interventions throughout implementation (n=24/32). Also, summative evaluation was described as a terminal report of the work just completed that might be fed back into improving a new intervention (n=29/32). Throughout the process the majority of the panel reported that they learned from partners a great deal that would not be learned if the

partnerships did not exist (n=24/32). However, it was unclear how a systematic approach incorporating learning into the process of evaluating and developing new educational interventions might operate outside of a partnership context.

The process of forming a partnership in response to a policy inducement requires that a team of potential partners develop and submit a proposal. The proposal will detail the participants, the activities to be undertaken, the budgetary needs, and the evaluation procedures as required by the funding agency (National Science Foundation, 2009). In order to respond to the policy inducement, the plan for the engagement must be laid out in detail before the funding is granted. A poorly developed plan simply will not get funding. Therefore, many of the critical decisions about how to address and manage a local problem will have to be made prior to the formation and active engagement of the partnership and its programmatic interventions. However, partners were added or lost over time. Thus, partnership formation was not described as a single event but as a process that continued throughout program implementation.

#### **4.3 Hypothesis Tests and Adaptive Management**

This work was developed around the hypothesis that policy-induced partnerships could serve as the basis for, and leads to, adaptively managing local environmental problems in complex and often uncertain environments. The ability to test this hypothesis is predicated on partnerships providing two conditions that would support adaptive management, sustainability (so that iterative interaction could lead to learning from experience) and adaptability (so that changes could be made in response to new information or conditions). In this section I will explain the results of the sustainability

(Section 4.3.1) and adaptability (Section 4.3.2) tests and explore whether the conditions for adaptive management are met or how they could be met within policy-induced partnerships (Section 4.3.3).

#### *4.3.1 Sustainability*

In this study partnership sustainability is hypothesized to be a function of embedded relationships and the management structure of the engagement. Greater importance placed on embeddedness coupled with a management structure that places decision making with the partnership are hypothesized to increase sustainability. There are three levels of sustainability represented in this dataset (see Table 15). The most sustainable partnerships represented in the table have existed prior to the current engagement and are expected to continue on into the future (S1). Newly formed partnerships – those not based in previous work – are defined as less sustainable because since they are new we cannot predict if they will be maintained (S2). There are no partnerships that have broken down within this data set because we cannot predict whether or not a newly formed partnership will dissolve due to conflicts or other problems among its participants (there is no data for cell S3). A group I refer to as the “opportunists” have had no prior working relationship with their current set of partners and do not expect to maintain one once their project is completed (S4).

Table 15. Partnership Sustainability

Cases (women Shaded)	Minority (Shaded)	Embeddedness	Locus of Decision Making	Sustainability Scale
d17		Low	Inside	s4
d61		High	0	s4
d81		N/A	0	s4
d28		Low	Inside	s2
d48		Medium	Inside	s2
d98		Medium	Inside	s2
d37		Medium	0	s2
d19		Medium	Inside	s2
d25		Low	0	s2
d41	NA	Medium	Inside	s2
d97		Low	0	s2
d95		Low	Inside	s2
d58		High	Inside	s2
d23	H	Medium	0	s2
d66	AA	High	0	s2
d59		Medium	Inside	s2
d45		Medium	Inside	s2
d36		Medium	0	s1
d83		Low	Inside	s1
d53		Low	Inside	s1
d79	NA	High	Inside	s1
d64		High	Inside	s1
d91		N/A	N/A	s1
d33		Low	Inside	s1
d93		Medium	0	s1
d78		Low	Inside	s1
d52		Low	Inside	s1
d44		Low	Inside	s1
d77		Medium	Inside	s1
d35		High	Inside	s1
d49		Medium	0	s1
d11		Medium	0	s1

As noted above there is a great deal of variability in how the Delphi panel approached defining the term partnership. The different cognitive frames make it difficult



to come up with a single definition or way to understand partnership that would be acceptable to all. However, there is a common thread that can be used to tie all of the definitions together. No matter what the underlying definition of a good partnership is, all partnership participants use the term as a kind of shorthand to describe a specific set of relationships, events and activities. They know who is or is not a part of the partnership (the boundaries of their engagement).

Typically this set is bound to a funding stream with specific prescribed programmatic activities. From this we can define partnership as a useful label we place on or around a relational event. The relational event consists of the relationships and activities developed and conducted under that particular label. Therefore, when considering the sustainability of this partnership (relational event) there are two elements that could be sustained, the event's relationships and its activities. It is interesting to note that white men make up the majority of the panelists with sustainable long-term partnerships (80%) while women and minorities make up more than half (64%) of the newly formed projects (see Table 15). This may be an indication that there is greater diversity among more recent grant recipients than there has been in the past.

When asked in an open-ended format "how long had you know someone from your partner organization," twenty percent of the panel reported that all of the relationships in their current work were new (n=7/32). However, for over half of the panel the relationships go back for many years (n=17/32). They had worked with the same people on several different projects one after another (with emphasis on the individual people). This leads to the conclusion that the majority of embedded professional relationships are more interpersonal than interorganizational.

If we are most concerned with sustaining programmatic activity when the funds of a grant-based inducement run out we need to identify an alternative funding stream. Clearly this would allow us to sustain the activity (e.g., continuing a teacher training or after school program). However, for the purpose of adaptively managing educational problems supporting this kind of sustainability is not particularly useful. Adaptive management does not require the continuation of a specific activity. It does require the sustainability of the interpersonal and perhaps the interorganizational relationships so that partners can continue engaging in dialog, learning, and new decision making.

In policy-induced partnerships when the funding ends the activity and perhaps the partnership will often end as well without the outside support. However that is only the active programmatic part of the relational event. The relationships may be sustained at some level without continued external support. For example, friendships that developed in the course of engaging in programmatic activity do not have to end. Often, the former partners seek out new opportunities to engage in activities that support organizational or personal needs. However, by bounding the partnership within the context of a set of externally funded activities (an excellent tool for evaluating the impact of that specific engagement) we are forced to look outside of the partnership for a venue within which we can engage in adaptive management. Using Goodlad's terminology, the platform we need to sustain to launch new activities must be the broader set of relationships that includes the active partners and others with whom they might choose to partner in the future. The partnership itself as defined cannot be the basis for adaptive management. However, the broader network of connections in which potential partners operate can be the basis for the sustained interaction that should lead to adaptive management.

There are two basic kinds of management structures among the panelist's partnerships. In the first there are representatives on each organization or stakeholder group that work together to make decisions (making commitments on behalf of their organization) about what the partnership will do (n=11/31). These look like what we would expect evolving from Goodlad's (1988) platform. Negotiated agreements form the basis of the partnering. In the second, the partnership is led by a team of participants who are first the managers of the partnership and its programmatic activities and are secondarily connected to their home institutions (n=20/31). These partnerships take on a quasi organizational form and might form the basis for a process of adaptive management. In some cases, these are the actual operators but in the larger statewide projects (n=9/32) the administrators make decisions that others carry out.

Among the opportunists (S4), the management structure is typically not within the partnership (as these form and reform regularly). However, they do conduct serial interventions sharing the management of projects from within their home institutions. This loosely connected set of actors has the potential and might be engaging in adaptive management of local education problems within the scope of a wider network of those interested in education. The one exception is case D17. In this case the panelist's organization is a private corporation that she refers to as the partnership (e.g., "we are the partnership") and therefore manages its partnership internally. As predicted the most sustainable partnerships are those that have internal control structures. This suggests that these participants do have the potential to engage in adaptive management within their education partnerships.

Sustained partnerships (S1) place a lower level of importance on embeddedness and meet less often than newly formed partnerships (S2). For the panelists from new partnerships trust is a more critical factor than it is for those with more established relationships. Based on the difference in Likert scores it seems that participants of established partnerships take it for granted while the newer projects are still working to develop trusting relationships. The hypothesized importance of embeddedness in general is not supported by the data. The panelists from the most sustained partnerships rank the importance of all of the vectors of embeddedness lower than their counterparts from newly formed engagements.

#### *4.3.2 Adaptability*

The second of criteria that must be met to adaptively manage education problems is the ability to adapt, as needs, conditions, or knowledge of the situation changes. In this study four drivers are hypothesized to increase the adaptability of partnerships (organizational strategic needs, the environment, policy inducements, and the rules and constraints the partners must manage, see Table 16). To facilitate the presentation of these results, the cases in this study are divided into three ranges of adaptability (high, medium, and low). The most highly adaptable cases are the ones hypothesized to be most likely to support adaptive management given the constraint that funders will permit them to adapt and change programs as needed. The cases categorized as low on the scale of adaptability are those least likely to support adaptive management.

As noted in the literature review above, partnership structure and environmental conditions drive and shape partnership operations. However, and it seems very important

to the question of adaptive management, the rules and inducements applied by the funding agency to recipients of grant funds define what activities are engaged in, who may or must participate and what evaluation procedures are needed to provide accountability. As one panelist noted, “education is highly political.” Choice options among programmatic interventions are limited to those that funders are willing to authorize. The partnership cases that were scored the most adaptable are also those most likely to report high levels of responsiveness to the rules and constraints they operate under (55%). This may be a function of tailoring their interventions to the rules of the funding agency. While higher levels of adaptability are hypothesized to increase the likelihood of partners engaging in adaptive management, this kind of adaptation would seem to limit the scope of activities and kinds of participants that could be included.

For example in the case of NSF-MSP the Principal Investigator from IHE was required to come from math or science faculty (National Science Foundation, 2009). In education projects IHE partners would more typically be drawn from colleges of education that train new teachers in pedagogical skills and thus have some prior or ongoing relationship with K-12 educators and administrators. However, education faculty members are specifically excluded as potential IHE Principal Investigators under the rules of the MSP program. For NSF this represented a desire to broaden the participation of IHE faculty in these programs (under the assumption that there would be some benefit for everyone involved in developing or supporting these new relationships).

In addition to the constraints on who can participate funders typically provide guidance on what activities they will pay for. If local conditions change or new information suggests a superior programmatic alternative such adaptation might have to

wait for a new funding / proposal cycle. Current public policy requires a kind of contract (the grant proposal) between the funding agency and the grant recipients to account for how public funds are or will be spent. Therefore within the partnership the structure of the engagement is limited to whatever adaptations the funder will allow. These requirements often severely limit the potential for adaptive management within the process of implementing a specific set of funded partnered activities.

The time to evaluate options and decide on activities is during the proposal development process. Once approved, the rules and structures that guide implementation of funded programs limit adaptation while the active partnering is going on. However, between phases of active engagement there are periods where the potential partners can reflect on other possibilities. Potential partners can come together to weigh needs and consider options. If sufficient consensus is developed and a funding stream can be identified, the reflective potential partners become activated around a plan of action (proposal). Once the proposed work is concluded and the funding stream dries up other options or funding streams can be considered.

Table 16. Partnership Adaptability

Cases (women Shaded)	Minority (Shaded)	Strategic Needs Scale	Environment Impacts Scale	Policy Inducements Scale	Rules / Constraints Scale	Adaptability Scale
d28		Low	Medium	Low	Low	Low
d17		Low	Medium	Low	Low	Low
d98		Low	Medium	Low	Medium	Low
d48		High	Medium	Medium	Low	Low
d37		Low	Medium	Medium	Medium	Low
d36		Low	Medium	Low	Medium	Low
d19		High	Medium	Medium	Low	Low
d61		High	Medium	Low	Medium	Low
d25		High	Medium	Low	High	Low
d83		Low	High	Low	Medium	Low
d41	NA	High	High	High	Low	Low
d53		Low	Medium	High	High	Low
d79	NA	High	Medium	High	High	Medium
d91		High	Medium	Medium	N/A	Medium
d33		Low	Medium	Low	Medium	Medium
d64		Low	High	Low	Low	Medium
d97		Low	Medium	Low	Medium	Medium
d78		Low	Medium	Medium	High	Medium
d93		High	Medium	Medium	Medium	Medium
d52		High	Low	High	Low	Medium
d44		High	High	Medium	Low	Medium
d95		Low	High	Medium	Medium	High
d58		Low	Low	Medium	High	High
d77		High	Medium	High	High	High
d35		High	High	High	Medium	High
d23	H	High	High	Low	High	High
d81		N/A	Medium	Medium	Low	High
d66	AA	High	Medium	Medium	Low	High
d59		High	Medium	High	High	High
d49		High	High	Medium	High	High
d45		N/A	Low	N/A	Medium	N/A
d11		N/A	Medium	N/A	Medium	N/A

Again this happens outside of the context and structure of a particular partnership (relational event – set of activities and actors). Given that the timing of critical decisions is prior to, and the structural platform from which these interventions are developed preexists, the active engagement of a partnered intervention the potential for adaptive management within policy-induced partnerships is extremely limited. The panelists are more likely to report high levels of motivation across all three measures hypothesized to

motivate partners to adapt (strategic needs, environment, and policy inducements) among the highly adaptable cases. This would confirm the hypothesis that higher levels of these variables drive highly adaptable partnerships. That organizational strategic needs shows up as a critical motivator to the highly adaptable partnerships (the top six cases all score high on this scale) is surprising given its relatively low overall importance across all cases (see Section 4.2.1).

#### *4.3.3 Adaptive Management in Partnerships*

The above results have suggested that highly sustainable and highly adaptable partnerships exist and can be identified. It is therefore possible to explore the potential for adaptive management within these partnerships. Highly adaptable partnerships are also those that are most strongly reacting to the rules and constraints placed upon them internally and externally. It may be that they are highly adaptable because the rules require them to change as the funding stream changes. While this may limit the range of options under consideration it may also encourage greater exploration in the market of funding opportunities that education institutions operate in. It is therefore also possible that adaptive management might be occurring within a broader network perspective.

In Table 17, Cells P1, P2 and P3 represent the partnerships with high levels of sustainability. Cell P1 couples high sustainability with the high potential to adapt to changing circumstances that is hypothesized to lead to adaptive management (n=3/32). While there is plenty of evidence to suggest that some of our panelists have engaged in sustained relationships (n=14/32), within the context of a partnership as defined in this study (a bounded relational event) there is less evidence to suggest that policy-induced



partnerships themselves are flexible or adaptable enough to allow for adaptive management. The constraints placed on potential partners through the grant proposal process bound the activities of grant recipients to such an extent that programmatic modifications are limited to improving the implementation of the predetermined activities. The opportunity to fully explore available intervention options lies outside of the education partnership.

Potential limitations on adaptability do not however preclude beneficial partnerships. Organizations that choose to respond to a particular policy inducement and are willing to accept the strings attached fall into two groups (those developing partnerships creating new institutional relationships and those based on longer-standing more sustainable relationships). In Cells P7, P8 and P9 we find those who opportunistically build new relationships to engage in the partnered implementation of programs designed to accomplish a wide variety of goals. These new relationships, if sustained, might foster adaptive management in the future. However, the choice of partners can be guided by the constraints of the funding opportunity and participants may not expect the newly formed relationship to be maintained once the partnership completes its programmatic work. The primary benefit of programs implemented through this kind of partnership is in the infusion of resources that can be used to support individual institutional goals.

Cells P4, P5 and P6 represent the large number of respondents that reported they are engaging in new opportunities that fit in with local needs but are not built upon previously existing working relationships (n=13/32). These cases are clustered in two groups (those that are highly adaptable and those scoring very low on the scale of

adaptability. Opportunism may explain the kinds of policy inducements organizations choose to respond to. In theory, there may be less adaptable institutions that would seek out and respond to only one kind of policy inducement ignoring all other opportunities.

Table 17. Partnerships as a Venue for Adaptive Management

	Adaptability High	Adaptability Medium	Adaptability Low
Sustainability High	P1 n= 3/30	P2 n= 9/30	P3 n= 2/30
Sustainability New Partnership	P4 n= 5/30	P5 n= 1/30	P6 n= 7/30
Sustainability Serial Opportunists	P7 n= 1/30	P8 n= 0/30	P9 n= 2/30
Sustainability Disbanded Partnership	P10 n= 0/30	P11 n= 0/30	P12 n= 0/30

In Table 17, Cells P10, P11 and P12 represent partnerships with varying levels of adaptability that have disbanded in response to some breakdown in their engagement. With the exception of those cases intentionally designed as temporary engagements there is no way to predict from the available data which of the current partnerships will break down. Therefore there are no cases in any of these cells.

Partnerships developed both out of sustainable institutional relationships and where no such relationships existed (reflecting the evolving goals or needs of multiple institutions). Relationships based on long-term interactions (e.g., a service provider relationship) lead the partners to respond to a particular policy inducement because it supported their group goals or mission. These relationships act as a particular node in wider education networks. The institutions often provide specific services (e.g., teacher training, provision of curricular materials) while others adapt or change their tactics between engagements in response to local needs or available funding opportunities.

Within the context of a particular partnership's set of activities, participants have relatively little ability to adapt to changes in local conditions, values or needs, or to information learned in the process of conducting programmatic activities. However, institutions have greater flexibility outside of the constraints of a particular partnered engagement. One panelist described her partnership as developing from "a loosely familiar network of formal and informal providers of professional development." This statement supports the notion that there exists a network of actors, whether actually connected or not, that is interested in local problems and tries to respond. Thus there is the potential for adaptive management outside of the partnership but within the broader network of interactions in which these sustained relationships exist.

## **Chapter 5 Conclusions and Policy Implications**

The results of this study lead to several contributions to the field of public policy and to the literatures on education and program evaluation. First, while the idea of using these partnerships as a sustainable venue for incorporating adaptive management principals requires some additional consideration, there does seem to be evidence that the panelists are creating additional value (social capital) by adaptively managing their local education problems in a looser network of interactions. This finding is especially significant in light of the extensive literature on the importance of learning communities and other network interactions in education. Second, the models of partnerships and adaptive management explored during this work have led to a necessary reconceptualization of partnership (as a label that bounds a funded relational event evolving out of a larger education community) that should provide a basis for future research and evaluation work. The formalization of certain relationships under the label partnership creates a perceived legitimacy that may create embeddedness where it did not exist previously. This partnership label can be used to distinguish the participants engaged in an active intervention implemented through partnering, from the loosely connected network of potential partners (e.g., the local learning community broadly conceptualized) interested in a policy issue. And third, this work suggests a rival to the importance of embeddedness in Granovetter (1985) as a critical driver of partnership formation. Organizational reputation and legitimacy coupled with a relevant policy inducement provide an alternative mechanism for validating new potential partners. And finally, this study provides some guidance for program evaluation when implementation is done with partners drawn from the local community.

## **5.1 Partnerships, Adaptive Management and Reform**

The results of this study suggest that the implementation and content requirements built into grant programs that include partners as a condition in aid most often result in a too narrow programmatic focus among the participants. Organizations choose to participate in disjointed serial interventions that support organizational needs or goals based on the availability of funding and partners for particular programmatic activities. They choose partners from among those who are interested in similar or complementary activities (or those specifically required as a condition in aid). The primary focus of STEM education partnerships is therefore on implementing and sometimes evaluating the funded programmatic activities and not in developing their partnership. Groups interested in improving teacher content knowledge get together, apply for grants, partner as needed to get funding, and implement their program.

Alternative solutions to education problems, those that do not have available funding, tend to be excluded from the activities, dialog and evaluation of policy-induced partnerships. Evaluations focus on measurable indicators of meeting programmatic goals avoiding the messier task of understanding the role or value of the partnership. This focus on funded programmatic activity, restricts the available intervention options, limits the effort spent on collaboration and discerning local values, reduces the potential the value of the partnership as a local problem solving-venue, and is inconsistent with the long history of educational reform movements (Clark, 1988; 1999b; Chubb & Moe, 1990; Moe & Chubb 2009; Berube, 1994) and a large, significant and growing literature on the value of learning communities in education especially in higher education (Dufour & Eaker, 1998; Shapiro & Shapiro, 1999; Smith et al, 2004).

The whole notion of partnerships in education is built upon the assumption that opportunities for collaboration are worth creating (Franklin, Bloch, and Popkewitz, 2003). However, collaboration becomes valuable, not because it might improve policy implementation, but as a future resource that provides a platform for the development of new and innovative programs (Goodlad, 1988; 1990; Tushnet, 1993; Firestone and Fisler, 2002). In our need for accountability in evaluation we have lost sight of the important growing literature on learning communities especially those attempting to reform higher education (e.g., Smith et al, 2004) and on the educational reform movements that began with Dewey's progressive ideals in the United States over seventy years ago (Dewey, 1933; 1938; Berube, 1994). These movements required greater equity and inclusiveness in the sixties and culminated with the excellence movement launched in the eighties (National Commission on Excellence in Education, 1983; Berube, 1994). These movements shifted education from rote memorization to a process of civic engagement and interactive learning. The results of this work call for a reconnection of the evaluation of programs, implemented through partnerships, to this literature. However, the venue for civic engagement is not found within the policy-induced partnership but is rather in the larger set of connections from which partnerships evolve.

The path to excellence in education comes to us through civic engagement within a local community. The narrow scope, of any one partnered, programmatic intervention must limit participation. However, in order to develop solutions to complex problems, at appropriate scales, and in the context of multiple, potentially conflicting, sets of values, it will be necessary to broaden the notion of partnership to include the entire network of actors interested in a policy issue, whether actively engaged or not. The attention

currently paid to learning communities in higher education suggests a strategy for increasing their participation in IHE-K-12 partnership programs (Smith et al, 2004). By expanding the scope of IHE learning communities from focusing on students, faculty, and administrators within a particular institution to include the broader community, they might begin to recognize the added value from this broader civic participation. Such a move is totally consistent with American ideals of local education and public participation in governance. Therefore, learning communities are especially relevant in today's society as there has never been as great a need or opportunity to pull together knowledge from such a diverse population or from so many fields of enquiry.

Building from the educational reform and learning community literature, I have suggested that one of the most important potential benefits of partnerships is as a venue for sustainable dialog, ongoing formative evaluation using appropriate indicators of progress, and adaptive decision making (adaptive management). However, education programs that focus narrowly on programmatic goals, even when they require a process of partnered implementation, are unlikely to provide a stable and sustainable core that will last beyond the funded intervention. Too great a focus on programmatic activity has been shown to result in a more fragmented network when active engagement ends (Human & Provan, 2000). And yet reform movements, developed around the notion of partnering and building learning communities to improve education, are still relevant. One of the most important contributions of this work is improving our understanding of how far our current public policy has strayed from that ideal.

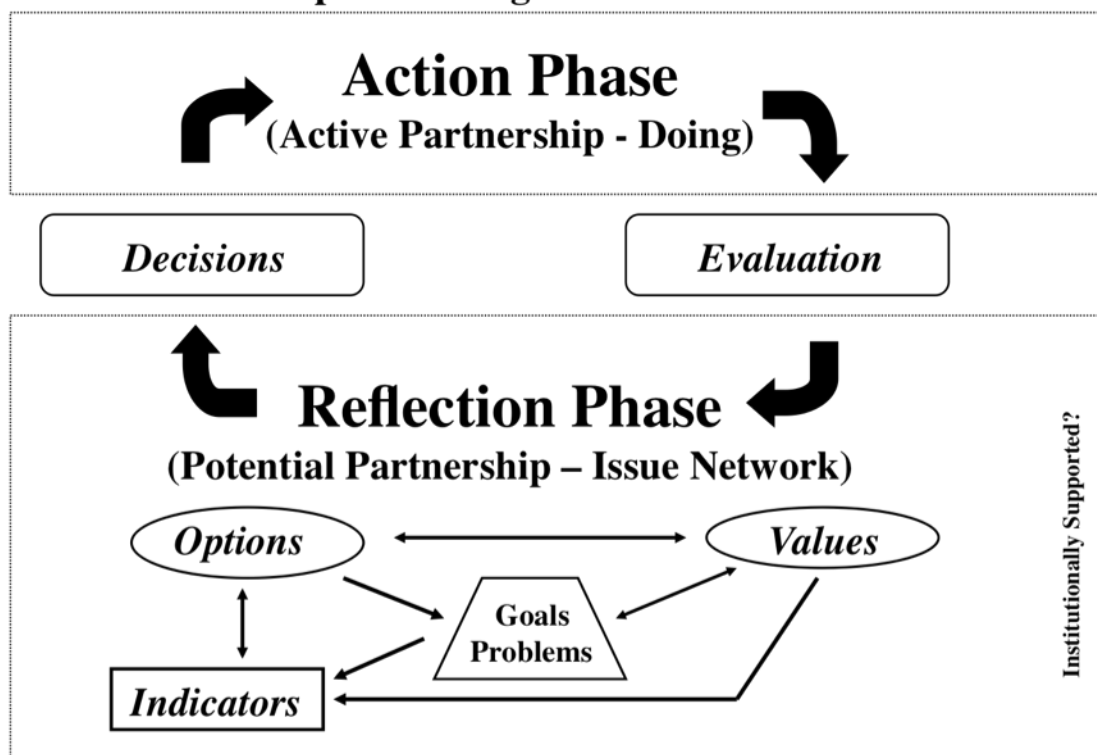
Additional support for evaluation and the development of a social network infrastructure between active, programmatic, partnership engagements are needed.

Improving environmental conditions can contribute to partnering but does not ensure programmatic success while challenging conditions may drive continued or new organizational interaction as institutions seek out new resources and alternative sources of funding. It is, after all, natural for wise problem solvers (grant seekers) to look for new funding opportunities that may or may not include current active partners. This wider set of connections provides potential partners and potential intellectual resources that can be tapped as funding becomes available. Even when the organizational connectivity is weak (embeddedness is low) it is possible to motivate strangers to seek out new potential partners through policy inducements and that organizations can choose partners based on organizational reputation or interpersonal relationships (a high level of legitimacy).

Partnering then consists of two stages: an active stage, in which an intervention or funding stream bounds the partnership, and a potential stage in which the wider set of interested parties is loosely connected. Instead of a stable partnership core that provides a focus for decision making and future action, organizations interested in a policy problem or choice of intervention seem to form a loose network, parts of which are activated as available funding is identified. Once an intervention's funding is exhausted the participating organizations gradually slip back into the second stage in which potential partners form a loosely connected network that can reflect on local conditions, needs, goals and previous partnering experiences. This network can also be seen as a loosely connected learning community. The progression from an active partnership to a reflective network parallels a place-based process of adaptive management but the place or venue in this case is the loosely connected network. However, the network's membership and therefore scope of interests would be much harder to clearly bound.



## Two Phase Adaptive Management Model\*



\*This model is derived from the work of Bryan G. Norton

Figure 8. Two Phase Model of Adaptive Management

Because of the iterative nature of the partnering in STEM education I have concluded that the policy-induced partnership is best defined as a relational event that is bounded by the funding cycle or intervention.<sup>45</sup> Any attempt at adaptive management within the partnership and under these conditions will be far less deliberative and more opportunistic in nature. Instead it seems that the best opportunity for adaptively managing local education problems comes from within a learning community during the period of reflection between the serial intervention-based partnerships. Such a learning community

<sup>45</sup> The idea of a *relational event* follows Goodlad's ideas about collaborative events providing a platform for coordinating programs, activities, and longer-term projects (1988) and the use of the term here was coined within our project by Gordon Kingsley.

might evolve naturally but it is consistent with educational reform of the past to expect that policy makers might intentionally design programs to foster or enhance such venues.

The model above (see Fig. 8) illustrates the two phases of an adaptive process. The first, a reflective phase in which goals and options are considered based on local values and appropriate indicators, leads to a decision to form a partnership in response to a policy inducement. The partnership then becomes active, carrying out the programmatic activity laid out in the funded project (e.g., conducting teacher content training, developing a curriculum, running a program for students). Once concluded, the project is evaluated leading to a new phase of reflection. Because so many of the choices about what can be done have been made prior to partnership formation (as specified by the funder's priorities) there is limited potential for *Adaptive Management* within the active partnership phase. However, once the specified programmatic activity has been conducted a broader network of actors may consider alternative interventions.

What is lacking is the institutional support for dialog and the consideration of policy alternatives within the larger network of potential partners. As funding agencies like NSF consider new partnership-based education programs, institutional support should be developed for a venue for dialog that includes space for values elicitation, decision making about goals, consideration of the appropriate scale and scope of multiple programmatic options, and the development of appropriate indicators of success. The results of this study suggest that this is already happening on an informal basis and perhaps this is where adaptive management is already taking place. However, with additional support for program and partnership evaluation the process of solving problems might be made more effective. In particular, by considering a broader range of

policy options on an ongoing basis at the local level perhaps education professionals will consider alternatives to narrow programmatic thinking (especially with the inclusion of persons in a community who are not education professionals and who might have other goals, values, or specific policy interests). In addition, because issues in education affect and are affected by other community conditions they might serve as a focal point for a wider process of community-based planning and management.

As long as the policy focus is on delivering preplanned interventions or programs, partnership will be just another implementation option: one with possible negative side effects. The requirement for specific kinds of partners as a condition in aid for grant programs has the potential to crowd out other beneficial collaborative interactions. Because of the serial iterative and programmatic nature of these educational interventions as typically experienced by this panel of experts, policy-induced partnerships are unlikely to provide a stable venue for adaptive management and the consideration of broader education problems. Policy prescriptions with a wider network focus that specifically fund evaluation and support venues for continued dialog are more likely to provide greater opportunities for adaptive management and sustainable partnerships.

## **5.2 Reconceptualizing Partnership as a Policy Tool**

This research started by developing a lifecycle model of a partnership that was quasi-organizational, spanned two or more organizations, and might serve as a venue for adaptive management. The results of this study have pointed to an evolutionary aspect to partnering, leading to a reconceptualization of partnership formation from a single event to a process of entry and exit that occurs over time. New members are added as needed or

lost due to attrition throughout the life of the partnership. With the membership constantly changing, bounding a partnership by who is in and who is not becomes unmanageably complicated. Contrary to a more organizational or entity-based conceptualization of partnership, this research has led to a new definition of the STEM partnership as a label placed on a *relational event* that is initiated by a *policy inducement* comprised of a set of inter-organizational collaborations aimed at enhancing the performance of participating partners in generating desired policy outcomes. A relational event encompasses a wider range of actors and relationship types under a single partnership label than does a more organizational model of partnership (See Table 18).

A policy inducement is defined as any initiative or program that provides funds for specified activities but has requirements for qualification. These inducements are intended to fund specific activities or to encourage behaviors desired by policy makers in the grant recipients.<sup>46</sup> For example, in the case of NSF-MSP, the requirement for higher education institutions to partner with local K-12 schools as a condition for receiving funds can be defined as a “Policy Inducement to Partner” (PIP). The policy inducement is the initiating condition for the partnership (the set of funded activities and supported relationships). The partnership is bounded by the set of actors connected to and the interventions funded under a particular inducement. Following this definition, any prior relationships or organizational connectivity would constitute the broader network within which the potential partners operate. The partnership itself would be bounded starting and ending with the funding cycle.

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<sup>46</sup> Policy inducements act on volunteers in contrast to rules, laws or mandates that require specific actions whether an organization is prepared, willing or able to comply.

A relational event is therefore the set of interactions between collaborators whose intent is to achieve a shared or complementary goal. This set of interactions includes the different types of actors and relationships that come together in making a partnership function: the interactions between STEM professionals (from both higher education and K-12) and students (from both higher education and K-12); the interactions of individual STEM professionals working together; the interactions of organizations in aligning rules and procedures; and the interactions of policies at the federal, state, and local levels. Inclusion of all of these relationships and actors in a single set makes a relational event a very messy concept because it mixes together multiple units of analysis and types of relationships. However, when education professionals relate their experiences in working with partnerships they blend these elements together easily in a narrative describing the relational event (often focused around the activities conducted).<sup>47</sup> Thus, the concept of a relational event captures the richness of the narrative expressed by the study panel.

One can think of a grant program (e.g, federal programs like NSF-MSP that require prospective participants to develop partnerships) as a catalyst for stimulating both a relational event (i.e., a policy inducement to partner), and for the STEM educational outcomes desired by policy makers. The announcement of the grant program in the form of a request for proposals (RFP) is made to a larger institutional field comprised of K-12 institutions, those elements of higher education interested in STEM education at the K-12

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<sup>47</sup> For example, a partnership champion (an individual level phenomenon), alignment of federal, state and local school policies (a policy level phenomenon), and community need (a policy level phenomenon) were frequently the drivers of effective communication across organizations, alignment of organizational incentives (IOR level of analysis), the willingness of professionals to be creative in designing and mobilizing professional development activities (a workgroup level phenomenon), and the reasons for teacher adoption of new content knowledge and techniques (an individual level phenomenon).

level, and other interested groups from the business, nonprofit, and governmental communities. This network of potential partners may have little or no connectivity prior to the RFP but may choose to work together around the focus generated by a grant.

Table 18. Two Approaches to Modeling Partnership

<b>Quasi-organizational Model of Adaptive Management within a Partnership - Diffusion of innovations move from a single point of central control</b>	<b>Network Model of Adaptive Management within a Partnership - Diffusion of innovations with multiple points of control</b>
The unit of analysis of outcomes is a product, technique or in our case the program.	The unit of analysis is a functional system.
The diffusion of new knowledge is from the center to the periphery.	The pattern of diffusion is more complex - system transformation.
Relatively fixed center and leadership	Shifting center and local leadership
Relatively stable goals and programs	Evolving goals and programs
Scope limited by programmatic resources	Scope limited by system connectivity
Feedback loop moves from the periphery to the center and back	Feedback loops operate locally and universally throughout the network.

The funded partnership creates a venue with perceived legitimacy that creates embeddedness where it did not exist before. This study supports the conclusions of previous work by those who argued that formalized relationships could encourage the participation of partners in environments in which embeddedness might not naturally evolve. The funding stream and the potentially enhanced prestige of partnership participation replace the need for a long history of positive engagement. Thus, this work, and further study of the creation and impact of embeddedness in partnerships, has the potential to add to the literature on legitimacy in social networks. The results of this study and the previous work of Human & Provan (2000) suggest that formalizing the

connectivity within the broader network, thus enhancing its legitimacy, would encourage greater participation and sustainability in the network.

When a funding agency designs a policy inducement to partner, the inducement identifies the boundaries of the potential partnership specifying the types of institutions that are permitted or likely to be called upon to participate as partners. The RFP may stimulate interactions between potential collaborators (even those with no prior connection), drawing people from the various organizations together to discuss the opportunity. As noted in the results above, the potential partners report that they are unlikely to partner with strangers. However, the process of developing acceptable grant proposals may serve as a getting to know each other period that is sufficiently long that participants develop a strong enough working relationship to implement the proposed programmatic work. Thus the RFP may serve as a catalyst for developing long-term relationships among potential partners regardless of whether they receive funding from any particular program. Evaluating an RFP may be a process of adaptive management.

This initial contact driven by the RFP can provide a sense of legitimacy and considerable value for developing partnerships and may foster the development of a more active network interested in educational issues. At times, these interactions will culminate in sufficient agreement among the participants to produce a completed proposal for submission to the sponsoring agency. The proposal is, in essence, a blueprint of the relational event in which the potential partners are likely to engage. Even if the proposal is unsuccessful, the potential partners were still encouraged to come together to explore their values and goals, consider programmatic alternatives and to find out if the funding

opportunity helped them solve a local problem. Thus the venue for engaging in adaptive management is the table around which these discussions are held.

Should the grant proposal be successful, the resources provided by the sponsoring agency are used to enact a planned relational event. Thus adaptive management (consideration of, and choice making about, programmatic options) will be less likely. Still, the partnership work will have the potential to drive transformation of the organizational and individual relationships (a stated goal of NSF-MSP) as the partners adapt to working together. Policy inducements to partner are an attempt to drive organizations to restructure their regular working arrangements to include new actors (the partners) and to drive adaptation to these new relationships. These inducements are generated by policy makers and are added to the conditions for receiving funding because something about these organizational adaptations is assumed to improve future policy implementation or to drive better outcomes. It is therefore important to improve our understanding of the impact of policy inducements in the context of the broader network of potential partners interested in a policy issue.

The diagram below (see Fig. 9) is a representation of the set of potential partners who are interested in a particular policy issue from which partnerships might evolve. On the far right is a bar that identifies all parties potentially interested in a policy issue as included in an *Issue Network*. The concept of an issue network follows Hecló (1978) and includes the full range of potential stakeholders from individuals (interested parties, practitioners and potential clients) to public and private organizations. In education the *Issue Network* at its most general level includes everyone with an interest in improving education (e.g., K-12 teachers and administrators, IHE Faculty, parents and students,



business interests, etc.). Within this *Issue Network* individuals and organizations are loosely connected (perhaps having no contact at all except in the shared interest in a policy issue). The actors in an *Issue Network* may be or at least have the potential to become activated around a problem definition, policy prescription, or specific element of the issue network.

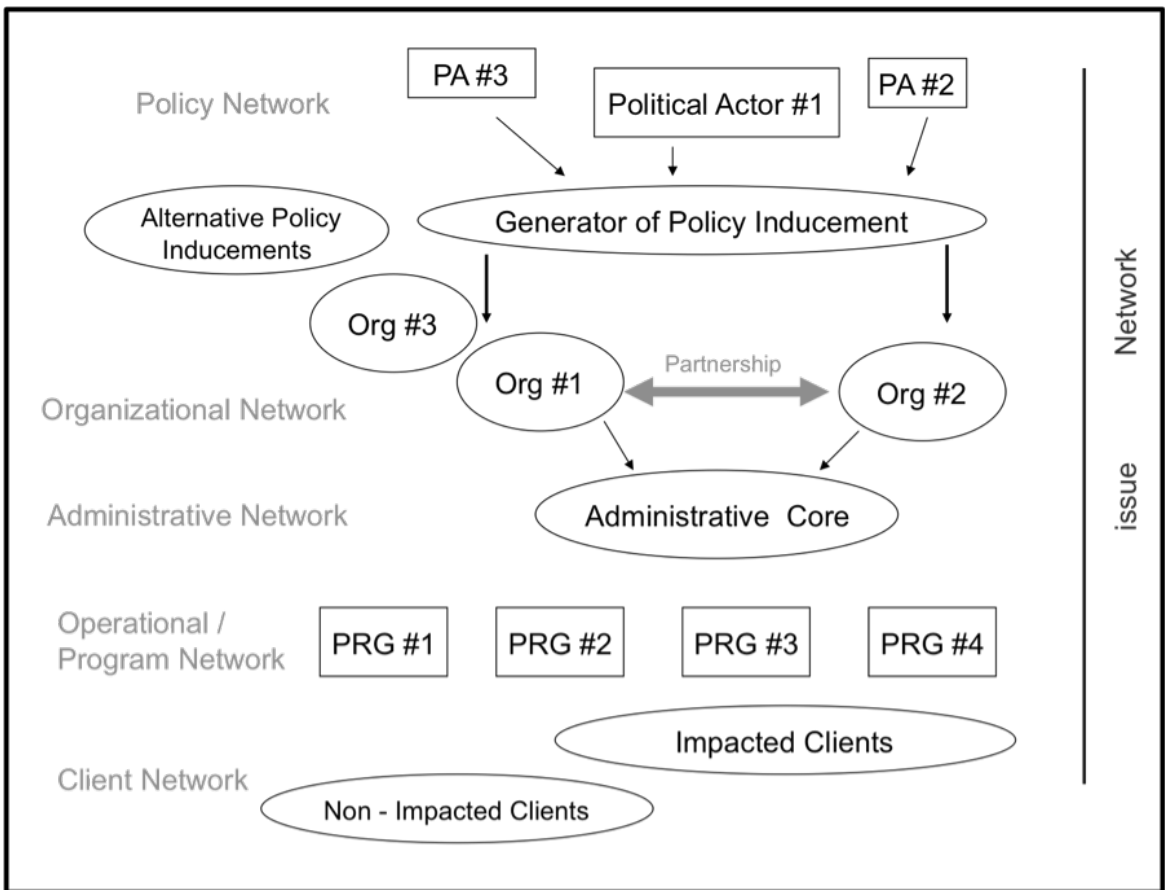


Figure 9. Issue Networks and Partnership Development

The *Policy Network* includes government at all levels including the organizations and lobbyists who influence the development of policies. Government programs are developed within this *Policy Network*. For example, grant programs develop *Policy Inducements* to support particular policy goals. The inducement will have strings

(conditions for receiving the inducement) and some set of benefits that will qualify and be attractive to some actors within the issue network. The *Generator of the Policy Inducement* is a government or other funding agency that developed or requested proposals for the intervention. At any given time there will be a number of inducements that can be considered by actors within an *Issue Network*.

In the case of a policy inducement to partner that specifies participation of certain organizational actors the *Organizational Network* is made up of all actors who meet the criteria for receiving funding (organizations who are interested in an issue but do not meet the criteria for a particular policy inducement are included in the broader Issue Network). When the organizations respond to a policy inducement to partner they become active around the conditions of the inducement and a partnership (a relational event bounded by the conditions of the inducement) begins. The decision makers within the partnership form the Administrative Core for the intervention.

The *Administrative Core* in this diagram serves two purposes. Within the context of a partnership this group manages the decisions of the partnered activity (during the active phase of the partnering). Absent a sustainable partnership the *Administrative Network* would change membership and location over time. Therefore, during the potential or reflective phase of the partnering the *Administrative Core* represents the formal or informal table around which decision makers among potential partners would congregate. In a more general sense this is the venue within which adaptive management would occur.

The *Operational / Program Network* represents the actors involved in the implementation of programmatic work. A single partnership might conduct one or several

different kinds of programs at the same time each with different sets of actors directly involved. The Client Network represents those impacted and those potentially impacted by the intervention (whether or not they are the intended recipients of an intervention).

### **5.3 Evaluation of Partnerships**

While the beginning and ending dates of policy-induced interventions offer a convenient starting point for bounding evaluation efforts, the partnered intervention must be understood in light of a broader set of ongoing relationships at multiple units of analysis (e.g., organizational, programmatic and individual) and in its particular context. The new intervention may add to ongoing efforts, may shift effort in new directions, or may create resistance to current trends. In order to understand the impact of a partnered intervention we need to know how it relates to the surrounding community and other environmental factors. In addition, there is also a need to recognize the evolutionary nature of interorganizational and interpersonal relationships in a community context.

As interventions are implemented they evolve as new actors are added or dropped or as needs or interests change. Thus, a partnership even between just two organizations will not form in total at a given point in time in a particular way. Even in a very narrowly specified intervention, the relationships will develop and change given the needs or interests of the partner organizations, personnel, or changes in programmatic or policy goals. It seems logical, when evaluating the effect of a specific program, to try to isolate the activity during its lifespan and to then try to measure its impact. However, the logical application of a bounded linear lifecycle model when evaluating the impact of partnered

activities ignores the broader local community context, history and possible futures that both drive and are impacted by the new policy-induced partnered activity.

According to Wenger (2007), there are three elements that distinguish a *community of practice* from other groups (Domain, Community, and Practice). The *domain* refers to a specific area of interest. The members of a specific community share an interest in a specific issue, problem or preferred solution. *The community* refers to the set of relationships that members participate in that enables them to acquire new knowledge or processes. And finally, *the practice* refers to the shared practice of community members (as in the lens through which they view problems, skills, and experiences). Members of a community of practice engage in the same class of activities (e.g., teachers in education). However, members of such a community will come from a range of organizations that have a common interest in the practice (e.g., improving teacher content knowledge). Thus acknowledgement of a community of practice that spans organizations can, for example, provide peer support for senior administrators or others without peers in their home institutions. For the analyst, the additional layer of complexity created by seating organizations within a network of interested community members should provide a foundation for explaining phenomena that go beyond the bounds of any one organization or single partnership.

As funding agencies consider future conditions for participation in grant programs it is important that they are reminded of the literature on learning communities and educational reform and create space for ongoing evaluation. A proposal process that requires grant recipients in partnering educational institutions to make all significant decisions, prior to being awarded funding, has the potential to contractually obligate them

to ignoring new information and not adapting (changing programmatic direction if needed). In order to get the greatest benefit from the interactions of partners they need to be empowered to use ongoing evaluation to redevelop plans as new information suggests better strategies or programmatic options. By requiring institutions to partner, the funding agencies correctly recognize that there are potential benefits to these interactions that add value beyond a particular intervention. However, by limiting the opportunities to reevaluate and adapt ongoing projects, after the proposal process, the potential benefits of the partnering are reduced.

As I conclude this discussion, it is important to point out once more the distinction previously made between programmatic activity (the set of interventions in a particular time and place), the partnership (the relational event describing the interpersonal and interorganizational links that facilitate program implementation) and the local learning community or issue network (the set of actors in a local community who are interested in an issue). This distinction requires a change in evaluating education programs conducted through partnerships from simply measuring what they accomplish (program evaluation) to understanding how the ties between individual actors and organizations impact desired outcomes (partnership and network evaluation). It is within the context of partnership and network evaluation that adaptive management can be utilized to improve decision making about future programmatic choices. If the partnership becomes a sustained institutional venue with broad participation and can be used to manage and launch multiple programs or engagements at various appropriate scales, then it can facilitate a process of learning and adaptive management. However, as previously noted, it may be necessary to evaluate the broader network of connections to

identify the administrative core of a less strongly connected learning community engaging in adaptive management.

## **5.4 Limitations and Future Research**

This research builds on a nearly fifty-year history of using the Delphi method of surveying panels of experts to explore complex problems. Everyone connected to the RETA project, including both the panelists and research staff, learned a lot and it provided a huge amount of data about partnerships and evaluation. The Delphi method is ideal for developing a clearer understanding of under-conceptualized or weakly theorized lines of research. However, this current study has pointed out the need to refine the kinds of questions asked during a Delphi and to limit their range. The initial sharp focus of the RETA study quickly expanded as the richness of the data generated through the Delphi method became obvious. Trying to learn, model and understand everything about partnerships and partnership evaluation in a single study evolved into a very broad and under-focused undertaking. Future studies with a narrower focus will be much easier to conduct and report on (e.g., a four round Delphi just on partnership formation).

### *5.4.1 Pros and Cons of Using Delphi Data*

The intention of the e-Delphi study was to develop a range of possible models of partnering to improve program evaluation and to support further research. The detailed information gathered from the panel of 32 experts represents a huge step forward toward answering questions about the value of partnerships. Also, this study expands the use of the Delphi methodology in education, as this is the first use of this Delphi derived data

set beyond the scope of the original partnership-modeling project. Drawing from this data to explore how principles of adaptive management might be applied to problems in STEM education was made easier due to my direct connection to the previous work.

While a great deal of effort went into seating the most representative panel of experts available, I can make no claim that the participants represent all partnerships or even all education partnerships thus potentially limiting the generalizability of this work. In addition, since completing the panel survey an unanticipated source of bias was identified in the sample. By using experience as the first criteria for selecting study participants (as is consistent with the literature on the Delphi methodology) a panel consisting of very experienced professionals was created.

Since the panelists all have a great deal of experience, they also tend to be senior level persons in their respective organizations. Thus, variation between top-down and bottom-up aspects of partnership communication, operations and decision making was not testable. However, the research was designed in consultation with previous literature and with an eye toward maintaining internal validity. In particular, each of the four rounds of the panel exercise approached questions from a different perspective so that it was possible to test for conceptual consistency within and between rounds. One finding of the RETA work (that goes beyond what was required for this study) was that panelists expressed differing opinions on some themes depending on whether they were, for example, speaking about their own work or when judging the potential work of others. It will be interesting to explore these shifts in a future paper.

#### *5.4.2 Future Work*

The amount of data collected during the RETA study will allow for a number of different writing projects exploring questions ranging from methodological studies to a host of practice-based inquiries.<sup>48</sup> The work on applying adaptive management in venues beyond the environment is also likely to be a fruitful research subject in the future. The work with the Delphi panel has suggested seven key themes for future research.

Partnership Administration – One element of partnership that requires detailed case analysis is the exploration of how partnerships are administered and how that administration fits into, conflicts with or complements the administration of the partner organizations. The results of this study suggest that partnership administration can impact outcomes; however, a more detailed analysis is required. In particular, I want to explore the importance of various administrative arrangements for improving the results of partnered interventions. Research from the private sector that suggests centralized control of interactions may lead to less wasted time and more productive information exchanges (e.g., Human & Provan, 1997, 2000; Provan & Milward, 1995, 2001). In the future, I would like to test the importance of centralized administrative mechanisms through case studies specifically designed to understand what effect these control mechanism have on partnerships in public contexts.

Interviewee Background – While there is some variation, the electronic Delphi panel selection process was geared toward people with a great deal of professional

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<sup>48</sup> Kingdon (1997) used correlations as a very elegant means for comparing issues and consistency over time. By recoding the data in this study (e.g., giving a 1 for agree or strongly agree and a 0 for all other answers it will be possible to determine the correlation of agreement with key themes over the four rounds. From this data it will be interesting to see on which themes the panel maintained consistency and to explore the reasons for the noted inconsistencies in other areas. Of course this kind of detailed conceptual analysis goes far beyond the needs or scope of this dissertation.



experience participating in partnerships. The nature of the Delphi method is that a panel of experts is required to accurately evaluate and make recommendations on the topics under review. People with a lot of experience also tend to move higher in the management structure of educational institutions and their partnered engagements. As a result, the responses are biased toward the ideas of senior level or long-term education partnership practitioners. This bias should not affect the results of this study because senior level practitioners are best positioned to know and report on the entire scope of their partnered interventions. However, future work may benefit from inclusion of participants with a broader range of experience levels. The difficulty in broader inclusion is that more participants will be needed and more data would need to be evaluated. It will be necessary to develop a more structured survey instrument that could be given to a large number of education practitioners.

Partnership Background – A significant finding of this research strongly suggests that previous partnership experiences matter and are carried forward in future partnership work. Some organizations operate in a serial fashion, shifting from grant to grant. How newly forming groups determine work patterns is unclear and may impact outcomes. It will be important to explore the process of developing new relationships through some form of direct observation. Other research methods (like Delphi) that require subjects to reflect on past experiences are too far removed from the actual relationship / partnership formation to accurately gauge the details of the process. Also it will be interesting to explore how the level of prior experience with similar projects or the personnel working on a project affects the successful implementation of externally funded programs.

Level of Embeddedness – In this work the connectivity that exists among partner organizations and individuals has been shown to be important to partnership implementation. In future work it will be important to explore in more detail how these relationships impact partnership operations and programmatic outcomes. In particular leadership issues and individual champions have been suggested as important to successful partnered implementation of education programs. Again, a case study approach will be needed to get into the fine detail of a particular project to understand which relationships and operational structures drive the variance in outcomes. Also, the idea that STEM professionals engage in adaptive management within a loose network that activates when funding exists needs to be explored.

Measuring Outcomes – The panel had some difficulty connecting the operational details of their partnership to the work they did and to the outcomes that were produced. Additional approaches to measuring how important partnership is to generating outcomes will be a key element of future work. In particular, evaluation of STEM programs implemented through partnerships needs to incorporate measures of how the entire decision making structure of the partnership limits or promotes the exploration of program improvements or alternatives (adaptive management).

Improving Policy Inducements – In future work it will be important to explore the extent to which policy inducements actually drive behavior (alternatively it may be that educators are simply acting opportunistically responding only to inducements that align with their needs). Also, the results of this study suggest that in these education partnerships, the policy inducements have sufficient programmatic content to limit the focus of the partnerships to the funded activities. While there is a desire on the part of

policy-makers to encourage the creation of sustainable relationships it seems unlikely that current policy prescriptions are going to succeed at this. It is important to future work to get a clearer understanding of the policy intent of funding agencies for their partnership programs. If, as it seems, NSF partnership programs are a funding mechanism that pays lip-service to creating sustainable partnerships while implementing another education policy agenda, then they are apparently succeeding (e.g., the programs are conducting teacher training, etc.). However, if partnerships are to become venues for sustainable relationships and adaptive management, current policy approaches need to be rethought and redesigned along the lines of building locally based learning communities.

## Appendix A: Georgia Tech STEM e-Delphi Panel Protocol

### Delphi Questionnaire

#### Round 1

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*The first round of this Delphi exercise will explore the organizations that make up Science, Technology, Engineering, and Math (STEM) partnerships, the roles of our panelists within those organizations, how and why partnerships form, what they do, how success is measured and, how partnerships are formally evaluated. We are using STEM to refer to the entire constellation of initiatives that have been developed to improve K-12 and university education in these areas. Before we get started with the Delphi exercise we want to introduce you to one another. In our selection process for the final panel we asked each of you to answer a set of questions about who we are as a group, how much experience we have to draw on, and what we think about some partnering topics.*

*Our panel is made up of  $x$  men and  $y$  women ages ranging from  $n$  to  $n'$ . We are from states / regions and average  $n''$  years working with STEM partnerships. Most of you have worked with about  $n'''$  partnerships in your careers.  $X'$  of you have been involved with the founding of at least one partnership,  $x''$  of you have been involved in their evaluations. As a group we have a tendency to work alone/within groups. Among our panel we have  $x''$  former or practicing teachers. What follows are three sets of questions. The first set will draw on your entire range of experience with STEM projects for improving educational outcomes. The second set will first ask you to consider one specific positive STEM partnership experience and then a negative STEM partnership experience in detail. And, the final question will explore the range partnerships you have been involved with.*

1a. From the following list please mark all the statements that fit with your past personal experiences.

1. Partnerships are formed by individuals through close personal relationships
2. Partnerships are formed by individuals through a wide network of personal relationships
3. Partnerships are formed by individuals through close professional relationships
4. Partnerships are formed by individuals through a wide network of professional relationships
5. Partnerships are formed by a small closely connected group of organizations
6. Partnerships are formed by a small group of dedicated professionals
7. Partnerships are formed by an administrative decision by an organization's upper management
8. Partnerships are formed by a single professional leading the way

1b. If you feel that there are other ways partnerships form that we need to consider, what are they?

2. How much time does it take to establish effective working relationships between organizations within a partnership, who have never worked together in the past?

1. 2 years or more
2. 1-2 years
3. 6-12 months
4. 2-6 months

How Important are the Following for the Development of Partnerships?

- 3a.1 Mutual goals among potential partners
- 3a.2 Long-term personal relationships with individuals among potential partners
- 3a.3 Long term working relationships between organizations
- 3a.4 A sense of professionalism among prospective partners
- 3a.5 Mutual trust of potential partner's judgment or opinions
- 3a.6 Mutual respect based on a potential partner's reputation
- 3a.7 A willingness to communicate goals and ideas across organizations
- 3a.8 Availability of new external resources / grants
- 3a.9 Presence of an interested / motivated individual
- 3a.10 Some additional mutual benefit that will accrue to partners
- 3a.11 Potential for good public relations
- 3a.12 Better coordination of existing resources
- 3a.13 A gain in prestige by association with partner organizations
- 3a.14 Active support of administrators
- 3a.15 Potential for promotion
- 3a.16 Public service or community involvement requirement for tenure
  1. No opinion
  2. Negative effect
  3. No effect
  4. Somewhat Important
  5. Important
  6. Very Important
  7. Critical

3b Are there other critically important pre-conditions you can identify from your experiences that must be in place before a partnership can form? Please list.

3c Are there other non-critical benefits of partnering? Please List.

3d Are there any activities that less experienced persons would think are important to partnering but turn out to be negatives? Please List.

4 From the list in Question 3a or from your experience please identify the single most important deciding factor in convincing your organization to enter into a partnership? What made this the deciding factor?

5 In the context of your STEM activities, please explain what the term partnership means to you (Up to 50 words)?

6a Within your direct experience have partnerships you worked with engaged in STEM partnership activities to improve any of the following objectives? Please check all that apply.

1. Curriculum development
2. School Reform Agenda

3. New Resource Generation
4. Coordination of Current Resources
5. Institutional Support of Education
6. Student Achievement Interpreted Broadly
7. Student Attendance
8. Teacher Training
9. Recruitment of Additional Partners
10. Student Standardized Test Scores as a measure of Student Achievement
11. Professional Development of non-teacher partners
12. Civic Leadership

6b Are there other objectives you have considered or believe are important? If yes, please list:

How Important are the Following to the Formation of a Successful Partnership?

- 7a.1 Structured team building exercises
- 7a.2 Regularly scheduled meetings
- 7a.3 Highly structured statements of work with deadlines
- 7a.4 Strict deadlines for project related actions
- 7a.5 Clearly stated dispute resolution procedures
- 7a.6 Legal contracts among partners
- 7a.7 Adequate administrative support
- 7a.8 Full time, dedicated staff for partnership
- 7a.9 Partnership retreats
- 7a.10 Partnership social events
- 7a.11 Recruitment of additional partners
- 7a.12 Efforts to increase institutional support
- 7a.13 Clear procedures for timely payment of invoices
- 7a.14 Advertising / public relations campaigns
  1. No opinion
  2. Negative effect
  3. No effect
  4. Somewhat Important
  5. Important
  6. Very Important
  7. Critical

7b Are there other critically important activities that might be used to enhance a partnership? Please List.

7c Are there other non-critical activities that might be used to enhance a partnership? Please List.

7d Are there any activities that less experienced persons would think are important to partnering but turn out to be negatives? Please List.

How Important are these Activities to the Success of a Partnership?

- 8a.1 Programs for school administrators
- 8a.2 Teacher training workshops
- 8a.3 Continuing education programs for teachers
- 8a.4 Professional mentoring programs for teachers
- 8a.5 University students teaching in the classroom
- 8a.6 Presence of an interested / motivated individual

- 8a.7 Individual student tutoring / mentoring
- 8a.8 Courses on test taking skills for students
- 8a.9 Trust building exercises for partners and staff

1. No opinion
2. Negative effect
3. No effect
4. Somewhat Important
5. Important
6. Very Important
7. Critical

8b Are there other critically important activities to successfully executing partnership goals? Please List.

8c Are there other non-critical activities to successfully executing partnership goals? Please List.

8d Are there any activities that less experienced persons would think are important to promoting partnership goals but turn out to be negatives? Please List.

How Effective have your Partnerships been at:

9a Providing professional development for teachers?

9b Improving K-12 student's overall math or science achievement generally?

9c Securing additional resources for education?

9d Enhancing math and science curriculum development?

9e Creating a cooperative environment between universities and K-12 schools?

9f Generating a measurable increase in standardized math or science test scores?

9g Increasing awareness of education interventions?

9h Improving the public's perception of local schools or universities?

9i Improving the student's perception of local schools or universities?

9j Increasing the number of local students entering STEM fields?

9k Increasing the number of local K-12 students entering partner universities?

9l Providing opportunities for university community members (faculty and students) for sanctioned civic leadership?

1. No Opinion
2. Very Ineffective
3. Somewhat Ineffective
4. Neither
5. Somewhat Effective
6. Very Effective

9m Are there other sought after partnership goals within your experience? If yes, please list:

10a When partnerships fail what are the chief reasons? Please place a one beside the most important reason, a two beside the next most important and the continue to rank order the list.

1. Personality conflicts among individuals
2. Clashes between organizational cultures
3. Resource allocation
4. Lack of resources
5. Lack of trust

6. Failures in communication
7. Insufficient commitment among partnering organizations
8. Insufficient commitment among Individuals involved

10b Are there other reasons for failure you have experienced? If yes, please list:

11a How did some persons or organizations resist partnering?

11b Why did some people or organizations choose not to participate?

12 Please identify partnerships that you have been involved with since 1990. For each partnership, please answer: What was the name of the partnership. What was your role in each of these partnerships? For example, were you an administrator, evaluator, participant

13 Within your experience, please identify a single partnership that you feel was the best partnership you have been involved with. Please provide its name, sponsor, and purpose.

14 We would like to know why you chose this particular partnership as the best and on what basis you made your choice. What made it the best?

15 What made this partnership experience so positive for you personally (Up to 50 words)?

16 For how long had you known or had a personal friendship with someone in the most important organizations before the idea of partnership was initially discussed? Please identify the organization, the time in months or years, and the type of relationship

17a We have provided a list of items we identified as sometimes contributing to the formation of partnerships. Please mark any that contributed to the formation of this positive partnership.

1. Long term personal relationships
2. Long term working relationships between organizations
3. Availability of new external resources / grants
4. Presence of an interested / motivated individual
5. Political pressure
6. Specific educational need

17b Please add any additional contributors you can think of:

Partnership Management?

18a Power during the formation and operation of this partnership was invested in one single individual?

18b Power was invested in one organization during the formation and operation of this partnership?

18c Power was shared equally by all organizations during the formation and operation of this partnership?

1. No Opinion
2. Strongly Disagree
3. Disagree
4. Neither
5. Agree
6. Strongly Agree

19 Some academic literature suggests that geographic distance between parties alters the effectiveness of partnerships, therefore we want to know where the organizations were located. In this partnership all of the organizations were located in the same:

State or larger, Region, County, City



- 20a Over time a partnership can add or lose member organizations. We are interested in getting a sense of how the size of this partnership changed during its operation. How many major organizations were involved in the formation of this partnership?
- 20b At any given time approximately how many major organizations on average were involved in the operation of this partnership?
- 20c What was approximately the highest number of organizations involved at any time?
- 20d What was approximately the smallest number of organizations involved at any time?

#### Structure and Accountability?

- 21a All work to be done within the partnership was legally contracted
- 21b Top level management solicited information from all levels within your organization
- 21c All work was done by my organization as agreed
- 21d All work was done by other organizations as agreed
- 21e It was easy to get payments for expenses
- 21f Organizations handled individual level personality disputes well
1. No Opinion
  2. Strongly Disagree
  3. Disagree
  4. Neither
  5. Agree
  6. Strongly Agree

- 22a How many months/years did it take for this partnership to go through the Formation phase?
- 22b How many months/years did it take for this partnership to go through the Operation phase?
- 22c How many months/years did it take for this partnership to go through the Spin-off phase?
- 22d How many months/years did it take for this partnership to go through the Dissolution / Completion phase? Please Enter NO if the Partnership is Still Active
- 23 Was this partnership formally evaluated?
1. Don't know
  2. No
  3. Yes

- 24 What methods / criteria were used for the evaluation?
- 25 Please describe as many negative experiences with partnerships as you can think of. What made each of these different from your positive experiences? In other words, what went wrong?

## **Round 2**

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*Round Description: In Round 2 of our E-Delphi panel we will be building off the responses you provided in Round 1. As preparation for answering questions in Round 2 we ask that you first review the summary of findings from Round 1. If you haven't done so already, please go to <<http://www.stemdelhipanel.gatech.edu>> and review a summary of Round 1 responses. There you will find tables of summarizing the structured questions from Round 1 as well as summaries and selections from your narrative*

responses. You will find that many of the questions posed to you in Round 2 will refer to trends in responses from Round 1.

In Round 2 you will find three types of questions:

*First, we will be probing a bit further on some of the responses from Round 1 seeking further clarification. For example, one of the findings from Round 1 is that panelists have very different understandings of what constitutes a partnership. Questions of this type will be trying to pin down your understanding of the meaning of some of the terms we (by that I mean you and our research team) use to describe partnerships.*

*Second, we will further explore some of the key contingencies and relationships. Many of you indicated in Round 1 that your answers might vary depending upon the type of partnership you were referring to as a basis for your answer. One of the key objectives of this E-Delphi panel is to explore whether a group of professionals, experienced in conducting partnerships, have any level of agreement concerning models that might be useful in evaluating STEM partnerships. It may well be that the appropriate evaluative models for distinct types of partnerships will be driven by a different set of factors. We want to begin exploring this issue in Round 2 (and will continue this line of inquiry throughout the remaining rounds).*

*Third, we will examine in more detail the outcomes from partner interactions and how these relate to the program impacts (for example, from curriculum development, student performance, or teacher training). In Round 1 several of you described the ultimate goals of the policies stimulating the creation of the partnership and how these might be different from the immediate objectives for the partnership.*

1 Describe the needs in your community (or region) that the partnership(s), in which you have participated, are aimed at addressing. If possible, please provide some detail as to the magnitude of the needs. In your answer also indicate how long standing and persistent these needs have been in your community or region.

2 Describe some of the key limitations that inhibit individual organizations from adequately addressing these needs without the partnership. In your answer, try to distinguish between limitations that are common to all partner organizations, and limitations that are unique to particular types of partner organizations.

3 Describe how partnership(s) expand the capacity of organizations to address community needs. Please provide specific examples of how capacity is improved for different types of partner organizations.

4 During Round 1 many of you noted that while it is important for partners to have mutual goals it is not necessary for partners to have agreement on the goals that each organization is pursuing. Several panelists noted that a common mistake of folks with limited experience in partnership is to push for agreement on common goals. Instead, one goal of a partnership should be to concentrate on identifying and aligning complementary goals. Please describe the difference between goal agreement and complementary goals. To help us better understand this distinction please provide an example that you have encountered in your experience.

5 Please describe the federal policy environment in which your partnerships are currently being developed and conducted. In your response, indicate whether federal, state or local policies influence the partnerships in which you are associated and how this influence is manifested. Also, if new policy initiatives are changing the way you work please explain.

6 Provide as complete a list as you can recall of federal programs that have sponsored the development of education partnerships. In your response, indicate whether the programs used terms other than partnership to describe the interaction of organizations.

7 Provide as complete a list as you can recall of state programs that have sponsored the development of partnerships. In your response, indicate whether the programs used terms other than partnership to describe the interaction of organizations. Also, indicate the linkages (if any) between state programs and federal programs.

8.a What is the likelihood of your organization entering into a partnership in which there are no individuals with whom you have had a history of interaction? If the likelihood is high provide an example drawn from your experience, if low please explain.

8.b How do you personally become aware of the work of STEM education professionals in your region? In your answer, please describe the communication channels for sharing information.

8.c Based on your experience, describe the process by which new partners are recruited. In your answer, describe how organizations have been selected for recruitment. Also, please describe how individual professionals have been selected to represent their respective partner organizations.

9. In Round 1, a significant number of panelists indicated that external grants and funds are the most important pre-condition for entering into partnerships. Please indicate the degree to which you agree or disagree with the following statements:

9.a My organization won't enter into partnerships unless the entire effort is covered by external funds

9.b Most partnerships are formed because they are required by the sponsor as a condition of the grant

9.c Most of our partnerships are sponsored by federal monies

9.d It is difficult to attract partners unless we have funds to offer to in exchange for their participation

9.e If there were no external grants, my organization would not be interested in participating in partnerships

9.f The STEM education objectives that our partnership pursues were significantly altered by conditions set by external sponsors.

1. No Opinion
2. Strongly Disagree
3. Disagree
4. Neither
5. Agree
6. Strongly Agree

10 In your most recent partnership, what percentage of the cost of your organization was covered by external grants? Please include all costs including personnel time, programs, and administration.

1. 75-100%
2. 50-75%
3. 25-50%
4. 0-25%

10.a Do you agree that your partner organizations had a similar degree of coverage?

1. No Opinion

2. Strongly Disagree
3. Disagree
4. Neither
5. Agree
6. Strongly Agree

11 How do the conditions for grants from external sponsors influence the way in which you pursue STEM education objectives. In your answer, please indicate both the positive and the negative ways in which external sponsors have shaped the STEM education programs on which you have worked.

12. Please indicate the degree to which you agree or disagree with the following statements:

12.a For partnerships to be effective the primary point of contact within each organization needs to be of the same (or at least very similar) rank in their home organization.

12.b For partnerships to be effective we need to have several individuals at various levels within each organization who occupy key functional roles critical to the delivery of partnership objectives

12.c For partnerships to be effective we need to have several individuals in other organizations who are knowledgeable of and sympathetic to our goals

12.d For partnerships to be effective the majority of partners should be geographically near one another

12.e For STEM partnerships to be effective the partners should be drawn from across the public, private, and non-profit sectors

12.f Partnerships are most effective when a single person is responsible for decisions

1. No Opinion
2. Strongly Disagree
3. Disagree
4. Neither
5. Agree
6. Strongly Agree

13 In Round 1 panelists indicated that partnerships were more likely to be effective if there was at least a small group of professionals with good partnership skills. We wonder if this group of professionals is similar to an 'administrative network' which is described in the research literature as a smaller group working within a partnership that coordinates the work for the larger group of organizations. The administrative network might consist of just a few individuals who may even work for just one or a few of the partner organizations. This group takes on the majority of the work designed to achieve partnership goals. The remaining membership of the partnership (called the operant network) will participate by contributing to execution of the plans made by the administrative network or their role may be limited to contributing personnel to participate in the partnership program (for example, in a teacher development program a partner's role might be limited to contributing teachers to participate in the training). In your experience do STEM partnerships exhibit this pattern of being organized through an administrative network? Please describe examples that follow (or don't follow) this pattern of organization and work.

14. In Round 1 the majority of panelists reported experiencing too many meetings, ineffective strategic planning exercises, and contrived social gatherings. This has led us

to explore the transaction costs associated with partnering. By transaction costs we mean those costs that partners might incur through interacting with one another and/or are associated with acquiring resources and services used for pursuing partnership goals. Please indicate the degree to which you agree (or disagree) that the following factors contribute to high levels of transaction costs for partner organizations.

14.a regular meetings

14.b coordinating across large numbers of partners

14.c low levels of agreement among partners

14.d complementary goals among partners regarding STEM education

14.e the use of formal agreements such as contracts

14.f partnership goals that include improving student scores on standardized tests

14.g mandates from public policies

14.h rules and requirements from external sponsors

14.i partnership goals that target challenging populations of students

14.j partnership goals that target challenging populations of teachers

14.k coordinating programs across a geographically dispersed partnership

14.l coordinating partners drawn from the public, private, and non-profit sectors

14.m few professionals with good partnership skills

14.n low levels of trust among partners

14.o turnover in partnership personnel

1. No Opinion
2. Strongly Disagree
3. Disagree
4. Neither
5. Agree
6. Strongly Agree

14.p What are the most important factors that increase the transaction costs of a STEM partnership? Describe how these important factors cause transaction costs to be high. In your estimation, can these factors be mitigated in order to reduce transaction costs?

15 In Round 1 panelists described the importance of mutual communication patterns amongst partner organizations. This was also listed as a major source of failure in STEM partnerships. Provide examples of how communication patterns can help or hinder a partnership in achieving goals.

16 During Round 1 several panelists identified poor communication patterns between universities and K-12 institutions as a source of failure in STEM partnerships. In your experience what are some of the major problems in communication between these two types of institutions?

17 Have you ever started a partnership with high levels of mutual respect and trust among professionals only to have the relationships disintegrate over time? If so, why and how did this happen; if not, how are respect and trust maintained?

18 In your experience, is it useful to have a formal agreement in the form of a contract or memorandum of understanding that binds the partners to a course of action? In what ways is this helpful or unhelpful?

19. For the following, please select the response that best characterizes your interactions with partner organizations.

19.a The typical frequency of your personal interactions with individual representatives of partner organizations is:

1. We have no regular meeting pattern but we do meet occasionally
2. Semi-Annually
3. Monthly
4. Weekly
5. Daily

19.b The typical frequency of a colleague from my organization interacting with individual representatives of partner organizations is:

1. They have no regular meeting pattern but they do meet occasionally
2. Semi-Annually
3. Monthly
4. Weekly
5. Daily

19.c The typical frequency of meetings in which all partner organizations are supposed to send a representative is:

1. We have no regular meeting pattern but we do meet occasionally
2. Semi-Annually
3. Monthly
4. Weekly
5. Daily

19.d In my work with partnerships I find my self working mostly with:

1. Both Equally
2. Females
3. Males

19.e Which of the following best describes your personal interactions with other individuals in your latest or current partnership?

1. My interactions with individuals within the partnership almost never refer to partnering activities and almost always refer to my regular work.
2. My interactions with individuals within the partnership rarely refer to partnering activities and usually refer to my regular work.
3. My interactions with individuals within the partnership usually refer to partnering activities and rarely refer to my regular work.
4. My interactions with individuals within the partnership almost always refer to partnering activities and almost never refer to my regular work.

20. When you consider a professional with good partnership skills, how important is it that they have the following traits:

20.a Part of their job description is to organize partnerships

20.b They are strong advocates for assisting teachers and students

20.c They have a graduate degree in a STEM education related field

20.d They have experience working with other partnerships

20.e They are strong advocates for education reform

20.f They have significant experience as an administrator

20.g They have significant experience as a teacher

20.h They are members of STEM related professional societies

20.i They are members of a local community service organizations

1. No opinion
2. Negative effect
3. No effect
4. Somewhat Important
5. Important
6. Very Important
7. Critical

20.j Are there other important characteristics of these professionals?

21 What would your organization do with the partnerships in which you are currently engaged if you left your post tomorrow?

22 Based on your experience, what is the level of turnover in key partnership personnel that is likely to occur during the life of a partnership? What are the consequences of turnover? Please provide some examples of this based on your experience.

23 In your experience which of the following descriptions of work patterns best characterizes the work you have observed being performed by most partnerships?

1. Other
2. Reciprocal -- the work of each partner is dependent upon inputs from the work of other partners. Partners engage in a give and take of work product until the job is finally completed and the STEM education-related program is delivered.
3. Sequential -- the work of partners follows a distinct sequence where the work completed by one partner serves as the starting point for the work of another partner
4. Pooled -- each of the partners does their own work and makes that available to the partnership without any significant direct interaction between organizations

23.a If other, Please describe

23.b In your expert opinion, why does the work of partnerships follow the pattern that you have observed in the previous question? If you observe more than one type of work pattern, then describe the most common types of work patterns. In your answer please provide some indication of the key factors that cause work to follow the pattern(s) that you have observed.

24 In what ways (if any), have your interactions with partner organizations changed your approach to working on partnership activities? Please offer examples of any changes.

25. Responses to Round 1 questions raised a question in the minds of the research team as to whether there might not be a distinction between partnership outcomes and program outcomes. The following questions are designed to help us understand whether panelists think there is a difference. Your current organization supports partnership through the following institutional commitments:

25.a Devoting personnel with job descriptions aimed at supporting partnership activities

25.b Devoting full-time staff to working on partnership activity

25.c Devoting staff time to working on partnership activity

25.d Rewarding personnel for engaging in partnership activity

25.e Providing cost share on grants supporting partnerships

25.f Devoting line operating budgets to supporting partnerships

1. No Opinion
2. Strongly Disagree
3. Disagree
4. Neither
5. Agree
6. Strongly Agree

25.a In your experience what is the likelihood that partner organizations devote similar types of resources to pursuing these goals.

26 Is there a distinction in your mind between the outcomes of partnership activity and the program outcomes that might be pursued by a partnership? From an evaluation perspective this is an important point so please describe your thinking in some detail.

27.a Taking one of your recent partnerships and describe the steps that the partnership has followed to achieve outcomes and impacts.

27.b Please choose one factor that is important for developing and implementing the partnership and explain how it affects partnership outcomes

27.c Please choose one important partnership outcome and explain how the choice of outcome measures ultimately influences whether impacts will be achieved.

27.d What effect (if any) has your partnership had on the local education community?

27.e What effect (if any) has your partnership had on the broader community (for example, business, politics, etc.)?

28.a What are the types of outcomes would you be likely to suggest exist for a formative evaluation that would describe all the work that the partnership has conducted? (A formative evaluation is one in which appraisals are focused on programs are still capable of being modified).

28.b What are the types of outcomes would you be likely to suggest exist for a summative evaluation? (A summative evaluation is one in which appraisals are focused on programs that are completed).

29 Continuing with the scenario in 28: The evaluator wants to know how she might distinguish between other work that your organization does in curriculum development, or teacher training, etc. and that done by the partnership. What would you recommend to your evaluator?

30 After reviewing the results of round one and our questions in round two, are there issues or themes you would like to explore further in rounds three and four?

### **Round 3**

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*In this round you will be asked to read and respond to two proposal summaries that describe STEM interventions as if you are a grant reviewer. The funding agencies are interested in enhancing STEM outcomes through collaborative means. In each scenario we will present a section of background information about the relationships among the organizations, local needs, and the regulatory environment. In a second section, we will outline a proposed activity or set of activities. And in the final section we will outline the project's expected outcomes. An identical set of questions about the proposal summary follows each scenario. Assume that a fully fleshed out proposal exists and could be reviewed if you wanted more information about some element in the summary. Some of the questions ask for open-ended responses. The rest ask your level of agreement to*



*statements about relationships between parts of the scenarios. Please treat the scenarios independently and in your responses refer back to the situation outlined in each proposal.*

## Scenario One

### Background

This proposal is being developed in response to a statewide initiative that seeks to bring the college and university science community actively into the process of developing new science courses for all of the state's high schools. The U.S. lags behind other developed nations in science achievement among high school students. Because our state ranks 48th in the nation on science related achievement tests, the legislature has passed a new set of laws (First in Science) requiring the governor and the board of regents to fund and make improving science education a priority for coming years. This project will promote high standards and the use of effective science cognitive approaches, and will create a framework that encourages ongoing partnerships between scientists within the state's colleges and universities and the teachers responsible for pre-college science education. In our state there are three major research universities and 14 smaller colleges. In addition there are 128 separate county school systems to be included in this initiative. The law demands that a working group be formed to develop a new science curriculum focused on earth science and biology that will draw together leading scientists from the colleges and universities, selected teachers, district science coordinators, and state officials responsible for science education. Our new Science Frontiers Curricular Partnership will include forty participants representing the 25 largest county school districts, two of the major universities and several state and district organizations. We recognize that we are creating a group that does not have a history of working together. However, in an initial survey of these participants we found that a significant majority believed improving the high school curriculum was an important goal for the state and their home institutions.

### Activities

Our basic strategy is to convene a collaborative group of K-12 and university science educators and other school and state administrators within the new Science Frontiers Curricular Partnership. We plan to give them the time and resources to design new earth science and biology curricula in which discovery and inquiry-based learning dominates, and to subsequently support professional development workshops for our current in-service teachers, and professional learning communities to assist our teachers in implementing the new courses. One specific objective is to involve higher education science faculty and scientists from around the state in the State Department of Education's normal process for creating the new High School Science Performance Standards.

To kick off the partnership, we will implement a 5-day Science Curriculum Development Institute that will bring together a select group of science faculty, educational researchers, high school teachers, science supervisors, and Department of Education specialists to create standards-based instructional units that stress course themes and overarching questions, and that utilize constructivist learning, multiple representations of data, causal modeling, field study, and appropriate uses of technology.

In addition, we hope to create professional learning communities that will include K-12 teachers, college and university faculty and scientists. We will create an on-line infrastructure to assist with connecting and maintaining these communities. We also plan to carry out multiple 3-day teacher professional development workshops for in-service teachers around the state to familiarize them with the new science courses and to help create another tier of professional learning communities to assist with course implementation. Coordinating the development of these learning communities will be the responsibility of the Science Frontiers Curricular Partnership. We expect these activities to last for five years and cost five million dollars.

#### Expected Outcomes

This project has the potential of impacting more than 50,000 high school students per year by providing them with new, high quality science courses that promote high level student learning in both science content and science process skills, that are taught using best practices based on current learning research, that make use of electronic resources and datasets such as those included in the National Science Digital Libraries, and that promote field study as a regular component of science instruction. This project will be evaluated on the basis of the curricula created, and on the impact of those new curricula on our high school students.

1 After reading the above scenario, what are the most important pieces of information you would be looking for in the body of the proposal to complete your evaluation? Please be explicit about what criteria you would use to evaluate this proposal.

Please tell us how strongly you agree with the following statements.

2a I want to know more about the interpersonal relationships involved in this proposal.

2b I want to know more about the organizational relationships involved in this proposal.

2c I want to know more about the working history of these organizations.

2d I want to know more about the needs of the community.

2e I want to know more about how laws, local policies, or funding opportunities that affect the organizations.

2f I want to know more about the distribution of funds among the partners.

2g I want to know more about the evaluation criteria to be used.

2h I want to know more about the distribution of work within the partnership.

1. No Opinion
2. Strongly Disagree
3. Disagree
4. Neither
5. Agree
6. Strongly Agree

3 Which aspects described in the background section of this proposal summary, are likely to influence the partnerships ability to engage in the proposed activities?

Please tell us how strongly you agree with the following statements.

3a As a reviewer I think that a partnership is likely to be successfully formed.

3b As a reviewer it seems that the way this partnership is starting will limit its ability to conduct the proposed activities.

3c As a reviewer it seems that given the way this partnership is starting it will be able to conduct its proposed activities.

3d As a reviewer I think it is likely that one organization will control all partnership activities.

1. No Opinion
2. Strongly Disagree
3. Disagree
4. Neither
5. Agree
6. Strongly Agree

4 Which aspects described in the activities section of this proposal, do you think are likely to influence the partnerships capacity to achieve the proposal's expected outcomes? Please tell us how strongly you agree with the following statements.

4a As a reviewer I think the expected outcomes in this scenario are likely to be accomplished as a result of the activities of this partnership.

4b As a reviewer I think getting a partnership formed will be an important measure of this project's success

4c As a reviewer I think that most of these activities could be handled outside of a partnership.

1. No Opinion
2. Strongly Disagree
3. Disagree
4. Neither
5. Agree
6. Strongly Agree

5 What might you reasonably expect to measure to evaluate the success of this project? How? Why? Please be specific about the measures that you think should be used in order for this proposal to be competitive.

Given the information in the above scenario, please tell us how strongly you agree with the following statements.

6a As a reviewer I think the costs of regular interaction will limit the success of this project.

6b As a reviewer I think the organizations involved will need a long time (greater than one year) to develop working relationships before the proposed activity can be implemented.

6c As a reviewer I think the organizations are likely to be more interested in the partnerships activities, rather than in specific expected outcomes.

6d As a reviewer I think the outcomes predicted are likely to be impacted by factors outside of the partnership's control.

6e As a reviewer I think it is likely that the partner organizations will transform their own internal operations due to exposure to the activities outlined in this scenario.

6f As a reviewer I think it is likely that the partner organizations will learn from the measurable expected outcomes in this scenario and to use this information to modify their partnership programs (for example when teachers finish a training program some measure of the change in teacher quality will be used to try to improve training program).

6g As a reviewer I think it is likely that some functions of the partner organizations will no longer be carried out by the organizations because they will be handled within the partnership.

6h As a reviewer I think it is likely that some work the organizations previously wanted to do, but could not do, can now be done through the partnership.

6i The overall price tag in the budget number at the end of the scenario is sufficient to achieve the expected outcomes.

6j The overall price tag in the budget number at the end of the scenario is sufficient to engage in the proposed activities

6k As a reviewer I would approve funding for this project.

1. No Opinion
2. Strongly Disagree
3. Disagree
4. Neither
5. Agree
6. Strongly Agree

7 Is a partnership necessary for these organizations to achieve the expected outcome in this type of project? Why or why not?

Scenario Two

Background

In response to No Child Left Behind the area high schools have been aggressive in monitoring both student and teacher performance. While the schools have made substantial progress it has been noticed that improvements in math have lagged far behind improvements in reading scores. Here we propose to create the Community Math Network, an innovative partnership between the high schools, community college, and state teacher college to improve both teacher and student performance.

We propose to build on the longstanding, positive working relationship between faculty and administrators at County Community College (CCC), State Teacher College (STC) and the area high schools. Over the past twenty years a close-knit network has developed within our small urban area between CCC, STC, and the five large feeder high schools in the area. Preliminary partnership meetings identified improving math scores in low-income high schools (4 of the 5 feeder high schools) as a problem that the schools have been unable to address through existing working relationships. We propose to bring the expertise of the STC and the professional development programs of the CCC into direct interaction with the day-to-day classroom activities in the high schools.

Our community school district has a large, poor, hyper-mobile, minority population with some 2400 high school students (80% of the total enrollment) qualifying for free lunches. The state government and the media have made improving the math achievement of the inner city area a priority and a group of motivated professionals have taken on the task of improving this situation. The business community has also targeted improving math scores as a priority for local educators. The state has committed \$10 million in grant monies to addressing the poor math scores in low-income high schools and the participating districts has committed a portion of the Title 1 funds to programs addressing lagging math scores. A leadership council has also been formed to address this issue represented by a senior administrator from each of the network including the CCC, the

three school districts in which the high schools are located, the feeder high schools, and the state as well as representatives from the local business community.

We are focusing only on improving math scores at this time. Recently it was recognized that the less affluent students in this area moved as often three or four times per school year. These moves, while potentially only a few blocks would often be across school boundaries resulting in a change in schools as well as in home situation and address. It is believed that this mobility is the cause of much of the disparity in achievement. Our strategy is to develop a standardized math curriculum that will be applied across all 5 high schools in the district and to have extensive professional development in the standardized curriculum for all math teachers in the district.

### Proposed Activities

The primary goals of our partnership are a) to standardize the math curriculum across the districts, b) to provide intensive tutor and teacher training programs in each of the high schools, and c) to have each high school math program be adopted by a leading local business that needs employees with improved math skills. Recognizing the need for some level of consistency for student achievement we plan to create a math curriculum with a single text, schedule, set of assignments and exams for all schools in the district.

A panel of experts from CCC and STC will develop the new math curriculum. Both institutions of higher education have outstanding departments of math and education. All of the key faculty members identified have established reputations as both evaluators and curriculum developers in math. Both CCC and STC have pledged to contribute 25% of the value of this project in the form of time and resources as in-kind contributions. The consistency in the curriculum is intended to ensure that students are not losing ground when they move due to changes in expectations or required knowledge. The project staff will then take the curriculum and create a summer training program for all district math teachers. The school system will run the training program based on the project staff's guidelines. The new curriculum will then be implemented in the upcoming school year. The business community will provide leadership in promoting job opportunities to students who demonstrate improved math scores.

### Expected Outcomes

We will evaluate the program by comparing changes in math scores on standardized tests with the science scores over the same period. We expect to see improvement in math scores for students impacted by the program while science scores should not change dramatically. If this program has its expected impacts we can expand it to cover other subject matter in future years.

We will also evaluate the improvement of teacher performance by doing classroom observations before, during and after participation in the teacher development program. To support this effort a peer-teacher council will be formed to advise both the partnership administrators and teachers going through the training program.

To add immediate impetus to the project the business community is committing to the creation of paying summer internship positions for high school students in which a student's math performance is one of the qualifying conditions for meriting employment.

8 After reading the above scenario, what are the most important pieces of information you would be looking for in the body of the proposal to complete your evaluation? Please be explicit about what criteria you would use to evaluate this proposal.

Please tell us how strongly you agree with the following statements. In order to properly evaluate the potential success of this proposed project:

9a I want to know more about the interpersonal relationships involved in this proposal.

9b I want to know more about the organizational relationships involved in this proposal.

9c I want to know more about the working history of these organizations.

9d I want to know more about the needs of the community.

9e I want to know more about how laws, local policies, or funding opportunities that affect the organizations.

9f I want to know more about the distribution of funds among the partners.

9g I want to know more about the evaluation criteria to be used.

9h I want to know more about the distribution of work within the partnership.

1. No Opinion
2. Strongly Disagree
3. Disagree
4. Neither
5. Agree
6. Strongly Agree

10 Which aspects described in the background section of this proposal summary, are likely to influence the partnerships ability to engage in the proposed activities?

Please tell us how strongly you agree with the following statements. Based on the information provided in the background section of this proposal:

10a As a reviewer I think that a partnership is likely to be successfully formed.

10b As a reviewer it seems that the way this partnership is starting will limit its ability to conduct the proposed activities.

10c As a reviewer it seems that given the way this partnership is starting it will be able to conduct its proposed activities.

10d As a reviewer I think it is likely that one organization will control all partnership activities.

1. No Opinion
2. Strongly Disagree
3. Disagree
4. Neither
5. Agree
6. Strongly Agree

11 Which aspects described in the activities section of this proposal, do you think are likely to influence the partnerships capacity to achieve the proposal's expected outcomes?

Please tell us how strongly you agree with the following statements. Based on the information provided in the activities section of this proposal:

11a As a reviewer I think the expected outcomes in this scenario are likely to be accomplished as a result of the activities of this partnership.

11b As a reviewer I think getting a partnership formed will be an important measure of this project's success

11c As a reviewer I think that most of these activities could be handled outside of a partnership.

1. No Opinion
2. Strongly Disagree
3. Disagree
4. Neither
5. Agree
6. Strongly Agree

12 What might you reasonably expect to measure to evaluate the success of this project? How? Why? Please be specific about the measures that you think should be used in order for this proposal to be competitive.

Given the information in the above scenario, please tell us how strongly you agree with the following statements.

13a As a reviewer I think the costs of regular interaction will limit the success of this project.

13b As a reviewer I think the organizations involved will need a long time (greater than one year) to develop working relationships before the proposed activity can be implemented.

13c As a reviewer I think the organizations are likely to be more interested in the partnerships activities, rather than in specific expected outcomes.

13d As a reviewer I think the outcomes predicted are likely to be impacted by factors outside of the partnership's control.

13e As a reviewer I think it is likely that the partner organizations will transform their own internal operations due to exposure to the activities outlined in this scenario.

13f As a reviewer I think it is likely that the partner organizations will learn from the measurable expected outcomes in this scenario and to use this information to modify their partnership programs (for example when teachers finish a training program some measure of the change in teacher quality will be used to try to improve training program).

13g As a reviewer I think it is likely that some functions of the partner organizations will no longer be carried out by the organizations because they will be handled within the partnership.

13h As a reviewer I think it is likely that some work the organizations previously wanted to do, but could not do, can now be done through the partnership.

13i The overall price tag in the budget number at the end of the scenario is sufficient to achieve the expected outcomes.

13j The overall price tag in the budget number at the end of the scenario is sufficient to engage in the proposed activities

13k As a reviewer I would approve funding for this project.

1. No Opinion
2. Strongly Disagree
3. Disagree
4. Neither
5. Agree
6. Strongly Agree

14 Is a partnership necessary for these organizations to achieve the expected outcome in this type of project? Why or why not?

15 You have now completed the first three rounds of this Delphi exercise. Are there issues or themes you would like to explore further in round four? Also, if you have any comments about anything relating to this project please include them here. Thank you for your participation.

#### **Round 4**

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*This is the fourth and final round of our E-Delphi Panel. Thank you very much for your outstanding participation to date. Your responses have provided great insight into the nature of partnering in STEM education, in some cases challenging many of the ideas in the current research and evaluation literature.*

*We thought we would take a moment to reflect upon the journey you have taken with us. During each of the previous rounds we have asked you to respond to questions from a particular point of view. The first round of questions asked you to reflect upon your own experiences in partnering. The second round of questions asked you to reflect on ideas and concepts found in the professional and research literature on partnering and relate these concepts to your own experience. In the third round we asked that you take on the role of an evaluator assessing two summaries of research proposals.*

*In Round Four we will pursue three objectives. First we will revisit issues from earlier rounds in which differences of opinion have arisen. In some cases these are differences of opinion among panelists that reflect the diversity of our panel. However, we are also probing differences in opinion from one round to another where responses have shifted with your frame of reference. Second we are asking questions that panelists have expressed an interest in pursuing further. Finally, we will be exploring some questions about evaluation within partnerships.*

1 If you were to develop a job description for a project director of partnership what skill set would you include? If you want to cut and paste an actual job description used in the past, feel free to do so.

2 Many of you have described partnerships that make use of governing and/or advisory boards to guide the strategic direction and implementation of the program. If you use these boards, please discuss the strategies that you have employed to determine the composition of the boards and the criteria that you prefer for the selection of board members. If not, Please tell us who within and how your partnership makes strategic decisions.

3 In Round 1 the majority of the panelists noted that turnover of personnel was a significant barrier to the effectiveness of the partnership. And in Round 3 many of you wanted to know the skill sets of the key personnel and whether they would be able to stay with the proposed projects long enough for a successful outcome. Yet in Round 2 the vast majority of panelists felt that they could easily be replaced and that your departure would cause a minimal disruption to the partnership. We found this to be a curious response and would like further clarification. We would like your view on this difference in responses.

4 The STEM partnerships that I have been most closely associated have focused on:

1. Other forms of education based community outreach
2. A holistic approach using multiple interventions
3. Retention of teachers



4. Education oriented basic research
5. Creating learning communities
6. Direct classroom level student oriented programs
7. Teacher training
8. Curriculum development

5 Please, briefly describe the differences between a teacher-training program run by your organization alone and one within a partnership? Are different people involved? Are there differences in decision-making procedures? What would your organization plan to do differently (assume funding is not an issue)?

6. Many of you noted that the types of STEM educational problems that your partnership is designed to address are long standing and persistent. We want to know the likelihood that the projects you have worked on within your partnerships will have substantial and lasting impacts (i.e. that last beyond the funding of any particular project) on the following STEM outcomes. If your partnerships have not dealt with the listed impact please mark not applicable.

What is the likelihood that projects you have worked on within your partnerships will have substantial and lasting impacts on:

- 6.a Improving student achievement in low performing schools
- 6.b Closing the achievement gaps
- 6.c Improving student retention
- 6.d Improving teacher content knowledge
- 6.e Improving teacher pedagogy
- 6.f Improving teacher retention
- 6.g Creating a learning community of STEM professionals between K-12 and IHE institutions
- 6.h Improving IHE faculty pedagogy
  1. Not applicable
  2. Very unlikely
  3. Somewhat unlikely
  4. Neither likely nor unlikely
  5. Somewhat likely
  6. Very likely

7 This is a two-part question that examines your use of evaluations. First, describe an action you have taken in reaction to the findings of a formative evaluation of a STEM partnership. Second, describe an action you have taken in reaction to the findings of a summative evaluation of a STEM partnership. For example, your answers might refer to any changes you have made to the administrative operations of a STEM partnership, the formal and informal relationships you maintain with partners, the program content the partnership was delivering, or some operation of your home organization.

8 Evaluations collect a great deal of information, much of which is required by governing entities. However, for this question, please do not focus on current regulations or mandates. In an ideal evaluation, what would be the key causal relationships that you would want observed for determining whether or not your partnership was being effective?

9. In the following questions, we ask that you reflect on how your home institution has been influenced by the partnerships in which you have participated. How strongly do you agree with the following statements?

9.a My organization has a policy of maintaining control of all partnership activities.

9.b When confronting a new problem, my organization actively seeks out other points of view.

9.c My organization has demonstrated a willingness to share control of partnership decisions.

9.d My organization regularly works with a number of organizations on an ongoing basis on issues other than STEM education.

9.e My organization regularly works with a number of organizations on an ongoing basis but only within partnership activities.

9.f My organization has learned and continues to learn new ideas or methods from our interactions with other organizations.

9.g My organization has learned and continues to learn new ideas or methods from participation in STEM partnerships.

9.h My organization regularly modifies intervention programs developed within our partnership because of things we learn from our partners

9.i My organization has changed in some fundamental way because of our interactions with other organizations (e.g., the way we do or approach our organizations regular work is different).

9.j My organization has changed in some fundamental way because of our STEM partnering activities (e.g., the way we do or approach our organizations regular work is different).

9.k Individuals within my organization learn a great deal through our partnering activities that would not be learned through interactions with organizations outside of our STEM partnership.

9.l My organization uses program evaluation to learn and improve programs.

9.m My organization has changed in some fundamental way because of something we learned during our STEM partnership's program valuation.

1. No Opinion
2. Strongly Disagree
3. Disagree
4. Neither
5. Agree
6. Strongly Agree

10 Do the partnerships that you work with have distinctive life cycles? If so, what are the distinctive periods in the life cycles?

(Composite Statement a) Partnership is not a silver bullet. We have gravitated toward this because no single institution has the capacity to address these persistent problems of student achievement, providing quality teaching, and low performing schools.

Partnerships are a necessary condition under the current organization of education in this country and the best hope that we have at present for building the capacity of low performing public schools.

11.a How strongly do you agree that this statement reflects your partnership experience?

11.b Please, tell us in what ways you agree or disagree with this statement. You have the option of editing the statement (you can save time by cutting and pasting the original text into the box for editing) or you can simply identify those elements of the statement that you would change and specifying how you would change them. If you agree with the entire composite statement then indicate so by typing the word "agree".

(Composite Statement b) The push for accountability in public schools is a mixed blessing. On the one hand, it has forced us to develop standards by which we can benchmark academic performance. On the other hand it is a blunt instrument that can skew the strategies and responses of schools. Improvements in test scores are not a good measure for the success of the STEM partnerships in which I have participated.

11.c How strongly do you agree that this statement reflects your partnership experience?

11.d Please, tell us in what ways you agree or disagree with this statement. You have the option of editing the statement (you can save time by cutting and pasting the original text into the box for editing) or by identifying those elements of the statement that you would change and specifying how you would change them. If you agree with the entire composite statement then indicate so by typing the word "agree".

(Composite Statement c) One of the most important ways in which we use partnership is to improve communication between institutions of higher education (IHE) and K-12 schools. Both types of institutions are built on cultures of isolation. Teachers do a lot of work on their own to determine what happens in their classroom and IHE faculty are under a lot of pressure to meet tenure requirements of writing and publishing and are discouraged from doing work that might be perceived as service oriented. Similarly, IHE faculty are not particularly good at listening and often do not understand the context within which teachers work or their motivations for pursuing professional development. Finally, the pedagogy used in IHE for math and science is outdated and part of the problem of STEM education. Partnership is the best tool we have found to break down some of these barriers through better communication.

11.e How strongly do you agree that this statement reflects your partnership experience?

11.f Please, tell us in what ways you agree or disagree with this statement. You have the option of editing the statement (you can save time by cutting and pasting the original text into the box for editing) or by identifying those elements of the statement that you would change and specifying how you would change them. If you agree with the entire composite statement then indicate so by typing the word "agree".

(Composite Statement d) Matching up the administrative systems of the various partner organizations can be a bit of a struggle. If there are exchanges of money, it's best to have a formal contract. Getting invoices approved and the endorsement of senior management in each organization can sometimes be a challenge. But these factors are only minor irritants when it comes to determining transaction costs. What really drives up the transaction costs of a partnership stem from communication problems between partners, when goals of partners drift apart, when trust begins to break down, or when there are long geographic distances between partners.

11.g How strongly do you agree that this statement reflects your partnership experience?

11.h Please, tell us in what ways you agree or disagree with this statement. You have the option of editing the statement (you can save time by cutting and pasting the original text into the box for editing) or by identifying those elements of the statement that you would

change and specifying how you would change them. If you agree with the entire composite statement then indicate so by typing the word "agree".

(Composite Statement e) The truth is that we have been interacting with our partners for a long time either formally or informally. We don't form partnerships in response to policy directives or to funding requirements. The funds enable our partnerships to do new things and to be more innovative in our approaches to STEM education. We might add members to our partnership in response to program requirements, but the core group has been working together for a while.

11.i How strongly do you agree that this statement reflects your partnership experience?

11.j Please, tell us in what ways you agree or disagree with this statement. You have the option of editing the statement (you can save time by cutting and pasting the original text into the box for editing) or by identifying those elements of the statement that you would change and specifying how you would change them. If you agree with the entire composite statement then indicate so by typing the word "agree".

"(Composite Statement f) [Instruction: In Round 2 we defined the terms "pooled" and "reciprocal" to describe the flow of work in a partnership. "Pooled" means that each partner does their own work and makes that available to the partnership without any significant direct interaction between organizations. "Reciprocal" means the work of each partner is dependent upon inputs from the work of other partners. Partners engage in a give and take of work product until the job is finally completed and the STEM education-related program is delivered. With these definitions in mind, considering the following statement drawn from your earlier responses.]

When the work of a partnership is conducted in a reciprocal fashion we are more likely to learn from one another and are more likely to be effective in meeting our objectives.

When we work in a pooled fashion we are falling victim to the organizational and social forces that tend to lead us to work in isolation of the larger professional community."

11.k How strongly do you agree that this statement reflects your partnership experience?

11.l Please, tell us in what ways you agree or disagree with this statement. You have the option of editing the statement (you can save time by cutting and pasting the original text into the box for editing) or by identifying those elements of the statement that you would change and specifying how you would change them. If you agree with the entire composite statement then indicate so by typing the word "agree".

(Composite Statement g) There is a distinction between partnership outcomes and the program outcomes we pursue through partnership. Partnership outcomes can be observed in the increased capacity of the individual partners to address the STEM education needs (for example, through better understanding of the issues, more effective communication between educational institutions and the STEM community, more effective leveraging of resources, and more effective representation of issues to policy makers). Program outcomes can be observed in the specific improvements (or lack thereof) in the professional development of teachers, the quality and content of curricula, or improvements in student achievement. Before a partnership can be effective in achieving program outcomes there must be improvements in the partnership outcomes.

11.m How strongly do you agree that this statement reflects your partnership experience?

11.n Please, tell us in what ways you agree or disagree with this statement. You have the option of editing the statement (you can save time by cutting and pasting the original text into the box for editing) or by identifying those elements of the statement that you would

change and specifying how you would change them. If you agree with the entire composite statement then indicate so by typing the word "agree".

(Composite Statement h) It is easier for us to measure improvements in teacher quality and in curricula. We have a harder time linking these measures to improvements in student performance, and an even harder time demonstrating how these contribute to the improvement of a low performing school. But ultimately, these are the key impacts that the STEM community is seeking to achieve.

11.o How strongly do you agree that this statement reflects your partnership experience?

11.p Please, tell us in what ways you agree or disagree with this statement. You have the option of editing the statement (you can save time by cutting and pasting the original text into the box for editing) or by identifying those elements of the statement that you would change and specifying how you would change them. If you agree with the entire composite statement then indicate so by typing the word "agree".

(Composite Statement i) Through partnerships we are better able to improve the quality of teaching, improve the content of the STEM curriculum, and create a learning community of STEM professionals. As a consequence of these improvements, student achievement in low performing schools will also improve significantly.

11.q How strongly do you agree that this statement reflects your partnership experience?

11.r Please, tell us in what ways you agree or disagree with this statement. You have the option of editing the statement (you can save time by cutting and pasting the original text into the box for editing) or by identifying those elements of the statement that you would change and specifying how you would change them. If you agree with the entire composite statement then indicate so by typing the word "agree".

1. No Opinion
2. Strongly Disagree
3. Disagree
4. Neither
5. Agree
6. Strongly Agree

12 We are interested in how your organization has used program evaluation or the results of a program evaluation within your current or most recent partnership. Please tell us the story of one program your organization was involved with that had an evaluation done. What did the evaluation measure? How were the results reported? Who were the results reported to? And, how were the results used (what actions if any occurred as a result of the evaluation)?

13 You have now completed the final round of this Delphi exercise. We would like to thank you once more for your participation. If you have any comments or questions about anything relating to this project or if there are things you learned from this exercise that you wish to share please tell us here. In the coming months as we complete the analysis of the four rounds we will be sharing the findings with you. Thank you for your participation.

# Appendix B: Quantitative Data Summary Tables

Delphi Round 1 Likert Tables

Round 1 data table	2 - 6 Months	6 - 12 Months	1-2 Years	2+ Years	Missing response	Total					Delphi Codes
<b>2 How much time does it take to establish effective working relationships between organizations within a partnership, who have never worked together in the past?</b>	5	6	16	4	1	32					Form Embeddedness
<b>How Important are the Following for the Development of Partnerships?</b>	Critical	Very Important	Important	Somewhat Important	No Effect	Negative	No Opinion	Missing response	Total		
3a.1 Mutual Goals	16	12	2	1	0	0	0	1	32	Form	
3a.2 Long-Term Personal Relationships	1	4	9	12	4	1	0	1	32	Form Embeddedness	
3a.3 Long-Term Working Relationships	1	2	14	11	3	0	0	1	32	Form Embeddedness	
3a.4 Sense of Professionalism among Partners	17	11	2	1	0	0	0	1	32	Form Embeddedness	
3a.5 Mutual Trust of Judgment or Opinions	16	14	1	0	0	0	0	1	32	Form Embeddedness	
3a.6 Mutual Respect	8	11	8	4	0	0	0	1	32	Form Embeddedness	
3a.7 Willingness to Communicate across Organizations	17	12	1	1	0	0	0	1	32	Form Embeddedness	
3a.8 Availability of New Resources / Grants	5	8	10	6	2	0	0	1	32	Form Strat Needs	
3a.9 Presence of an Interested, Motivated Individual	15	13	2	1	0	0	0	1	32	Form Champions	
3a.10 Some Additional Benefit	8	14	5	3	0	0	1	1	32	Motivations	
3a.11 Potential for Good PR	0	6	13	10	2	0	0	1	32	Form Strat Needs	
3a.12 Better Coordination of Existing Resources	3	7	10	8	1	0	2	1	32	Form Strat Needs	
3a.13 Some Gain in Prestige by Association with Partners	0	2	9	16	3	0	1	1	32	Motivations	
3a.14 Active Support of Administration	12	11	7	0	0	0	1	1	32	Motivations	
3a.15 Potential for Promotion	0	3	4	11	9	0	4	1	32	Motivations	
3a.16 Public Service Requirement for Tenure	1	6	6	4	7	0	6	2	32	Motivations	
<b>How Important are the Following to the Formation of a Successful Partnership?</b>	Critical	Very Important	Important	Somewhat Important	No Effect	Negative	No Opinion	Missing response	Total		
7a.1 Team Building Exercises	1	4	9	12	4	1	0	1	32	Ops Buy In	
7a.2 Regular Meetings	10	10	7	3	0	0	0	2	32	Ops Nature of Partnership	
7a.3 Deadlines / Structured Statements of Work	4	7	10	4	2	1	2	2	32	Ops Nature of Partnership	
7a.4 Strict Deadlines	4	7	13	5	2	0	0	1	32	Ops Nature of Partnership	
7a.5 Dispute Resolution Procedures	4	4	5	6	7	0	5	1	32	Ops Nature of Partnership	
7a.6 Legal Contracts	2	4	7	7	4	2	5	1	32	Ops Nature of Partnership	
7a.7 Administrative Support	17	9	5	0	0	0	0	1	32	Ops Nature of Partnership	
7a.8 Full-Time Staff	14	8	5	4	0	0	0	1	32	Ops Nature of Partnership	
7a.9 Partnership Retreats	4	3	10	9	2	0	3	1	32	Ops Nature of Partnership	
7a.10 Social Events	0	3	3	15	8	0	2	1	32	Ops Nature of Partnership	
7a.11 Recruitment of Additional Partners	0	4	7	5	6	1	8	1	32	Ops Evolution	
7a.12 Increasing Institutional Support	5	11	8	5	0	0	2	1	32	Ops Evolution	
7a.13 Procedures for Timely Payment of Invoices	9	8	8	4	1	0	1	1	32	Ops Nature of Partnership	
7a.14 Advertising / Public Relations	3	2	9	5	5	1	6	1	32	Ops Nature of Partnership	

Delphi Round 1 Likert Tables

<b>How Important are these Activities to the Success of a Partnership?</b>	Critical	Very Important	Important	Somewhat Important	No Effect	Negative	No Opinion	Missing response	Total	
8a.1 Programs for School Administrators	5	16	7	3	0	0	0	1	32	Ops Program / Admin
8a.2 Teacher Training Workshops	15	12	2	1	1	0	0	1	32	Ops Program / Admin
8a.3 Continuing Education for Teachers	13	13	3	2	0	0	0	1	32	Ops Program / Admin
8a.4 Professional Mentoring for Teachers	8	14	6	2	0	0	1	1	32	Ops Program / Admin
8a.5 University Students Teaching in Classrooms	2	3	7	9	3	1	6	1	32	Ops Program / Admin
8a.6 Presence of an Interested, Motivated Individual	22	6	3	0	0	0	0	1	32	Ops Champions
8a.7 Individual Student Tutoring/Mentoring	1	8	6	6	1	1	8	1	32	Ops Program / Admin
8a.8 Courses on Test-Taking Skills for Students	1	3	4	6	5	2	10	1	32	Ops Program / Admin
8a.9 Trust-Building Exercises	1	6	3	10	6	0	5	1	32	Ops Embeddedness
<b>How Effective have your Partnerships been at:</b>	Very Effective	Somewhat Effective	Neither	Somewhat Ineffective	Very Ineffective	No Opinion	Missing response	Total		
9a Professional Development	19	8	1	1	0	1	2	32		Ops Program / Admin
9b Improving K-12 Student Achievement	3	20	1	2	1	3	2	32		Ops Program / Admin
9c Securing Additional Resources	12	14	3	0	0	1	2	32		Ops Program / Admin
9d Enhancing Curriculum Development	16	8	3	0	0	3	2	32		Ops Program / Admin
9e Creating a Cooperative Environment between Universities and K-12 Schools	14	10	5	0	0	1	2	32		Out Achiev / Process
9f Increasing Test Scores	4	12	8	0	1	5	2	32		Out Achiev / Performance
9g Increasing Awareness of Education Interventions	6	19	2	0	0	3	2	32		Out Achiev / Process
9h Improving Public Perception of Local Schools or Universities	3	10	9	1	0	7	2	32		Out Achiev / Process
9i Improving the Student's Perception of Local Schools or Universities	3	10	9	1	0	7	2	32		Out Achiev / Process
9j Increasing the Number of Local Students entering STEM Fields	1	12	8	0	1	8	2	32		Out Achiev / Performance
9k Increasing the Number of Local Students Entering Partner Universities	1	9	7	2	0	10	3	32		Out Achiev / Performance
9l Providing Leadership Opportunities	2	6	9	0	0	13	2	32		Out Achiev / Process
Structure and Accountability?	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	No Opinion	Missing response	Total		
21a All Work Legally Contracted	2	8	3	5	8	4	2	32		Ops Operational Evolution
21b Top Management Solicited Information from All Levels	9	12	3	2	4	0	2	32		Ops Operational Evolution
21c All Work by My Organization was Done as Agreed	12	11	2	3	1	1	2	32		Ops Operational Evolution
21d All Work by Other Organizations was Done as Agreed	4	17	2	4	2	1	2	32		Ops Operational Evolution

Delphi Round 1 Likert Tables

21e It Was Easy to get Paid for Expenses	7	12	4	2	2	3	2	32	Ops Operational Evolution
21f Organizations Handled Individual-Level Personality Disputes Well	3	7	4	6	4	6	2	32	Ops Operational Evolution
Partnership Management?	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	No Opinion	Missing response	Total	
18a Power was Invested in One Individual during Formation and Operation	2	11	4	3	9	1	2	32	Ops Power Relations
18b Power was Invested in One Organization during Formation and Operation	5	12	3	3	7	0	2	32	Ops Power Relations
18c Power was Shared Equally during Formation and Operation	3	13	2	10	1	1	2	32	Ops Power Relations



Delphi Round 2 Likert Tables

Round 2 Tables										
<b>9. In Round 1, a significant number of panelists indicated that external grants and funds are the most important pre-condition for entering into partnerships. Please indicate the degree to which you agree or disagree with the following statements:</b>	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	No opinion	Missing response	Total		
9.a My organization won't enter into partnerships unless the entire effort is covered by external funds	2	7	3	8	11	0	1	32		Form Strat Needs
9.b Most partnerships are formed because they are required by the sponsor as a condition of the grant	3	11	7	5	4	1	1	32		Form Coercion
9.c Most of our partnerships are sponsored by federal monies	5	14	4	6	2	0	1	32		Form Strat Needs
9.d It is difficult to attract partners unless we have funds to offer to in exchange for their participation	8	16	2	5	0	0	1	32		Form Strat Needs
9.e If there were no external grants, my organization would not be interested in participating in partnerships	1	6	1	12	10	1	1	32		Form Strat Needs
9.f The STEM education objectives that our partnership pursues were significantly altered by conditions set by external sponsors	3	8	6	5	8	1	1	32		Form Coercion
10 In your most recent partnership, what percentage of the cost of your organization was covered by external grants? Please include all costs including personnel time, programs, and administration.	0-25%	25-50%	50-75%	75-100%	Missing response	Total				
	5	2	11	13	1	32				Ops Strat Needs
10.a Do you agree that your partner organizations had a similar degree of coverage?	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	No opinion	Missing response	Total		
	5	13	1	6	0	6	1	32		Ops Strat Needs
12. Please indicate the degree to which you agree or disagree with the following statements:	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	No opinion	Missing response	Total		
12.a For partnerships to be effective the primary point of contact within each organization needs to be of the same (or at least very similar) rank in their home organization.	5	13	8	4	1	0	1	32		Out Embeddedness
12.b For partnerships to be effective we need to have several individuals at various levels within each organization who occupy key functional roles critical to the delivery of partnership objectives	13	15	1	2	0	0	1	32		Out Embeddedness
12.c For partnerships to be effective we need to have several individuals in other organizations who are knowledgeable of and sympathetic to our goals	8	19	3	1	0	0	1	32		Out Embeddedness
12.d For partnerships to be effective the majority of partners should be geographically near one another	1	12	5	5	8	0	1	32		Out Embeddedness
12.e For STEM partnerships to be effective the partners should be drawn from across the public, private, and non-profit sectors	4	8	8	6	4	1	1	32		Out Embeddedness

Delphi Round 2 Likert Tables

12.f Partnerships are most effective when a single person is responsible for decisions	2	4	5	4	16	0	1	32		Out Embeddedness / Out Power Impacts
14. In Round 1 the majority of panelists reported experiencing too many meetings, ineffective strategic planning exercises, and contrived social gatherings. This has led us to explore the transaction costs associated with partnering. By transaction costs we mean those costs that partners might incur through interacting with one another and/or are associated with acquiring resources and services used for pursuing partnership goals Please indicate the degree to which you agree (or disagree) that the following factors contribute to high levels of transaction costs for partner	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	No opinion	Missing response	Total		
14.a regular meetings	4	16	3	5	3	0	1	32		Ops Transaction Costs
14.b coordinating across large numbers of partners	9	14	4	2	1	1	1	32		Ops Transaction Costs
14.c low levels of agreement among partners	12	7	7	0	2	3	1	32		Ops Transaction Costs
14.d complementary goals among partners regarding STEM	0	5	9	11	4	2	1	32		Ops Transaction Costs
14.e the use of formal agreements such as contracts	2	8	7	10	3	1	1	32		Ops Transaction Costs
14.f partnership goals that include improving student scores on	5	12	7	5	2	0	1	32		Ops Transaction Costs
14.g mandates from public policies	1	17	6	1	2	4	1	32		Ops Transaction Costs
14.h rules and requirements from external sponsors	6	14	6	2	2	1	1	32		Ops Transaction Costs
14.i partnership goals that target challenging populations of	2	11	6	10	2	0	1	32		Ops Transaction Costs
14.j partnership goals that target challenging populations of	2	14	3	8	4	0	1	32		Ops Transaction Costs
14.k coordinating programs across a geographically dispersed	12	11	5	1	1	1	1	32		Ops Transaction Costs
14.l coordinating partners drawn from the public, private, and non-	1	16	6	1	3	4	1	32		Ops Transaction Costs
14.m few professionals with good partnership skills	10	12	5	2	1	1	1	32		Ops Transaction Costs
14.n low levels of trust among partners	12	11	4	0	3	1	1	32		Ops Transaction Costs
14.o turnover in partnership personnel	11	11	7	0	2	0	1	32		Ops Transaction Costs
19. For the following, please select the response that best characterizes your interactions with partner organizations.	Daily	Weekly	Monthly	Semi-Annually	No Regular meeting pattern	Missing response	Total			
19.a The typical frequency of your personal interactions with individual representatives of partner organizations is:	4	14	7	2	4	1	32			Ops Embeddedness
19.b The typical frequency of a colleague from my organization interacting with individual representatives of partner organizations is:	6	16	5	0	4	1	32			Ops Embeddedness
19.c The typical frequency of meetings in which all partner organizations are supposed to send a representative is:	0	1	19	9	2	1	32			Ops Embeddedness
	Males	Females	Both Equally	Missing response	Total					
19.d In my work with partnerships I find my self working mostly with:	2	8	21	1	32					Ops Embeddedness

Delphi Round 2 Likert Tables

19.e Which of the following best describes your personal interactions with other individuals in your latest or current partnership?	My interactions with individuals within the partnership almost always refer to partnering activities and almost never refer to my regular work.	My interactions with individuals within the partnership rarely refer to partnering activities and usually refer to my regular work.	My interactions with individuals within the partnership rarely refer to partnering activities and usually refer to my regular work.	My interactions with individuals within the partnership almost never refer to partnering activities and almost always refer to my regular work.	Missing response	Total					Ops Embeddedness / Regular Work
	11	16	2	1	2	32					
20. When you consider a professional with good partnership skills, how important is it that they have the following traits:	Critically Important	Very Important	Important	Somewhat Important	No Effect	Negative	No Opinion	Missing response	Total		
20.a Part of their job description is to organize partnerships	3	2	5	9	10	0	2	1	32		Ops Embeddedness
20.b are strong advocates for assisting teachers and students	9	13	7	1	0	0	1	1	32		Ops Embeddedness
20.c have a graduate degree in a STEM education related field	0	1	9	12	7	0	2	1	32		Ops Embeddedness
20.d have experience working with other partnerships	1	9	11	9	0	0	1	1	32		Ops Embeddedness
20.e are strong advocates for education reform	10	11	7	2	0	0	1	1	32		Ops Embeddedness
20.f have significant experience as an administrator	0	5	9	8	7	0	2	1	32		Ops Embeddedness
20.g have significant experience as a teacher	2	4	7	8	7	0	3	1	32		Ops Embeddedness
20.h They are members of STEM related professional societies	0	0	8	12	10	0	1	1	32		Ops Embeddedness
20.i They are members of a local community service organizations	0	0	3	8	12	0	8	1	32		Ops Embeddedness
23. In your experience which of the following descriptions of work patterns best characterizes the work you have observed being performed by most partnerships?	Pooled	Sequential	Reciprocal	Other	Missing response	Total					
	4	0	21	6	1	32					Ops Operational Evolution
25. Responses to Round 1 questions raised a question in the minds of the research team as to whether there might not be a distinction between partnership outcomes and program outcomes. The following questions are designed to help us understand whether panelists think there is a difference. Your current organization supports partnership through the following: institutional	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	No opinion	Missing response	Total			
25.a Devoting personnel with job descriptions aimed at supporting partnership activities	12	9	3	5	1	1	1	32			Out Achievements
25.b Devoting full-time staff to working on partnership activity	8	10	3	5	3	1	2	32			Out Achievements
25.c Devoting staff time to working on partnership activity	16	14	0	0	0	1	1	32			Out Achievements
25.d Rewarding personnel for engaging in partnership activity	5	15	5	3	1	2	1	32			Out Achievements
25.e Providing cost share on grants supporting partnerships	13	11	1	3	0	3	1	32			Out Achievements
25.f Devoting line operating budgets to supporting partnerships	5	14	3	3	2	4	1	32			Out Achievements

Delphi Round 3 Likert Summary Tables

Round 3 tables									Delphi Codes
2.) Please tell us how strongly you agree with the following statements.	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	No opinion	Missing response	Total	
2a I want to know more about the interpersonal relationships involved in this proposal.	10	9	10	2	0	0	1	32	Ops Embeddedness
2b I want to know more about the organizational relationships involved in this proposal.	22	7	1	1	0	0	1	32	Ops Embeddedness
2c I want to know more about the working history of these organizations.	17	11	3	0	0	0	1	32	Ops Embeddedness
2d I want to know more about the needs of the community.	16	12	2	1	0	0	1	32	Ops Environment
2e I want to know more about how laws, local policies, or funding opportunities that affect the organizations.	13	14	2	1	0	1	1	32	Ops Environment
2f I want to know more about the distribution of funds among the partners.	16	7	6	1	0	1	1	32	Ops Strat Needs
2g I want to know more about the evaluation criteria to be used.	25	5	1	0	0	0	1	32	Out Linking Outcomes
2h I want to know more about the distribution of work within the partnership.	22	6	2	0	0	1	1	32	Ops Operational Evolution
3 Please tell us how strongly you agree with the following statements.	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	No opinion	Missing response	Total	
3a As a reviewer I think that a partnership is likely to be successfully formed.	1	7	6	15	2	0	1	32	Form Story
3b As a reviewer it seems that the way this partnership is starting will limit its ability to conduct the proposed activities.	6	19	2	3	1	0	1	32	Form Story
3c As a reviewer it seems that given the way this partnership is starting it will be able to conduct its proposed activities.	2	5	6	18	0	0	1	32	Form Story
3d As a reviewer I think it is likely that one organization will control all partnership activities.	4	5	13	6	0	3	1	32	Form Story
4. Please tell us how strongly you agree with the following statements.	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	No opinion	Missing response	Total	
4a As a reviewer I think the expected outcomes in this scenario are likely to be accomplished as a result of the activities of this partnership.	1	6	5	14	5	0	1	32	Out Achievements
4b As a reviewer I think getting a partnership formed will be an important measure of this project's success	15	11	2	3	0	0	1	32	Form Story
4c As a reviewer I think that most of these activities could be handled outside of a partnership.	1	5	4	11	10	0	1	32	Form Story
6.) Given the information in the above scenario, please tell us how strongly you agree with the following statements.	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	No opinion	Missing response	Total	
6a As a reviewer I think the costs of regular interaction will limit the success of this project.	2	10	10	3	5	1	1	32	Ops Transaction Costs
6b As a reviewer I think the organizations involved will need a long time (greater than one year) to develop working relationships before the proposed activity can be implemented.	12	13	2	4	0	0	1	32	Ops Embeddedness
6c As a reviewer I think the organizations are likely to be more interested in the partnerships activities, rather than in specific expected outcomes.	4	10	4	8	4	1	1	32	Ops Admin / Program
6d As a reviewer I think the outcomes predicted are likely to be impacted by factors outside of the partnership's control.	5	19	4	3	0	0	1	32	Out Environment
6e As a reviewer I think it is likely that the partner organizations will transform their own internal operations due to exposure to the activities outlined in this scenario.	0	5	7	14	5	0	1	32	Out Org Change

Delphi Round 3 Likert Summary Tables

6f As a reviewer I think it is likely that the partner organizations will learn from the measurable expected outcomes in this scenario and to use this information to modify their partnership programs (for example when teachers finish a training program some measure of the change in teacher quality will be used to try to improve training program).	3	11	5	9	2	1	1	32	Ops Linking Outcomes
6g As a reviewer I think it is likely that some functions of the partner organizations will no longer be carried out by the organizations because they will be handled within the partnership.	0	5	7	11	6	2	1	32	Out Org Change
6h As a reviewer I think it is likely that some work the organizations previously wanted to do, but could not do, can now be done through the partnership.	5	18	5	1	1	1	1	32	Out Capacity Building
6i The overall price tag in the budget number at the end of the scenario is sufficient to achieve the expected outcomes.	0	3	6	7	11	4	1	32	Out Strat Needs
6j The overall price tag in the budget number at the end of the scenario is sufficient to engage in the proposed activities	1	9	5	8	4	4	1	32	Out Strat Needs
6k As a reviewer I would approve funding for this project.	1	6	3	10	9	2	1	32	Out Achievements
<b>9.) Please tell us how strongly you agree with the following statements. In order to properly evaluate the potential success of this proposed project:</b>	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	No opinion	Missing response	Total	
9a I want to know more about the interpersonal relationships involved in this proposal.	6	10	7	7	1	0	1	32	Ops Embeddedness
9b I want to know more about the organizational relationships involved in this proposal.	10	16	2	2	1	0	1	32	Ops Embeddedness
9c I want to know more about the working history of these organizations.	12	12	4	2	1	0	1	32	Ops Embeddedness
9d I want to know more about the needs of the community.	8	14	4	4	0	1	1	32	Ops Environment
9e I want to know more about how laws, local policies, or funding opportunities that affect the organizations.	8	14	5	3	0	1	1	32	Ops Environment
9f I want to know more about the distribution of funds among the partners.	11	12	7	1	0	0	1	32	Ops Strat Needs
9g I want to know more about the evaluation criteria to be used.	19	10	1	1	0	0	1	32	Out Linking Outcomes
9h I want to know more about the distribution of work within the partnership.	13	13	4	1	0	0	1	32	Ops Operational Evolution
<b>Please tell us how strongly you agree with the following statements. Based on the information provided in the background section of this proposal:</b>	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	No opinion	Missing response	Total	
10a As a reviewer I think that a partnership is likely to be successfully formed.	17	10	2	0	2	0	1	32	Form Story
10b As a reviewer it seems that the way this partnership is starting will limit its ability to conduct the proposed activities.	2	4	5	6	14	0	1	32	Form Story
10c As a reviewer it seems that given the way this partnership is starting it will be able to conduct its proposed activities.	12	10	4	4	1	0	1	32	Form Story
10d As a reviewer I think it is likely that one organization will control all partnership activities.	2	7	10	7	5	0	1	32	Form Story
<b>11. Please tell us how strongly you agree with the following statements. Based on the information provided in the activities section of this proposal:</b>	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	No opinion	Missing response	Total	
11a As a reviewer I think the expected outcomes in this scenario are likely to be accomplished as a result of the activities of this partnership.	5	14	2	6	4	0	1	32	Out Achievements

Delphi Round 3 Likert Summary Tables

11b As a reviewer I think getting a partnership formed will be an important measure of this project's success	12	2	8	6	3	0	1	32	Form Story
11c As a reviewer I think that most of these activities could be handled outside of a partnership.	0	5	4	14	7	0	2	32	Form Story
<b>13.) Given the information in the above scenario, please tell us how strongly you agree with the following statements.</b>	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	No opinion	Missing response	Total	
13a As a reviewer I think the costs of regular interaction will limit the success of this project.	0	2	6	16	5	2	1	32	Ops Transaction Costs
13b As a reviewer I think the organizations involved will need a long time (greater than one year) to develop working relationships before the proposed activity can be implemented.	0	5	4	15	7	0	1	32	Ops Embeddedness
13c As a reviewer I think the organizations are likely to be more interested in the partnerships activities, rather than in specific expected outcomes	0	5	6	13	7	0	1	32	Ops Admin / Program
13d As a reviewer I think the outcomes predicted are likely to be impacted by factors outside of the partnership's control.	5	12	6	5	1	1	2	32	Out Environment
13e As a reviewer I think it is likely that the partner organizations will transform their own internal operations due to exposure to the activities outlined in this scenario.	2	15	5	5	3	1	1	32	Out Org Change
13f As a reviewer I think it is likely that the partner organizations will learn from the measurable expected outcomes in this scenario and to use this information to modify their partnership programs (for example when teachers finish a training program some measure of the change in teacher quality will be used to try to improve training program).	7	18	3	3	0	0	1	32	Ops Linking Outcomes
13g As a reviewer I think it is likely that some functions of the partner organizations will no longer be carried out by the organizations because they will be handled within the partnership.	0	8	9	6	5	3	1	32	Out Org Change
13h As a reviewer I think it is likely that some work the organizations previously wanted to do, but could not do, can now be done through the partnership.	8	18	3	1	1	0	1	32	Out Capacity Building
13i The overall price tag in the budget number at the end of the scenario is sufficient to achieve the expected outcomes.	4	7	8	2	0	10	1	32	Out Strat Needs
13j The overall price tag in the budget number at the end of the scenario is sufficient to engage in the proposed activities	8	10	3	0	0	10	1	32	Out Strat Needs
13k As a reviewer I would approve funding for this project.	7	14	2	3	3	1	2	32	Out Achievements

RND4questions	Curriculum development	Teacher training	Direct classroom intervention	Creating learning communities	Education oriented, basic research	Retention of teachers	A holistic approach using multiple interventions	Other forms of education based community outreach	Missing responses	Total	Delphi Codes
4 The STEM partnerships that I have been most closely associated have focused on:	3	7	2	1	0	0	16	0	3	32	Ops Program / Admin
6. Many of you noted that the types of STEM educational problems that your partnership is designed to address are long standing and persistent. We want to know the likelihood that the projects you have worked on within your partnerships will have substantial and lasting impacts (i.e. that last beyond the funding of any particular project) on the following STEM outcomes. If our partnerships have not dealt with the listed impact please mark not applicable.  What is the likelihood that projects you have worked on within your partnerships will have substantial and lasting impacts on:	Very likely	Somewhat likely	Neither likely nor unlikely	Somewhat unlikely	Very unlikely	Not applicable	Missing responses	Total			
6.a Improving student achievement in low performing schools	10	17	2	1	0	0	2	32			Out Linking Outcomes
6.b Closing the achievement gaps	7	17	4	1	1	0	2	32			Out Linking Outcomes
6.c Improving student retention	5	12	6	1	1	5	2	32			Out Linking Outcomes
6.d Improving teacher content knowledge	17	12	0	1	0	0	2	32			Out Linking Outcomes
6.e Improving teacher pedagogy	15	12	2	0	1	0	2	32			Out Linking Outcomes
6.f Improving teacher retention	2	12	11	2	1	2	2	32			Out Linking Outcomes
6.g Creating a learning community of STEM professionals between K-12 and IHE institutions	9	9	6	5	0	1	2	32			Out Linking Outcomes
6.h Improving IHE faculty pedagogy	6	9	4	4	4	3	2	32			Out Linking Outcomes
9. In the following questions, we ask that you reflect on how your home institution has been influenced by the partnerships in which you have participated. How strongly do you agree with the following statements?	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	No opinion	Missing responses	Total			
9.a My organization has a policy of maintaining control of all partnership activities.	3	6	5	9	6	1	2	32			Out Org Structure
9.b When confronting a new problem, my organization actively seeks out other points of view.	14	13	1	2	0	0	2	32			Out Org Structure
9.c My organization has demonstrated a willingness to share control of partnership decisions.	15	10	2	2	0	1	2	32			Out Org Structure
9.d My organization regularly works with a number of organizations on an ongoing basis on issues other than STEM education.	18	8	0	0	2	1	3	32			Out Org Structure
9.e My organization regularly works with a number of organizations on an ongoing basis but only within partnership activities.	2	3	2	11	12	0	2	32			Out Org Structure
9.f My organization has learned and continues to learn new ideas or methods from our interactions with other organizations.	19	11	0	0	0	0	2	32			Out Changes in Capacity
9.g My organization has learned and continues to learn new ideas or methods from participation in STEM partnerships.	17	10	2	0	0	1	2	32			Out Org Structure
9.h My organization regularly modifies intervention programs developed within our partnership because of things we learn from our partners.	11	13	2	2	0	2	2	32			Out Admin / Program
9.i My organization has changed in some fundamental way because of our interactions with other organizations (e.g., the way we do or approach our organizations regular work is different).	7	15	4	1	2	1	2	32			Out Org Change
9.j My organization has changed in some fundamental way because of our STEM partnering activities (e.g., the way we do or approach our organizations regular work is different).	7	15	4	0	2	2	2	32			Out Org Change
9.k Individuals within my organization learn a great deal through our partnering activities that would not be learned through interactions with organizations outside of our STEM partnership.	14	10	5	1	0	0	2	32			Out Changes in Capacity

Delphi Round 4 Likert Tables

9.l My organization uses program evaluation to learn and improve programs.	15	14	1	0	0	0	2	32			Out Changes in Capacity
9.m My organization has changed in some fundamental way because of something we learned during our STEM partnership's program evaluation.	3	12	10	3	1	1	2	32			Out Org Change
11. In the following questions we are going to ask you to react to composite statements designed to summarize responses from the earlier rounds. Each statement links several ideas together that reflect a clustering of responses from the panel. In some cases we have provided the view of the majority of the panelists. In others, the composite statement reflects the views of a minority of the panelists. We are interested in how well these statements reflect your views. You will be asked to indicate the degree to which you agree with the statement and also how you might change each statement so that it better reflects your experiences. The first composite statement is:											
(Composite Statement a) Partnership is not a silver bullet. We have gravitated toward this because no single institution has the capacity to address these persistent problems of student achievement, providing quality teaching, and low performing schools. Partnerships are a necessary condition under the current organization of education in this country and the best hope that we have at present for building the capacity of low performing public schools.	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	No opinion	Missing responses	Total			
11.a How strongly do you agree that this statement reflects your partnership experience?	17	7	1	1	2	1	3	32			Out Changes in Capacity
(Composite Statement b) The push for accountability in public schools is a mixed blessing. On the one hand, it has forced us to develop standards by which we can benchmark academic performance. On the other hand it is a blunt instrument that can skew the strategies and responses of schools. Improvements in test scores are not a good measure for the success of the STEM partnerships in which I have participated.	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	No opinion	Missing responses	Total			
11.c How strongly do you agree that this statement reflects your partnership experience?	9	14	4	3	0	0	2	32			Out Achievements
(Composite Statement c) One of the most important ways in which we use partnership is to improve communication between institutions of higher education (IHE) and K-12 schools. Both types of institutions are built on cultures of isolation. Teachers do a lot of work on their own to determine what happens in their classroom and IHE faculty are under a lot of pressure to meet tenure requirements of writing and publishing and are discouraged from doing work that might be perceived as service oriented. Similarly, IHE faculty are not particularly good at listening and often do not understand the context within which teachers work or their motivations for pursuing professional development. Finally, the pedagogy used in IHE for math and science is outdated and part of the problem of STEM education. Partnership is the best tool we have found to break down some of these barriers through better communication.	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	No opinion	Missing responses	Total			
11.e How strongly do you agree that this statement reflects your partnership experience?	11	11	2	6	0	0	2	32			Out Changes in Capacity
(Composite Statement d) Matching up the administrative systems of the various partner organizations can be a bit of a struggle. If there are exchanges of money, it's best to have a formal contract. Getting invoices approved and the endorsement of senior management in each organization can sometimes be a challenge. But these factors are only minor irritants when it comes to determining transaction costs. What really drives up the transaction costs of a partnership stem from communication problems between partners, when goals of partners drift apart, when trust begins to break down, or when there are long geographic distances between partners.	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	No opinion	Missing responses	Total			
11.g How strongly do you agree that this statement reflects your partnership experience?	14	11	1	1	1	2	2	32			Ops Transaction Costs
(Composite Statement e) The truth is that we have been interacting with our partners for a long time either formally or informally. We don't form partnerships in response to policy directives or to funding requirements. The funds enable our partnerships to do new things and to be more innovative in our approaches to STEM education. We might add members to our partnership in response to program requirements, but the core group has been working together for a while.	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	No opinion	Missing responses	Total			



Delphi Round 4 Likert Tables

11.j How strongly do you agree that this statement reflects your partnership experience?	6	12	5	5	2	0	2	32			Form Motivations
(Composite Statement f) [Instruction: In Round 2 we defined the terms "pooled" and "reciprocal" to describe the flow of work in a partnership. "Pooled" means that each partner does their own work and makes that available to the partnership without any significant direct interaction between organizations. "Reciprocal" means the work of each partner is dependent upon inputs from the work of other partners. Partners engage in a give and take of work product until the job is finally completed and the STEM education-related program is delivered. With these definitions in mind, considering the following statement drawn from your earlier responses.] When the work of a partnership is conducted in a reciprocal fashion we are more likely to learn from one another and are more likely to be effective in meeting our objectives. When we work in a pooled fashion we are falling victim to the organizational and social forces that tend to lead us to work in isolation of the larger professional community.	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	No opinion	Missing responses	Total			
11.k How strongly do you agree that this statement reflects your partnership experience?	18	9	1	3	0	0	1	32			Ops Operational Evolution
(Composite Statement g) There is a distinction between partnership outcomes and the program outcomes we pursue through partnership. Partnership outcomes can be observed in the increased capacity of the individual partners to address the STEM education needs (for example, through better understanding of the issues, more effective communication between educational institutions and the STEM community, more effective leveraging of resources, and more effective representation of issues to policy makers). Program outcomes can be observed in the specific improvements (or lack thereof) in the professional development of teachers, the quality and content of curricula, or improvements in student achievement. Before a partnership can be effective in achieving program outcomes there must be improvements in the partnership outcomes.	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	No opinion	Missing responses	Total			
11.l How strongly do you agree that this statement reflects your partnership experience?	10	13	3	3	1	0	2	32			Out Admin / Program
(Composite Statement h) It is easier for us to measure improvements in teacher quality and in curricula. We have a harder time linking these measures to improvements in student performance, and an even harder time demonstrating how these contribute to the improvement of a low performing school. But ultimately, these are the key impacts that the STEM community is seeking to achieve.	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	No opinion	Missing responses	Total			
11.o How strongly do you agree that this statement reflects your partnership experience?	19	4	0	5	2	0	2	32			Out Achievements
(Composite Statement i) Through partnerships we are better able to improve the quality of teaching, improve the content of the STEM curriculum, and create a learning community of STEM professionals. As a consequence of these improvements, student achievement in low performing schools will also improve significantly.	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	No opinion	Missing responses	Total			
11.q How strongly do you agree that this statement reflects your partnership experience?	9	14	3	3	1	0	2	32			Out Achievements / Out Admin / Program

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