K-20 Partnership: A Definition and Proof-of-Concept

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Introduction

School districts and institutions of higher education (IHEs) have, historically, attempted to improve K-12 instructional quality and student performance in relative isolation from each other, and with limited success.[1] The No Child Left Behind (NCLB) Act and calls to improve pre-service teacher education have prompted policymakers and others to rethink models of instructional improvement and teacher preparation. One possible model involves partnerships between K-12 districts and IHEs, which we call "K-20 partnerships," to bring about fundamental and sustainable changes in teaching. K-20 partnership formation is an aspect of NCLB legislation and is enacted through the National Science Foundation's Math and Science Partnership (MSP) program[2] and US Department of Education's (US ED) Teacher Quality Enhancement grants.[3]

As a policy effort, partnerships between K-12 agencies and IHEs have the common sense appeal that "together, we are stronger." In other words, policymakers reason that the complex problem of improving teaching and learning might be better addressed by leveraging formerly isolated resources and knowledge, and channeling those resources toward teacher quality improvement, student learning advancement, and organizational transformation.

In their requests for proposals, the NSF and US ED grant review criteria call for rigorous evaluation of partnership effects. In our role as evaluators of an MSP, we believe that a first step in evaluating partnerships, their interventions, and outcomes is defining what partnerships are and are not. Doing so also enables evaluators to determine if, in fact, NSF and US ED grantees accomplished funded work; what roles, if any, partnerships played in achieving desired ends; and, ultimately, if the NSF and US ED theory of action has merit. Previously, numerous evaluation studies have examined the effects of partnership-developed interventions, but only a few have associated intervention results with partnerships between K-12 and higher education institutions.[4] To determine the value of partnerships for improving teaching, learning, and educational institutions, evaluators must make firm links between partnerships, interventions, and outcomes. The resultant models, we believe, can help practitioners construct more effective partnerships and successful interventions.

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[1] Clark, 1988; Edelen-Smith, 2002; Essex, 2001; Goodlad, 1988, 1991; Robinson, 2005; Smedley, 2001;

[2] NSF stipulates that MSPs must address five features, including a focus on partnership, data-based decision making, teacher workforce development, enhanced university and K-12 coursework, and organizational change. Specifically, the MSP call for proposals identifies the involvement of science, technology, engineering, and mathematics (STEM) faculty and graduate students as necessary because (a) STEM higher educators have sophisticated understandings of content that, research suggests, K-12 teachers lack and need to undertake reform-oriented instruction and (b) STEM higher educators are positioned to model excellent teaching in foundation courses for pre-service teachers.

[3] The US ED Teacher Quality Enhancement Grants include (a) state grants, (b) partnership grants, and (c) teacher recruitment grants. Partnership grants provide funding to teacher preparation institutions, schools of arts and sciences, and local school districts in high-need areas for improvement of teacher education program accountability, pre-service teacher content knowledge; pre-service teacher acclimatization, teacher use of technology, and teacher work with diverse populations.

[4] Kingsley & O'Neil, 2004; Smedley, 2001; Clifford, 2007.

In this paper, we argue that partnership, as a construct, needs further definition to distinguish it from other forms of organization and inter-organizational relationships. Having identified this problem through literature review, we put forth the following definition, which is synthesized from available literature.

> *A K-20 partnership is an organization (i.e., a social entity in which people routinely engage together in tasks) that is formed through a formalized agreement among partners, comprising at least one actively-engaged college/university and one actively-engaged K-12 school district and intended to accomplish mutual benefits that the partners, alone, could not accomplish.*

We then test our definition through a single case, which serves as a proof of concept study. Our conclusion discusses the adequacy and sufficiency of our definition and reports on next steps in our work.

1.0 Context of Our Work

The National Science Foundation Math and Science Partnership project that we are evaluating is called the System-wide Change for All Learners and Educators (SCALE) project. SCALE has been funded from the beginning of 2003 through the end of 2007.[5] SCALE aims to significantly improve mathematics and science teaching and learning in four urban areas by simultaneously bringing about organizational changes in participating school districts and IHEs. The NSF made the award to the University of Wisconsin-Madison (UW-Madison), and UW-Madison issues subcontracts to the other partnership organizations. The participating K-12 districts are the Los Angeles Unified School District (LAUSD), Denver Public Schools, Madison Metropolitan School District, and Providence Public School District. Participating IHEs are the University of Wisconsin-Madison, California State University at Dominguez Hills and California State University at Northridge. The University of Pittsburgh, with its Institute for Learning (IFL), was a SCALE partner until late 2006.

3.0 Methods

Defining precisely what is to be studied is central to evaluators' and researchers' work. Bounding phenomena to be studied enables researchers and evaluators to discern the unit of focus, ask precise questions, employ appropriate methods, and set study limitations. Seeking to evaluate a K-20 partnership led us to review available research literature, and we found further definition was necessary.

Researchers and evaluators use multiple methods to define constructs. Generally speaking, these methods involve synthesis of the global/general perspective through literature review or Delphi study. Then, definitions are tested and refined by taking the local/particular perspective into account, which often involves observing the phenomena in the field. Definitions are finalized after several iterations of testing and refinement, once the researchers/evaluators feel confident that the definition adequately describes the phenomenon and enables others to distinguish the phenomenon from other like

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[5] Information on SCALE can be found at: http://scalemsp.wceruw.org.

phenomena in the field. To us, Geertz's phrase, "continuous dialectical tacking," adroitly describes this general method (1983).

In this paper, we describe the first iteration of continuous dialectical tacking. We report findings from a literature review that identifies problems with the ways researchers define "K-20 partnership." We then draw upon the reviewed and other literature to create an initial definition, and test that definition by making observations on a single case of a working group that, expert nominees believed, is an excellent example of K-20 partnership.

3.1 The Global Perspective: Literature review methods and a partnership definition
Literature reviews and Delphi studies can be used to survey expert opinions on a given topic. Previous studies of K-20 partnership have used each method to identify salient variables in partnership formation and productivity[6] and describe variations in partnership definition apparent in the field.[7]

We chose to conduct a literature review to describe how evaluators and researchers were using the term *K-20 partnership* and to synthesize a definition from the research literature. The literature review also serves to situate the following: How is our partnership defined? (2) Why and how do partnerships form? (3) What factors in partnership are associated with success/failure? (4) What outcomes have been associated with partnership activity? and (5) What inquiry methods have been used to study partnership? The first question is salient to our discussion here.

The literature review sampling method led to a review of often-cited, rigorous research on K-20 partnerships published in the past 10 years, and influential studies from other fields. We began with an initial scan of recent empirical studies located in juried educational journals via keyword search of three on-line databases and Google Scholar. [8] The scan produced over 10,000 hits, indicating that the literature base on K-20 partnerships or related terms is quite large.[9] We then narrowed the search by considering (a) the number citations of the article, which is an indicator of importance in the field, and (b) methodological rigor and transparency in the article, which is a necessary criterion for answering our research questions. Although we started with a focus on K-20 partnerships because of our work with MSPs, we recognized early on the multi-disciplinary nature of the research base on partnerships, and included significant studies from business and healthcare research as well. At present, our queriable EndNote database is populated by 77 abstracts, 58 of which focus on K-20 partnerships.

After identifying literature that met our criteria, Clifford (2007) conducted a conceptual analysis to answer the literature review questions. The conceptual analysis identified five patterns (discussed below) in the way researchers defined partnership. As a result of the

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[6] Clark (1988), Essex (2001), and Smedley (2004) used literature review for this purpose.

[7] Kingsley and Waschak (2004) used Delphi study for this purpose.

[8] Jstor, Ingenta, ERIC were used.

[9] While we have attempted to be thorough, we acknowledge that the review is not comprehensive. A more comprehensive review would require more time and resources than currently available.

review, we identified the need to further define K-20 partnership for ourselves. We then synthesized a definition of "K-20 partnership" by drawing upon reviewed and additional literature from organizational analysis, leadership, education, healthcare, and business fields.

3.2 The Local Perspective: Proof of concept via case study

Proof of concept studies test and elaborate upon researchers' initial understanding of terms and theories. Our proof of concept study uses case methods as a means of testing our emergent K-20 partnership definition, which is an appropriate use of the method.[10] The proof of concept research study question is:

> *Research Question: How well does the observed phenomenon, a working group that expert nominees consider to be a "successful K-20 partnership," align with our proposed definition?*

The research question requires us to determine if the identified working group, which expert nominees consider to be a "K-20 partnership," exhibits characteristics that we associate with that term. Thus, a sub-question is: Is the identified group a K-20 partnership, as we define it? Reciprocally, we want to know if our definition adequately and sufficiently describes partnership by making general observations in the field. Thus a second sub-question is: If the given case is of K-20 partnership, then what, if any, changes to our definition need to be made to accommodate our field observations?

In our proof of concept study, we use case methods to answer the research question. Case methods are prevalent in organizational and inter-organizational research because they allow researchers to attend to the multiple data streams necessary to characterize complex systems within or between organizations. Case study was appropriate for our purpose because it enabled us to get a detailed look at formal and informal social processes within a partnership over one year's time. The following describes our procedures and further describes our rationale.

3.21 Case selection

We selected a case that afforded a good opportunity to view a K-20 partnership, as we defined it, because we wanted to test our definition. Yin (1994) recommends researchers select cases that provide good opportunities to build, and potentially elaborate upon, emergent constructs or theories. Once our partnership definition appears to represent best cases, counter-factual cases can be selected to test whether our partnership definition has adequate power to discern K-20 partnership from other types of organizations or groups.

Our case was selected from the SCALE MSP. SCALE is a large, loosely coupled entity organized into nearly 100 "working groups," which we define as multiple people joined together to accomplish some task or take part in some organized collective action. We reasoned that some of the SCALE working groups would be examples of K-20 partnership, and some would not. The selected case was:

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[10] Yin, 1994; Eisenhardt, 1989.

1. Recommended by knowledgeable SCALE practitioners as a good example of "K-20 partnership," however they defined that term;
2. Involved in teacher professional development, because teacher professional development is a common instructional leadership and was identified by the NSF MSP as a core K-20 partnership purpose;
3. Deemed to be "successful" by outcomes measures obtained by independent studies because, given current NSF and US ED policies, the field values studies of successful partnerships; and
4. Mature (the group was in its second iteration of offering teacher professional development) since this would allow us to observe routines and norms, which are two indicators of formal organization.

3.22 Case design
A case study can employ multiple methods to build and test theory about a bounded phenomenon. We used interview, observation, and document review to explore participant motivations, participant perspective variation on goals and outcomes, and formal/informal work processes.

Semi-structured interviews were used to answer sub-questions #1 and #2. Semi-structured interviews enable researchers to explore the breadth of participant perspectives with a common experience and allow respondents to present context-sensitive factors in their own terms, while providing study focus. We chose semi-structured interviews because we needed data to identify and describe the variability of inputs and outcomes, as they are perceived by the working group participants, and we anticipated respondents would provide a wide range of responses that may make complex connections between themselves, their K-12 or IHE institutions, and the SCALE working group.

Document review, observations, and interviews were used to answer sub-questions #3 and #4 via task analysis. Task analyses describe (a) the work and experiences of members of a single role group (e.g. IHE faculty, K-12 teachers) or (b) how people work systematically to complete complex tasks in their organizations. Task analyses tend to describe what tasks are completed, how tasks are completed, and who completed the tasks. Previous task analyses findings suggest people engage in many tasks, some of which are reflected in their official job descriptions, and tap into official/formal and unofficial/informal organizational practices to accomplish those tasks.[11] For our task analysis, we used document review to gather data on official/formal working group operations and participation, and interview and observation to gather data on unofficial/informal working group operations and participation. In our task analysis, we created task categories such as "leading" or "design work" and describes how tasks are accomplished by individuals in the group over time.

To summarize this section on case methods, Chart 1 (below) lists our research questions, and for each question presents the relevant group phase, data gathering method used, and sample sizes.

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[11] See Brown & Duguid, 2002; Halverson & Clifford, 2006 as examples.

Chart 1: Case questions, method and sample

Sub-question	Data-gathering method	Sample from presented case
Q1. What motivates people and their organizations to engage in cross-organizational work?	Interview	13 interviews (approximately half of group participants)
Q2. What learning or other benefits, if any, are realized?	Interview	Interviews
Q3. What tasks do people engage in to complete their work?	Observation, document review, interview	Document review; 8 audio-recorded, observed meetings spanning 46 hours of group work; interviews
Q4. How is work distributed across people and organizations?	Observation, document review, interview	Document review; 8 audio-recorded, observed meetings spanning 46 hours of group work; interviews

4.0 The Global View: Patterns in the ways that researchers define partnership

Here we present findings from our literature review that directly pertain to how K-20 partnerships are defined. We conclude that researchers address partnership in four ways: (1) they do not define partnership, (2) they define partnership as an organization populated by members of two or more organizations, (3) they define partnership by contrasting it with other types of inter-organizational relations, or (4) they provide observable and measurable definitions but do not specify sufficient conditions or indicators of partnership. We also conclude that a more precise definition is needed to support evaluation studies. To that end, we then present and explain a definition of K-20 partnership that we believe will support more effective evaluation and research on partnerships.

4.1 Pattern 1: Researchers do not define partnership
Approximately 40% of reviewed educational articles use the term "partnership," but do not define it. The following quotes typify this group:

> This article will provide an overview of the school/university partnership that provided the context for the study and present findings from our study of beginning teachers' classroom research projects. (Davis & Higdon, 2005, p. 101)

> The GUIE partnership stakeholders consist of the Gear Up grant receiving university, five middle schools selected from within the university catchment area, and the high schools that the middle school students ultimately attend. Additional stakeholders include the communities that each of these schools are located within, as well as the families that comprise communities. (Mayers & Schnorr, 2003, p. 108)

Each of the studies reports outcomes that the researchers attribute to a partnership. Without a definition of partnership, however, it remains unclear whether these outcomes

can be attributed to partnership, or to some other factor in the social environment under consideration.

4.2 Pattern 2: Defining partnership by describing its member organizations

The second pattern in the literature is to define partnership as an organization comprised of members from two or more organizations.[12] We view this approach as problematic because the definition of "organization" and "membership" remain ambiguous. Without specifying what "organization" means, evaluators can view "partnership" as encompassing such a broad range of relationships that the term loses its value.[13] For example, some researchers consider partnership to be a formalized entity with legal standing,[14] while others view partnership as a loosely-coupled network of individuals who, upon occasion, interact in dyads, but not as a single group.[15] Given that researchers underspecify "organization," other evaluators and researchers will be challenged to determine if a gathering of people is or is not a partnership.

Similarly, the meaning of "membership" is ambiguous. Because membership denotes affiliation with a group, and group recognition of that affiliation, it can encompass a very wide range of relationships. For example, public K-12 schools have service agreements for vending machines, referral procedures with other government agencies, and contracts with curriculum publishers. Each, it could be argued, acts as a "member" in assisting the school to accomplish its work; however it is unclear whether these relationships constitute a partnership.

4.3 Pattern 3: Definition by association

The third pattern in the literature is to define partnership by associating it with other forms of inter-organizational relations, each of which is under-defined. For example:

> In this article, we present glimpses of partnership nested within a network of schools that have chosen to work closely with Miami University. (Badiali & Flora, 2000, p. 146)

> Higher education consortia are forming K-12 partnerships and alliances that are linking with individual public schools and their school systems. (Druckman & Peterson, 2002, p. 11)

In these examples, Badiali & Flora and Druckman & Peterson define partnership by contrasting it with network and consortia. Druckman & Peterson also liken partnership to alliance. However, these authors do not specifically define these terms. Other authors used the term "partnership" interchangeably with joint venture, network, consortium, collaborative, and alliance. The business and healthcare literature also include contractual

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[12] Essex, 2001

[13] Podnoly (1998).

[14] Kochan (2000) view the Saturn automobile company as a "partnership" between management and a labor organization; Lang & Gordon (1995) consider large law firms to be partnerships; and Robinson & Darling-Hammond (2005) consider professional development schools to be partnerships between teacher education programs and K-12 districts.

[15] Podonoly & Page, 1998; Vangen, 2003; Edelen-Smith & Smith, 2002.

agreements and outsourcing arrangements, law firms, and administration-union contracts under the partnership umbrella.

4.4 Pattern 4: Good definitions without specific indicators identified
A minority of studies articulate observable and measurable features that define partnership, or employ a definition *a priori* in investigating partnership outcomes. Our review suggests that when observable and measurable partnership features are provided, authors do not quantify or articulate partnership features adequately to allow researchers to determine with certainty if particular phenomenon is a partnership. In other words, observable and measurable indicators of partnership are not identified by even the best definitions.

Pattern four is best exemplified by the following two quotations. Goodlad's (1988, 1991) definition is the most-often cited a priori definition found in our literature review:

> A school-university partnership represents a planned effort to establish a formal, mutually beneficial inter-institutional relationship characterized by the following:
> * Sufficient dissimilarity among institutions to warrant the effort of seeking complementarity in the fulfillment of some functions.
> * Sufficient overlap in some functions to make clearly apparent the potential benefits of collaboration.
> * Sufficient commitment to the effective fulfillment of these overlapping functions to warrant the inevitable loss of some present control and authority on the part of the institution currently claiming dominant interest. (Goodlad, 1991, p. 59)

While Goodlad (1991) says a sufficient amount of dissimilarity, overlap, and commitment are necessary in a school-university partnership, he does not specify what he means by "sufficient," nor does he say whether all three characteristics are necessary. Similarly Catelli, Padovano, & Costello (2000) define an "authentic partnership" between schools and universities:

> Whether the relationship is symbiotic or organic, what is clear is that in authentic partnership, as opposed to other types of joint ventures, the school and university do act as equal partners. They agree at the outset to work side by side on preselected matters pertaining to schooling and teacher education—often sharing physical resources, monies, personnel and administrative decisions either immediately or in later phases of their partnership relationship. More specifically, their ultimate goals are to institutionalize the partnership in their respective settings, create an inter-institutional structure that will permit change and improvement to occur at both levels, and strive toward a new seamless system of education. Formal contracts or letters of understanding forecasting their intent and outlining the *terms of the initial phases are characteristic of these partnerships.* (emphasis in original, p. 227).

From our perspective, Good, Catelli et al, and eight additional articles provide very helpful definitions of partnership, and identify the criteria for successful partnership.

They do not, however, specify in observable and measurable terms the sufficient amount, or acceptable range, of the criteria in a "partnership." Articulating minimum sufficiency can help evaluators, practitioners, and policymakers determine if partnerships exist and the varieties of partnership associated with effective outcomes and conditions.

In this section, we have identified four patterns for defining partnership in the educational literature. Based on our review of the literature, we conclude that a good deal of ambiguity exists about the definition of K-20 partnership. Without a more precise definition, we believe evaluators will be challenged to determine the value of partnership for improving organizational change and vitality, teaching improvement, and student learning. We believe, as do other researchers, that K-20 partnerships hold great potential for learning, change, and improvement for participating actors and their organizations. However, without a good definition, educational researchers will be challenged to explain why partnerships form, what they do, and what outcomes are attributable to the partnership.

5.0 Toward a Partnership Definition that Supports Evaluation and Research

Our literature review of theoretical and empirical work identified four patterns, primarily from organizational studies. Each pattern is problematic for researchers/evaluators. Thus, to move our work forward we created a definition of partnership, which we stated at the outset, and deem to more adequately serve our purposes:

> *A K-20 partnership is an organization (i.e., a social entity in which people routinely engage together in tasks) that is formed through a formalized agreement among partners, comprising at least one actively-engaged college/university and one actively-engaged K-12 school district and is intended to accomplish mutual benefits that the partners, alone, could not accomplish.*

Here we unpack this definition.

A partnership is an organization (i.e., a social entity in which people routinely engage together in tasks)...
The first phrase defines partnership as a type of organization, and differentiates it from simple financial exchanges, non-routine interactions and other social relationships. [16] Organizational analysis has produced multiple definitions of the term. We take the perspective that the term "organization" represents a set of social relations and routines that facilitate work in exchange for rewards to attain goals. [17] As such, we expect that the following indicators of "organization" should apply to K-20 partnership:

- Goals are shared goals among participants[18]; and
- Routines are established paths of interpersonal interaction that persist over time, are how organizations work to achieve their goals, and are frequently developed through trial and error. [19]

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[16] Gulati & Singh, 1998.
[17] Yanow, 2002; DiMaggio & Powell, 1991; Podolny & Page, 1998; Lang & Gordon, 2002
[18] March & Simon, 1958.
[19] Hutchins, 1995; Giddens, 1984.

Researchers seeking to establish that a group is a K-20 partnership would need to show, minimally, that people within the group interact routinely to complete tasks. By "routinely" we mean researchers must show that group members complete at least two cycles of an explicit, formalized work procedure. Researchers would also need to minimally show that group members share at least one of the goals to be addressed by the work at hand.

… that is formed through a formalized agreement among partners, comprising at least one actively-engaged college/university and one actively-engaged K-12 school district … The second phrase of the definition identifies partnership members as "firms" (e.g., colleges, universities, K-12 school districts), describes their relationship as established through a formal agreement, and specifies the nature of their interaction as "actively engaged." Our decision to include these criteria is explained below.

We require that K-20 partnerships include at least two members and that these members represent two types of organizations—K-12 school districts and colleges/universities—that organizational theorists define as "firms." A "firm" is a type of organization that has legal standing and public recognition, and where people interact to achieve tasks and goals within a set of socio-technical systems.[20] Thus, partnerships involve cross-organizational work, and co-mingling of the constituent of the firms' work systems.

We include this criterion in our definition to differentiate K-20 partnerships from intra-organizational relations, which are formal or informal relationships among sub-divisions within a firm. For example, a university department's agreement to work with another university department, or the agreement between engineers and line employees are examples of intra-organizational relations. These intra-organizational relationships may be examples of partnerships, but not of K-20 partnerships.

Requiring that the members of K-20 partnerships are organizations, rather than individuals, differentiates partnerships from other forms of inter-organizational relations among K-12 and higher education organizations. Our literature review identified two studies[21] that defined partnership as two or more individuals from K-12 and higher education institutions who work collaboratively. Given that, in recent years, social network and other forms of analyses have shown organizations, including K-12 and higher education, to be interconnected through supply chains, social relations, and other formal and informal relationships, we find these authors' definition of partnership too broad; for them, partnerships could be, potentially, as ubiquitous as meetings. To us, K-20 partnerships must entail formalized arrangements between member organizations, such that the partner organizations commit to supporting the work undertaken by those individuals in their organization who actually participate in the partnership. Thus, an inter-organizational interaction between two individuals (e.g., one professor and one K-12 educator) from different organizations would be a "partnership" if each person participated on the basis of commitment from their home organization, but would only be a "relationship" in the absence of organizational commitment.

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[20] Kochan, 2000; Holmstrom & Roberts, 1998.
[21] See Briscoe, 2002; Holmund Tanner, 2005.

Lastly, our definition sets active engagement among K-12 and college/university members as a criterion. By active engagement, we mean that human, financial, and material resources from partnering organizations must be employed in jointly-enacted work intended to achieve partnership goals. We included active engagement as a criterion to differentiate the inter-organizational relationships in partnership from "paper participation," which involves a commitment without actual participation. Although we believe a partnership involves active engagement by its partnering organizations, we note that each partner's level of resources and engagement need not be equal.[22]

In sum, the second phrase of our definition differentiates partnerships from "firms" and less formal inter-organizational relations. Researchers and evaluators seeking to establish that a particular inter-organizational relationship constitutes a K-20 partnership should be able to demonstrate that this group (a) was formed through a formal agreement that was signed by upper echelon leaders of K-12 districts and colleges/universities (e.g., college dean, provost) and dedicates organizational resources to cross-organizational work, and (b) actively engages resources and representatives from K-12 and higher education institutions in work intended to achieve partnership goals.

....and is intended to achieve mutual benefits...
The third phrase of our partnership definition focuses on intended mutual benefits and, by implication, the motivation to form partnerships. "Benefit" may include financial gain, knowledge advancement, improved reputation, development and provision of goods and services, and organizational/professional learning and change. Our literature review suggests that K-20 partnerships are often formed to develop and maintain professional development schools,[23] curriculum,[24] in-service professional development,[25] research[26] and student recruitment/retention programming.[27] In business, partnership participation frequently has been associated with organizational vitality[28] and increased competitiveness.[29] The NSF MSP program emphasizes that partnerships can change K-12 and higher education practices and systems, and can improve instructional quality and student achievement.

Although we note that partnerships are intended to provide mutual benefits, mutuality does not mean equality. While all partners do some work, and receive some benefit, partners need not do so equally.[30]

Researchers employing our definition to determine if a given group is a K-20 partnership would need to show, minimally, that all K-12 and college/university participants state that they anticipate that their organizations receive some benefit, as defined broadly

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[22] Farrell & Scotchmer, 1988.
[23] Robinson & Darling-Hammond, 2005.
[24] Radinsky et al, 2001; Holmund Tanner, 2005.
[25] Grundy & Robison, 2001; Waddle & Conway, 2005; Epanchin & Colucci, 2002; Mariage & Garmon, 2003; Townsend & Boca, 2003; Firestone & Fisler, 2002; Marlow & Nass-Fukai, 2000; Briscoe & Prayaga, 2002; Carlone & Webb, 2005; Gomez, et al, 2000.
[26] Waddle & Conway, 2005.
[27] Mayers & Schnorr, 2003.
[28] Lang, 1995.
[29] Amaldoss & Meyer, 2000.
[30] Farrell, 1988; Klijn, 1996.

above. For NSF MSP programs, benefits statements should include improved organizational practices, instructional quality, and, ultimately, student learning.

… that the partners, working alone, could not accomplish.
The fourth phrase in our definition focuses on interdependence among partners. We have already stated that partnerships involve some cross-organizational engagement in work to achieve some mutual benefits. Should the partners view themselves capable of achieving these ends by themselves, they would not form partnerships, but rather remain self-sufficient. Though the amount of interdependence may vary, partnerships must involve at least one person from each partner organization in some form of joint work. Partnership analyses suggest considerable variation in how work flows within partnerships. For example, people in partnering organizations may work semi-autonomously and competitively, cooperatively, or collaboratively.[31] Researchers seeking to establish that a given group is a K-20 partnership would also need to show that members from K-12 school district and college/university institutions complete tasks through joint work.

In sum, we have defined K-20 partnership as an inter-organizational relationship that is different from a "firm" in that it is constituted by multiple firms. We have also differentiated partnerships from simple exchange relationships between firms by stating that partnerships, themselves, are organizations. Finally, we said that for a group to be considered a partnership, it must have a formalized agreement among, active engagement by, and shared goals, routines, and interdependency among, the participating organizations.

6.0 The Local View: Testing the Definition in the Field

As we indicated above, our literature review pointed to a need to further define partnership, which led to our initial definition. With definition in hand, we ventured into the field to test how well our definition describes a group that we were already studying since it meets our criteria for case selection and because SCALE informants and others consider it a good example of "partnership." The case describes the motivation, tasks, work distribution, and benefits of the Los Angeles-area Middle School Science Immersion Group (LAMSIG) as it existed in 2005-2006.[32] We first describe the circumstances leading to the formation of LAMIG, and then present the case in four sections, each of which considers whether LAMSIG meets the four criteria stated in our definition of a K-20 partnership.

To provide some background on our case, the purpose of LAMSIG is to provide in-service teacher professional development in support of improved middle school science teaching in the Los Angeles Unified School District (LAUSD), the second largest district

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[31] Gulati & Singh, 1998; Uzzi, 1997.

[32] The name, "Los Angeles Middle School Immersion Group," is a researcher-assigned name. LAMSIG leaders stated that the group name actually used by participants shifted over time, with changes in the group membership and main tasks, and also varied by partner organization. The leaders observed that they encouraged the use of different names for the group as a strategy to encourage group ownership. Although known by different names, by 2006 group membership was generally stable. Leaders reviewing this text viewed "Los Angeles Middle School Immersion Group" as, in many ways, more descriptive of group activities.

in the United States. LAMSIG is a programmatic outgrowth of collaboration among some SCALE partners (UW-Madison, LAUSD, California State University, Dominguez Hills, and California State University, Northridge) and some partners of the Quality Educator Development (QED) project (CSUDH, LAUSD, and UW-Madison). QED is a US Department of Education-funded Teacher Quality Improvement grant administered by CSUDH.

In the fall of 2003, as SCALE was beginning, a team of district leaders and academics articulated a concept of science teaching and learning called "immersion." Immersion is a type of inquiry-based science instruction that is informed by research, national science teaching standards, and national curricula. Immersion: (a) engages all students in an inquiry process of asking questions and providing evidence-based explanations; (b) encourages teachers to guide, rather than dictate, learning; (c) provides time and support for students' active development of deep understanding of core science concepts as outlined by the National Science Education Standards; and (d) provides opportunities for students to make connections among key concepts and between classroom learning and places outside school where learning may be applied. SCALE leaders coined the term to break from past reform efforts, and to build consensus around a vision of rigorous teaching.

The timing for immersion science development was opportune in LAUSD. California standards and testing policies were being scaled up to address science, LAUSD had just begun a curriculum revision/selection cycle, and district-level science administration had been restructured to provide greater oversight and support for elementary and secondary science. LAUSD administrators were reworking policy to support national science and state standards, but like many districts, LAUSD supported a diverse science curriculum representing different approaches to science teaching. Informed by recent research and the Institute for Learning (IFL), LAUSD administrators sought to increase instructional coherence in science without ostracizing teachers or losing teachers' flexibility to address diverse student learning needs/interests. Immersion offered LAUSD a new, possibly unifying, term for reform-oriented science education that could be accepted by various factions within the district.

As part of its curriculum revision effort, LAUSD began developing science instructional guides, which suggest a scope and sequence of standards-aligned activities, as a method for developing coherence. Grade 4 through 8 instructional guides were released in 2003. At the same time, LAUSD administrators recognized the need for teacher professional development and curriculum unit exemplars as a means of ensuring that the instructional guides would be used in a way that would support reform-oriented science teaching. With regard to teacher professional development, the district viewed both in- and pre-service emphases as important, given the level of teacher attrition.

However, LAUSD lacked the capacity to provide the needed in-service teacher professional development and on-going support for teachers using immersion science teaching. Like many large districts, multiple organizations, including the CSUs, provided in-service teacher professional development programming. According to LAUSD administrator interviewees, professional development programming often did not align with LAUSD standards, curricula, and guidelines. In addition, the professional

development programming was not sustained and supported over time. Because SCALE, as a project, includes regional IHEs, its leaders saw an opportunity; they could offer the K-12 district partner, LAUSD, opportunities to align and improve the in-service teacher education services that regional IHEs already were providing, and, possibly, bring pre-service teacher education into alignment with LAUSD policies as well.

In early 2004, UW-Madison and LAUSD staff sought to identify curriculum units that would be examples of immersion from commercial or NSF-funded materials because the LAUSD timeline for instructional guide rollout for physical, life, and earth sciences in grades 4 through 7 was only 3 months. The expectation was that, once curriculum samples were identified, LAUSD and another SCALE partner, the IFL, would provide teacher professional development to introduce and support immersion. Unfortunately, UW-Madison staff could not locate ready-made units that met the criteria for immersion or that could be supported financially or politically by local administrators. As one LAUSD administrator commented: "If you just develop or locate something and hand it to the district, then they [district people] say, 'Well, this doesn't suit our needs.' So then you must involve the district people along the way… We benefit from getting a unit developed, you know, tailor-made to our situation." That is, an immersion unit must not only meet criteria for reform-oriented instruction and state/national standards, but also be relatively inexpensive and leverage existing curricula and laboratory equipment. Further, local teacher leaders and administrators had to be sufficiently knowledgeable about the unit and the pedagogy it represented in order to provide high quality teacher professional development.

In January 2005, SCALE leaders sought a new direction: They would write tailored immersion units that would supplant existing units. To do so, SCALE and the newly-funded Quality Educator Development (QED) grant (a TQE award) formed a workgroup called the Los Angeles Middle School Immersion Group (LAMSIG). LAMSIG included LAUSD, California State University-Dominguez Hills (CSUDH) and the University of Wisconsin-Madison (UW-Madison). Upper echelon administrators at each of these institutions chose to be involved in QED and SCALE. Additionally, LAMSIG included science faculty members from CSU-Northridge (CSUN).

6.1 Testing the definition: Evidence of LAMSIG status as an organization, as indicated by shared goals
We defined a K-20 partnership as an organization that is formed by at least one K-12 and at least one IHE. One way to differentiate organizations from mere groups is by the shared goals of their members.[33] Data from official documents, observations of the procedure for creating these documents, and interview data all suggest that LAMSIG members, considered in terms of role groups, share some, but certainly not all, goals.

In 2006, LAMSIG leaders created the following graphic to represent its goals (located at the bottom of the graphic), objectives, and tasks. The graphic was reviewed by all LAMSIG members prior to its use in publications and presentations.
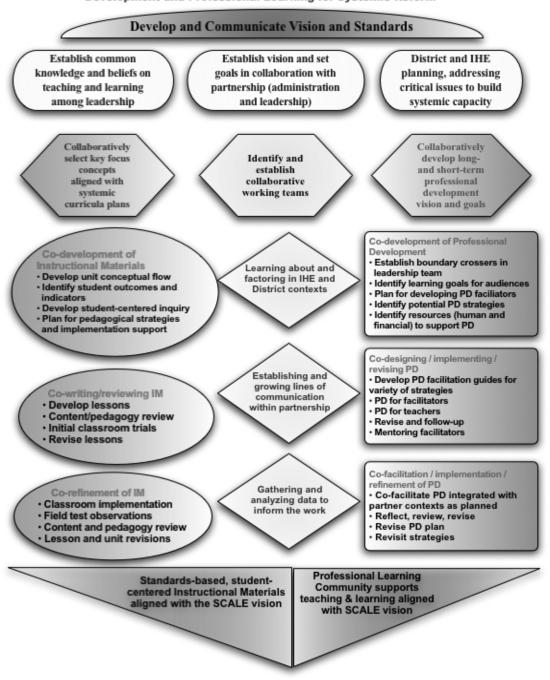
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[33] Fisher & Duncan Fisher, 1997.

Chart 2: LAMSIG members' representation of their scope of work

The SCALE Immersion Model for Collaborative Instructional Materials
Development and Professional Learning for Systemic Reform

Develop and Communicate Vision and Standards

Establish common knowledge and beliefs on teaching and learning among leadership

Establish vision and set goals in collaboration with partnership (administration and leadership)

District and IHE planning, addressing critical issues to build systemic capacity

Collaboratively select key focus concepts aligned with systemic curricula plans

Identify and establish collaborative working teams

Collaboratively develop long- and short-term professional development vision and goals

Co-development of Instructional Materials
• Develop unit conceptual flow
• Identify student outcomes and indicators
• Develop student-centered inquiry
• Plan for pedagogical strategies and implementation support

Learning about and factoring in IHE and District contexts

Co-development of Professional Development
• Establish boundary crossers in leadership team
• Identify learning goals for audiences
• Plan for developing PD faciliators
• Identify potential PD strategies
• Identify resources (human and financial) to support PD

Co-writing/reviewing IM
• Develop lessons
• Content/pedagogy review
• Initial classroom trials
• Revise lessons

Establishing and growing lines of communication within partnership

Co-designing / implementing / revising PD
• Develop PD facilitation guides for variety of strategies
• PD for facilitators
• PD for teachers
• Revise and follow-up
• Mentoring facilitators

Co-refinement of IM
• Classroom implementation
• Field test observations
• Content and pedagogy review
• Lesson and unit revisions

Gathering and analyzing data to inform the work

Co-facilitation / implementation / refinement of PD
• Co-facilitate PD integrated with partner contexts as planned
• Reflect, review, revise
• Revise PD plan
• Revisit strategies

Standards-based, student-centered Instructional Materials aligned with the SCALE vision

Professional Learning Community supports teaching & learning aligned with SCALE vision

While Chart 2 officially represents LAMSIG goals, and LAMSIG member approval indicates that the goals are shared, our interview protocol also asked members to discuss their goals for participation. Chart 3 displays the goals mentioned by people in different role groups. Interview data (n=15) indicate that people in the different role groups mentioned 10 goals, 3 of which were shared across role groups.

Chart 3: Goals mentioned by LAMSIG interviewees by organizational role group

	Goal	K12 teacher	K12 administrator	CSU faculty	UW-Madison faculty & staff
1	Learn about science inquiry & immersion	X			X
2	Build ownership/accountability for initiative		X		X
3	Build partnership				X
4	Develop professional developers/leaders		X		X
5	Increase student learning	X	X	X	X
6	Increase K-12 instructional quality	X	X	X	X
7	Develop immersion unit examples	X	X	X	X
8	Improving teaching through encouraging teacher use of immersion		X		X
9	Send consistent message about district policy		X		
10	Improve leadership capacity		X		X

In Chart 3, an "X" means that all members of the interviewed constituent group mentioned this goal. Application of this criterion to data representation may suggest to readers that little variation within roles groups was observed, but we found roles groups were not uniform. Our analysis thus far has not identified variations in the ways LAMSIG members understood these goals, or why the goals were important. However, in light of prior research on school and university perspectives on partnership and collaboration, we are confident that notable differences existed.[34]

The finding suggests that LAMSIG meets one minimal criterion for "K-20 partnership," according to our definition: LAMSIG members shared at least one goal. These findings on shared goals raise several questions about sufficiency that would be helpful to address:

- In the LAMSIG case, shared goals were associated with core, official group operations, but would a group be considered a partnership if shared goals are not associated with the official or intended charge?
- If different role groups interpret apparently shared goals differently, how much difference can be tolerated before the goals cannot be judged as actually shared?

6.2 Testing the Definition: Evidence of LAMSIG membership and active engagement

According to our definition, if LAMSIG is to be considered a K-20 partnership, it must be formed through a formalized agreement between at least one actively-engaged college/university and one actively-engaged K-12 school district. Our observation and

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[34] Bullough & Kauchak, 1997; Carlone & Webb, 2005; Davis & Feldman, 2003; Radinsky et al, 2001.

interview data suggests LAMSIG met these criteria for a K-20 partnership. We cite as evidence the SCALE/QED proposals, which were officially supported by the participating institutions' leaders, LAMSIG funding patterns, and member participation in LAMSIG activities.

LAMSIG formation occurred through formalized agreement among participating institutions. As discussed above, SCALE and QED are each grant-funded projects convened through formalized agreements among upper-level leaders in LAUSD, CSUDH, UW-Madison, the Institute for Learning, and other participating institutions. LAMSIG formation drew upon SCALE and QED staff time and funding, and these funding decisions were recommended by leadership committees comprised of participating institutions' upper administrators and approved by the respective principal investigators. Additionally, the participating organizations negotiated intellectual property rights and use agreements of LAMSIG-produced immersion units that represent an additional type of agreement.

As further evidence of organizational support, LAMSIG staff time and materials were paid for by additional grant funding that could have been dedicated to other operations. For example, the LAUSD secondary science director viewed LAMSIG as aligned with LAUSD's California MSP grant, and drew upon that and other funding to open staff lines for science specialists and teacher leaders who would participate in LAMSIG.

> *We pulled in the components of standard instruction into the process, which is [SCALE] Goal One, in looking at the supports in the system to accomplish a rigorous instructional program with high expectations that's effort-based.… [and] the pre/in-service component, that was drawn right into it because when QED was formed, you know, that brought up the support for LA, in terms of capacity. Then all of the other factors related to that goal all of a sudden fell into place. What are the two [regional] universities doing with their pre-service teachers? How can we integrate this work into what we're doing in those classrooms so that—and the California MSP, we're all very connected, in that sense.* [LAUSD administrator]

As the quote shows, the LAUSD administrator pulled together different funding streams to capitalize upon possible synergies between programs, to focus resources to achieve reforms, and to present a coherent approach to science instruction and reform.

While formalized K-12 and IHE institutional commitment is a necessary component for K-20 partnership, our definition also requires different organizational representatives to be actively engaged in cross-organizational work. Our document review and observational data indicate that LAMSIG was comprised of members of different organizations. Our criteria for membership were participation in group activities and a sense of belonging to the group. In everyday usage, membership is commonly determined by reviewing official documents, such as budgets or meeting agendas, but these documents may be inaccurate because individuals listed in these documents may never actually participate. To avoid this problem, we reviewed LAMSIG official roles and other documents, and observed meetings and email traffic. To qualify as a participating member of LAMSIG, an individual not only had to be included on LAMSIG member

rolls (a recognition by the group of individual membership), but also had to routinely participate in virtual or face-to-face meetings. Chart 4 presents LAMSIG group membership by role group during the 2005-2006 academic year.

Chart 4: LAMSIG participation by number of people in organizational role groups

Organization	Role within organization	Number participating in LAMSIG
LAUSD	Teacher leaders	6
	Sub-district science specialists	9
	Central office science administrators	3
UW-Madison	Academic staff (includes SCALE science immersion team and administration)	5
	STEM Professors (the SCALE PI)	.5
	Administrators (the SCALE PI)	.5
CSUs	STEM Professors	8
	Education Professors	5
	Administrators	1
Consultants	WestED	2
	IFL	1

As Chart 4 shows, the data indicate that both K-12 and IHE members from partnering institutions actively participated in, and were publicly recognized as members of, LAMSIG.

6.3 Testing the Definition: Evidence of LAMSIG interdependency and routine

According to our definition, K-20 partnerships involve some interdependency among participating organizations (e.g., CSUDH, LAUSD, CSUN, UW-Madison), which means that partnerships accomplish goals that the partnering organizations, working alone, could not accomplish. We also said that K-20 partnerships are organizations, and defined organization as a social entity where people routinely engage in tasks together.

To test for interdependency and routine, we conducted a task analysis. Although task analyses are commonly used to describe the tasks of individuals occupying the same role group in the same or similar organizations, we modified this technique to assess how individuals with different roles from different organizations contribute to task accomplishment.[35] Our task analysis (1) identifies tasks and tasks sequences that LAMISG completes, (2) describes how often task cycles are completed, to determine if the work is routine, and (3) describes who connects to whom, and how, during task completion, to ascertain interdependence among members from different home organizations. We drew on official documents (i.e., meeting agendas and procedures documents), meeting observations, and interviews to ascertain how work flow occurred within the group, and if the work was routine.

Implicitly embedded in the goals stated in Charts 2 and 3 (above) are three major tasks and sub-tasks undertaken by the LAMSIG:

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[35] For discussion, see Spillane & Camburn, 2006, and Halverson & Clifford, 2007.

1. Leadership and management, that involved selecting and supporting LAMSIG members, coordinating partner organization initiatives and resources, setting agendas, managing workflow, developing grants, and planning;
2. Instructional materials development, that involved researching, writing, reviewing, pilot testing, and revising immersion units;
3. In-service professional development design that involved designing events, training event facilitators, and recruiting teachers.

Chart 2 represents these tasks as intertwined and co-dependent: leadership, instructional materials development, and professional development design all needed to occur simultaneously in order for LAMSIG to achieve its goals. In actuality, leadership tasks and instructional materials design and revision required relatively continuous activity, while professional development design began and ended in 8 months' time.

We followed LAMSIG, both as a whole and through its sub-divisions, as it worked to complete these three major tasks during the 2005-2006 academic year. A synopsis of our analysis follows.

6.3.1 Were the tasks routine?
By definition, routines are established paths of interpersonal interaction that persist over time, and serve as a method for organizations to achieve their goals.[36] Routines represent collective understanding of how goals can be achieved in context, are developed through trial and error, and represent collective and ongoing learning about how work can be most effectively accomplished.[37] In more mature organizations, routines are typically codified in procedures that are enacted by members' work, but routines can also exist in organizations without codified procedures. Ascertaining if partnerships have established routines presents a challenge to researchers because tasks may be integrated into the normal workplace activities of partnership members, thus blurring the line between work specific to the partnership and work specific to participating organizations.

At the point of data collection, some LAMSIG operations had matured to the point where tasks had been arrayed and partially codified into routines, and a second iteration of tasks was underway. In particular, LAMSIG members had codified instructional materials design and professional development design tasks into published procedures, and LAMSIG was in its second iteration of enactment. LAMSIG members worked to represent and explain their procedures to non-LAMSIG groups. In particular, in 2005-06, in response to the addition of new LAMSIG members and decisions to increase the number of immersion units to be developed and professional development institutes to be offered, LAMSIG leaders revised their group procedures. These were adaptations of procedures that LAMSIG members had employed previously and in different contexts.

To illustrate our points, we discuss implementation of the collaborative instructional materials design procedure. LAMSIG's collaborative instructional materials (i.e., immersion units) development process were first formulated by the UW-Madison SCALE science immersion team, and then approved and supported by the CSU and

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[36] March & Simon, 1958.
[37] Hutchins, 1995; Giddens, 1984.

LAUSD leaders within the LAMSIG leadership sub-group. Progress through the steps in the collaborative instructional materials development process (listed in the left hand column in Chart 2, above) is tracked and reported by a UW-Madison science immersion team member. Each immersion unit is designed by a sub-group of LAMSIG that has expertise in the content area, which is called the Immersion Unit Advisory Team (IUAT).[38] Each immersion unit design cycle takes approximately 5 months to complete.

Thus far, the design procedure has been used in two of three middle school unit designs: Plate Tectonics (6th grade) and Density & Bouyancy (8th grade). The third unit, Variation and Natural Selection (7th grade), was not co-developed, written, or refined collaboratively due, primarily, to time restrictions. Instead, SCALE science immersion team members wrote this unit, and K12 administrators and IHE faculty IUAT members reviewed and commented on the unit. In light of the short timelines for the 6th and 8th grade units, the LAMSIG team found that use of the collaborative design process pressed them (particularly the SCALE science immersion team members who facilitated the process) to the limits of their capacity.

In contrast to the instructional materials design and professional development design tasks, leadership tasks appeared to be only partially routinized. A sub-group of LAMSIG, which included LAUSD and CSUDH upper administrators and the principal investigators from SCALE and QED, took on LAMSIG leadership tasks (e.g., recruitment of members, decision-making, agenda setting, event planning). The LAMSIG leadership sub-group followed a set meeting agenda, but the tasks of member recruitment, event coordination, and member support processes continued to challenge the group. No established division of labor or procedure emerged with regard to these tasks. The members of this sub-group often spent their meeting time (re)negotiating work parameters, responsibilities, timelines, and group decision-making processes.

Our analysis of LAMSIG operations suggests that the group has established some routines, and that the routines are continuing to evolve as the group adds members and situations change. Clearly, LAMSIG views its three main tasks, and their corresponding routines, as the scope of the group's work, as they represent that work in Chart 2. The three routines fit together. Leadership routines run parallel with and support the routines used to complete instructional materials and professional development design tasks. During the first iteration, the instructional materials and professional development design routines are sequential, because professional development designs are informed by the instructional materials, although in 2005-2006, these routines overlapped.

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[38] The instructional materials design procedure was borrowed from Biological Science Curriculum Studies (BSCS), a non-profit corporation that develops and supports science textbooks and other curricula. The UW-Madison science immersion team modified the BSCS process to engage LAMSIG members in the writing/revision process and to teach them about collaborative curriculum development. LAMSIG members have shared the instructional materials design procedures with the LAUSD elementary science team and other content-area teams. In addition, LAMSIG members made several presentations about their collective instructional materials and professional development design work at national conferences. The UW-Madison science immersion team has since informed BSCS of these modifications, and BSCS has integrated the modifications into the collaborative design process that they use.

6.3.2 Were the participating organizations interdependent? Tasks are often completed by multiple people in organizations, and task routines are translated to a division of labor. A division of labor creates interdependent relationships among workers or firms that are attempting to complete tasks and achieve goals.[39] Firms, such as K-12 and IHE institutions, have their own procedures and division of labor, and are able to act semi-autonomously to complete tasks "in-house." In partnerships, according to our definition, K-12 and IHEs combine personnel, financial and other resources to complete tasks that, working alone, they could not complete. In other words, the partnering organizations agree, when acting in partnership, to work interdependently to achieve tasks. If LAMSIG is a partnership, we should see evidence of a cross-organizational division of labor.

Organizational research provides us with a taxonomy for describing divisions of labor. Chart 5 displays interdependent divisions of labor derived from organizational research, and uses sports metaphors to help explain the terms. We sought evidence of these working relationships in LAMSIG's completions of its three tasks: leading, designing professional development, and development of instructional materials.

Chart 5: Types of Organizational Interdependency[40]

Interdependency Type	Definition
Pooled	Each person and/or firm contributes complementary work performed simultaneously, as in a rowing team.
Sequential	Each person and/or firm independently completes a discrete task, and the tasks are serially arrayed to complete the product/service, as in a relay race squad.
Parallel	Each person and/or firm works independently through an entire process, and the combined results constitute the desired outcome, as in Ryder Cup team play in golf.
Competitive	Each person and/or firm works independently and competitively to more efficiently produce a more effective product, process, or service, as in a boxing match. The results are intended to make all competitors better, and outcomes may or may not be shared.

Our analysis suggests that all of the LAMSIG tasks were undertaken via cross-organizational division of labor, thus providing evidence of interdependency and thus more evidence that LAMSIG is a K-20 partnership. Our analysis of how LAMSIG completed its tasks provides an on-the-ground look at a potential partnership's division of labor (see Chart 6). Combined with our analysis of membership (above), our analysis of interdependency indicates that LAMSIG conducted cross-organizational work that brought human, knowledge, political, and financial resources to bear on instructional materials and professional development design. Our analysis of interdependency also shows that LAMSIG is a dynamic organization in that the division of labor was organized

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[39] Engstrom, 2000.

[40] Thompson (1967) categorized interdependencies within organizations. Gulati & Gargiulo (1999) and Clark (1988) applied Thompson's and other's work to partnerships. We added a fourth category, "competitive," to reflect research, mainly from the software development field, on how competing firms work together to create innovative products and procedures.

according to task. Moreover, our task analysis indicates that in the case of leadership and instructional materials development, LAMSIG used multiple interdependent divisions of labor to complete the task. The analysis also points to a division of labor that we call "facilitated," meaning that one or more partnership members are responsible for linking other members through a process.

Chart 6: LAMSIG Interdependency

Task	Interdependency Type
Leading	*Pooled* for coordination of LAMSIG operations *Parallel* for leaders' efforts to change their own organizations to support K12 –IHE partnership
Instructional materials design	*Parallel* for LAMSIG instructional materials development *Pooled* or *sequential* for content and pedagogy design
Professional development design	*Pooled* for decision-making about professional development design *Parallel* for unit-specific institute design

To explain how we made these judgments, we provide the following case example. By design, the LAMSIG collaborative instructional materials design procedure begins when LAUSD administrators and UW-Madison science immersion team members pool their knowledge about standards, policy, and curriculum design to identify possible areas for improved curriculum units through informal analysis of LAUSD textbooks and instructional guides. Once identified, another group, called an Immersion Unit Advisory Team (IUAT), is convened from the LAMSIG group. Each IUAT is comprised of at least one K-12 teacher, STEM faculty member, K-12 sub-district science administrator, and UW-Madison immersion science team member. IUAT members work together in both face-to-face and virtual meeting spaces to negotiate common language, key issues, and immersion unit design. LAMSIG IUATs ranged in size from 7 to 12 members. Within each IUAT, a UW-Madison science immersion team member introduces other team members to instructional design methods and materials (e.g., mapping a conceptual flow, using design templates), thereby linking members in a process that facilitates instructional materials design. While all members helped, the UW-Madison team member is primarily responsible for producing the immersion unit, while other members are responsible for reviewing and critiquing it. This facilitated design process thus allows IUAT members to question and negotiate the content and pedagogy integrated into their immersion unit.

While each IUAT pooled cross-organizational resources to design immersion units, LAMSIG's division of labor during instructional materials design is best described as parallel. While instructional materials design tasks were underway, three separate but coordinated IUATs operated within LAMSIG. Each IUAT worked independently and asynchronistically through similar processes toward the common goal of developing one science immersion unit per K-12 school year. As with any designed procedure, situations often dictate variation in actual use. As noted above, LAMSIG used the intended collaborative design procedure for two of three middle school unit designs (Plate Tectonics for 6th grade, and Density & Bouyancy for 8th grade), but not for the third (Variation and Natural Selection for 7th grade). Due to time restrictions, this third unit

was written entirely by SCALE science immersion team members, and reviewed and critiqued by K12 administrators and IHE faculty members in the IUAT. Despite this variation in process, each IUAT was characterized by division of labor, and exhibited both pooled and sequential interdependency.

Our case found evidence of LAMSIG routine and interdependency, which suggests that according to our definition LAMSIG is a partnership. The case also raises questions about the sufficiency of our definition.

- We observed that LAMSIG twice enacted formalized leadership, instructional materials design, and professional development design procedures. Is a single iteration an adequate indicator that a routine has been established?
- The case suggests that LAMSIG represents a departure from previous IHE and K-12 relationships in the region, but our data collection occurred within a year of LAMSIG formation. Do we have adequate evidence that cross-organizational work has become routine?
- We note that LAMSIG's divisions of labor were differently configured according to task, but our partnership definition does not take partnership flexibility or dynamism into account. Should it?

6.4 Testing the Definition: Evidence of mutuality of LAMSIG benefits

Our definition of K-20 partnerships also highlights the importance of mutual benefit, meaning that participating organizations, and their representatives, receive something of worth as a result of partnership activity. While the term "partnership" frequently connotes equal sharing of benefits, observation of partnerships indicates that not all partners view partnership participation as equally beneficial.[41] Partners may receive different types of benefits from participation, may weight these benefits quite differently, and may receive different proportions of benefits based on participation or risk.

To determine if LAMSIG provided mutual benefits, and if so, to determine how equal the benefits were, we turned to interviewee responses to questions pertaining to benefits, such as (a) why they persisted in LAMSIG, and (b) what they learned, if anything, from participation, and how they learned it. Responses to these questions resulted in statements like the following:

> *Then, there is the real mundane thing, which is I want to keep the [science field] department healthy, and to do that I need people who are going to get into college and do well. Unless we have good teaching happening in seventh, eighth, and ninth grade, we're not going to have them.* [STEM faculty member]

Interview data analysis resulted in identification of (a) the types of benefits realized, (b) who received which type of benefit, and (c) from whom or what the interviewee received the benefit. In the examples above, the LAUSD sub-district administrator receive tailored curriculum units from the entire LAMSIG group, and the STEM faculty member believed he would receive better quality students, eventually, as a result of teachers' use of immersion units. Chart 7 (below) displays results from our analysis.

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[41] Gulati & Gargiulo, 1999; Kingsley & Waschak, 2004; Smedley, 2001.

Chart 7: Benefits mentioned by LAMSIG interviewees

Who received	What received	From whom/what
K-12 teachers	Legitimacy & power	K-12 administrators, group participation
	Instructional moves & tools	UW-Madison science immersion team, K-12 teacher colleagues
	Knowledge of available resources	STEM faculty
	Content knowledge	STEM faculty
	High quality curriculum units	Group participation
K-12 administrators	Knowledge of available resources	K-12 teachers, STEM faculty
	Insights on teacher experiences	K-12 teachers
	National perspective on instructional change	UW science immersion team
	How to design & conduct high quality teacher pd	UW science immersion team
	Assistance in sending a coherent message about district instructional policies	UW science immersion team
	Resources & strategies for instructional change	K-12 administrator colleagues
	Content knowledge	STEM faculty
	Improved teacher quality through IHE change	STEM faculty
	Deepened understanding of science inquiry	Group participation
	High quality curriculum units	Group participation
STEM faculty	Knowledge of K12 teaching and administration	K-12 teachers, K-12 administrators
	Knowledge of how to motivate students	K-12 teachers
	National perspective on instructional change	UW-Madison science immersion team
	Knowledge of available resources	STEM faculty colleagues
	Knowledge about how people learn science	Group participation
	High quality curriculum units	Group participation
	Better quality students, eventually	Group participation
UW-Madison science immersion team	Access and knowledge to test ideas	Group participation
	Vehicle for sustaining change effort beyond SCALE	Group participation
	Feedback on ideas, materials	Group participation
	Knowledge of district systems	Group participation

Chart 7 suggests LAMSIG participation resulted in mutual benefit because individuals from each of the represented organizations received some knowledge, political capital, and materials that could be used in their work in their home institution. The benefits were received both from colleagues in other organizations or from role group colleagues (i.e., teacher to teacher, faculty to faculty) with whom they reported having limited opportunities to interact within their organization. Additional data collection and analysis would be needed to learn how different groups weighted these benefits, the degree to which specific benefits were associated with different LAMSIG interventions, or if these benefits resulted in changes in practice in the participants' home organizations.

7.0 Conclusions

The National Science Foundation and the US Department of Education are currently placing an emphasis on K-20 partnerships in an effort to hasten the pace of instructional quality improvements and organizational change in K-12 districts and institutions of higher education. Evaluators and researchers are currently engaged in ascertaining effects, if any, of partnerships and their interventions in terms of student achievement, teacher quality, and organizational change. This paper raises questions about our ability to associate important changes with partnership, given the ambiguity of the term that is evident from our literature review.

In an effort to more effectively undertake our evaluation study of the SCALE project, we sought to diminish this ambiguity by, among other things, distinguishing "K-20 partnership" from other forms of social interactions among K-12 districts and IHEs. We therefore formulated a partnership definition and tested it against a case of "successful K-20 partnership." Our definition of partnership is:

> *A K-20 partnership is an organization (i.e., a social entity in which people routinely engage together in tasks) that is formed through a formalized agreement among partners, comprising at least one actively-engaged college/university and one actively-engaged K-12 school district and is intended to accomplish mutual benefits that the partners, alone, could not accomplish.*

In unpacking this definition, we identified the presence of shared goals, formal agreements, active cross-organizational membership, cross-organizational and interdependent work routines, and mutual benefits as essential attributes of "K-20 partnerships." To us, all of the above features must be present in order for a group to be considered a K-20 partnership.

Our case-based proof of concept study focused on a SCALE working group that expert nominees consider to be a good example of "K-20 partnership" and for which we have some independent measures of "success." Results from the proof of concept study suggest that our definition is adequate, in that all identified criteria were found to be present and we did not find other features at work that were not addressed by the criteria. Analysis of interviews, observation, and document review data indicate that the Los Angeles-area Middle School Science Immersion Group (LAMSIG) members included people representing a K-12 district and three IHEs, that these people used routines to

jointly carry out agreed-upon tasks, and achieved results that benefited all the participants and their home organizations.

The case raises questions about the sufficiency of our K-20 partnership definition, however. Specifically, we note that LAMSIG routines, division of labor, goals, and benefits changed during the course of data collection, and with shifts in the group's tasks. According to its members, LAMSIG emerged and evolved over time. We also observe differences in the number of shared goals, mutual benefits, and iterations of LAMSIG's curriculum design protocol. While LAMSIG met minimal criteria for K-20 partnership, we believe LAMSIG could be functioning above a basic level.

While we provide a definition of K-20 partnership, we do not provide a taxonomy that describes, in observable and measurable language, variations in characteristics above the most basic level. A taxonomy may be useful to practitioners who seek to design K-20 partnerships that will effectively influence present organizational or regional educational situations. Such research would be particularly useful when identified characteristics can be associated with effective outcomes such as organizational, teacher quality, or student learning improvements.

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