

## **Organizational Mapping: The form and function of a K-20 partnership for improvement of mathematics and science teaching**

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**Note: The diagrams on pages 5 and 7 require color in order to be interpreted as intended.**

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# **Organizational Mapping: The form and function of a K-20 partnership for improvement of mathematics and science teaching**

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## **1.0 Introduction**

If, in the past half century, there is a constant in public education, it is the effort to improve instruction. At least four lines of educational research have emerged to explain the relative success of instructional change efforts. The first focuses on local factors, that is, the personnel<sup>1</sup> or organizational features<sup>2</sup> that mediate policy messages. The second turns toward the state, suggesting that the pluralistic nature of the public education sector in the U.S. engenders conditions that make instructional change problematic.<sup>3</sup> A third, emergent line pursues cognitive disjunctions in the ways that policy makers and executors understand the problems and policy signals that naturally complicate the change equation (Spillane, Reimer, Reiser, 2002).

These three perspectives have added considerably to our understanding of instructional change, but each examines change as though the space between statehouse and schoolhouse is empty. Rowan (2001), Apple (1993) and others have made visible how multiple organizations inhabit an “instructional change industry” that mediates<sup>4</sup> policy, instruction, and curriculum in schools. Members of the instructional change industry conduct research, develop instructional materials, consult with leaders, provide funding, and train personnel. “Understanding how these organizations are structured and function, and how they interact with schools and governing agencies should help round out our knowledge about school change processes in American schools—including why schools experience wave after wave of innovation and reform while at the same time maintaining a stable core of instructional activities” (Rowan, 2001, p.2). Alternatively, examining the structures and functions of organizations in the instructional change industry may also provide insights on how and why instructional changes, both large and small, are developed and sustained. Drawing on this fourth line of inquiry, we are seeking to shed light on the structures and functions of K-12 and university partnerships (hereafter K-20 partnerships).

A “partnership” may go by many names: alliance, collaborative, coalition, joint venture, and network all appear prominently in research literature and have similar definitions. Partnerships form through an agreement among people or organizations to address issues or opportunities that alone cannot be addressed, and partnerships may end when one or

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<sup>1</sup> See McLaughlin & Talbert (1994), and Cohen & Hill (2000) as examples.

<sup>2</sup> See Newmann and associates (1996) as examples.

<sup>3</sup> See Rowan’s (2001) discussion.

<sup>4</sup> Wertsch (1993, 1997) uses the term “mediation” to describe how artifacts work in social contexts by supporting, constraining, and changing knowledge and behavior. We use the term as Wertsch uses it, and we anticipate future work will explore how instructional change organizations act as mediational means.

more partners cease to see them as useful (Hardy et al, 2000; Halliday et al, 2004).

Commonly, partnerships are formed by organizations to:

- share risks or costs associated with technology or knowledge production (Lang & Gordon, 1995; Dutta & Weiss, 1997);
- distribute knowledge or materials (Lang & Gordon, 1995; Gulati & Singh, 1998);
- increase efficiency or hasten response (Gulati & Singh, 1998); and
- foster organizational adaptation or rejuvenation (Dutta & Weiss, 1997).

Organizational research has documented the form and function of partnerships in business, law, health, and non-profit sectors.<sup>5</sup> Fewer studies have examined how and why educational partnerships are structured to influence teaching and learning (Kingsley and O'Neil, 2004).

In public education, governmental agencies have, through policy or procedure, turned to partnerships as a means of encouraging change. Working from the premise that inter-organizational exchange can catalyze resources necessary for teaching and learning improvement, federal and state governments have used funding policies and procedures to foster various types of partnerships. Launched in 2003, the National Science Foundation's Math and Science Partnerships (MSPs) encourage K-20 partnerships to improve student performance in mathematics and sciences. The National Science Foundation requires MSPs to conduct organizational analyses, and has separately funded several research, evaluation, and technical assistance (RETA) projects to examine partnerships.<sup>6</sup>

Our work takes one MSP, the System-wide Change for All Learners and Educators (SCALE) partnership, as its focus.<sup>7</sup> SCALE is the only K-20 MSP that aims to improve all students' performance in mathematics *and* science in four large, urban school districts distributed across four time zones in the United States. To accomplish this goal, SCALE is guided by a theory of action. Stated in its broadest terms, this theory of action is that, through processes of co-construction among leaders and experts from the various partner organizations, SCALE catalyzes local, regional, and national resources to build K-20 capacity for improved mathematics and science learning. From a district standpoint, the theory of action is that SCALE actors, working through multiple points of access to district policy and practice, create multi-dimensional change in instructional guidance that produces improved instruction and instructional support in schools (Clune, 2005).

SCALE is a five-year project, and thus it provides us with an excellent opportunity to examine partnerships as they develop. SCALE's proposal writers included a longitudinal organizational analysis study with formative and summative components as part of the partnership's research and evaluation plan. Our research asks the following broad questions about the SCALE partnership:

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<sup>5</sup> The term "sector" is used to denote an area of the economy where multiple organizations work to provide services and goods to society (DiMaggio and Powell, 1991).

<sup>6</sup> MSP and RETA information can be found at [www.ed.gov/rschstat/research/progs/mathscience/descriptions/nsf\\_msp.doc](http://www.ed.gov/rschstat/research/progs/mathscience/descriptions/nsf_msp.doc).

<sup>7</sup> SCALE information can be found at [www.wcer.wisc.edu/scalemsp](http://www.wcer.wisc.edu/scalemsp).

1. Why do particular structures, functions, and people come to work within the SCALE partnership?
2. How do leaders organize people and tools to accomplish partnership goals, as stated in the formal initiating documents?

This paper particularly addresses the second research question by describing how the partnership, as an organization, has been positioned to meet its goals.<sup>8</sup> In describing the structures, functions, and people actively engaged in SCALE, we introduce “organizational mapping” as a method of census-taking, which provides a partial representation and understanding of the partnership.

## 2.0 Methodology

Theorists define the term “organization” multiple ways. For the purposes of our study we draw upon the socio-cultural tradition in organizational research and define an organization as a network of people and resources acting together to accomplish tasks. A social and material network leaves open the possibility that an organization is not bound to brick, mortar, or place, but may extend, shift, and even learn over time (Wenger, 2000). Metaphorically, we view the network of individuals and materials that constitute an organization as an organism that is both enhanced and hampered by its ecology (Morgan, 1986). In this case, we use organizational research methods to understand how and why people do and do not act collectively to accomplish tasks and goals, and use evaluation research methods to identify areas of improvement.

Our questions seek to describe and understand the SCALE partnership as an organization. We thus initially turned to organizational charts as a tool to document and represent organizational structures, individuals’ relationships to them, and development over time. As research tools, charts have strengths and limitations: they are good at representing formal relationships between workers and sub-units within organizations, but are less effective in describing informal and dynamic relationships or extra-organizational relationships that are important in organizational functioning and knowledge distribution (Krackhardt & Hanson, 1993; Aldrich, 1976).

Cognizant of their limitations, we planned to produce and analyze a SCALE organizational chart each year. Using common practices, we synthesized organizational charts from interview, document, and observational data. Interview data became very important in understanding why the partnership was configured as it was and in developing our methodology. After initial attempts (in September 2003 and April 2004), and drawing heavily on our interview data, we became increasingly aware of the limitations of organizational charts. For various reasons, key features of the SCALE partnership’s dynamic structure simply could not be represented with this mapping tool.

First, although SCALE, as with many partnerships (Hardy et al, 2000), has line staff and an official chain of command, our initial data pointed toward informal relationships and

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<sup>8</sup> Here, we use the past tense because data for this report was collected in April, 2004.

interactions as important to understanding organizational functions. As Kingsley and O’Neil (2004) observed, many partnerships are built upon previous, trusting relationships among principal parties. In SCALE, we immediately noted that well-connected principal parties were tapping pre-existing networks of expertise to address SCALE’s comprehensive goals. These salient, yet often opaque, inherited informal hierarchies operated in conjunction with SCALE’s formal structure. We were unable to represent these relationships with organizational charts. Further, partnership start-up and growth occurred quickly, resulting in dramatic changes in partner responsibilities during the early months. Because organizational charts have no way to indicate change over time, these elements of the partnership could not be represented. That is, to effectively represent the partnership, we needed ways to present its informal, pre-existing, and dynamic relationships.

Second, in many cases, SCALE became part of pre-existing reform initiatives, and their corresponding social structures, within the partner (or “local”) organizations. For example, in three partner districts, a teacher professional development initiative positioned in the central administration “became SCALE” because the goals of the initiative and of SCALE were aligned, and because SCALE resources were used to sustain and extend the initiative. In other cases, the partnership launched improvement efforts within partner organizations. Whether new or pre-existing, SCALE’s organizational structures were also located within one or more of the partnering organizations. We realized the need to represent SCALE from two and sometimes three standpoints—as an organization unto itself and as located within partner organizations. Organizational charts, which are designed to provide a single view of an organization, did not allow us to represent this feature of the partnership’s ecology.

Finally, SCALE personnel roles challenged the utility of organizational charts. Few SCALE participants work solely for the partnership; most continue to work in their local organizations. Many participants simultaneously were engaged in multiple SCALE roles at different levels of the partnership hierarchy. Further, some SCALE members work in organizations that are not official partners of SCALE. Organizational charts can show one person’s multiple roles, but the number of roles and organizations made representation of organizational complexity through organizational charts challenging.

In short, our need to be able to represent the informal, pre-existing, rapidly changing, and co-location of partnership personnel and sub-structures was not met by organizational charts. We therefore concluded that answering our research questions required us to elaborate on traditional organizational charts. We offer the following somewhat lengthy description of what we call “organizational maps” as a means of describing the methods used to produce the findings presented in Section 3, and also as a potential tool for others studying partnerships.

## 2.1 Organizational maps and cartography

Like charts, maps can be a means of representing social groups. Generally, though maps, offer greater representation latitude than other forms of social representation. Maps can be intentionally dynamic, encompass apparent and hidden structures and group relations, represent perspectives on a subjective reality, and lead users to (re)construct realities and representations (Harley, 1996). Our efforts to describe the partnership prompted changes to our methods and development of “organizational maps.”

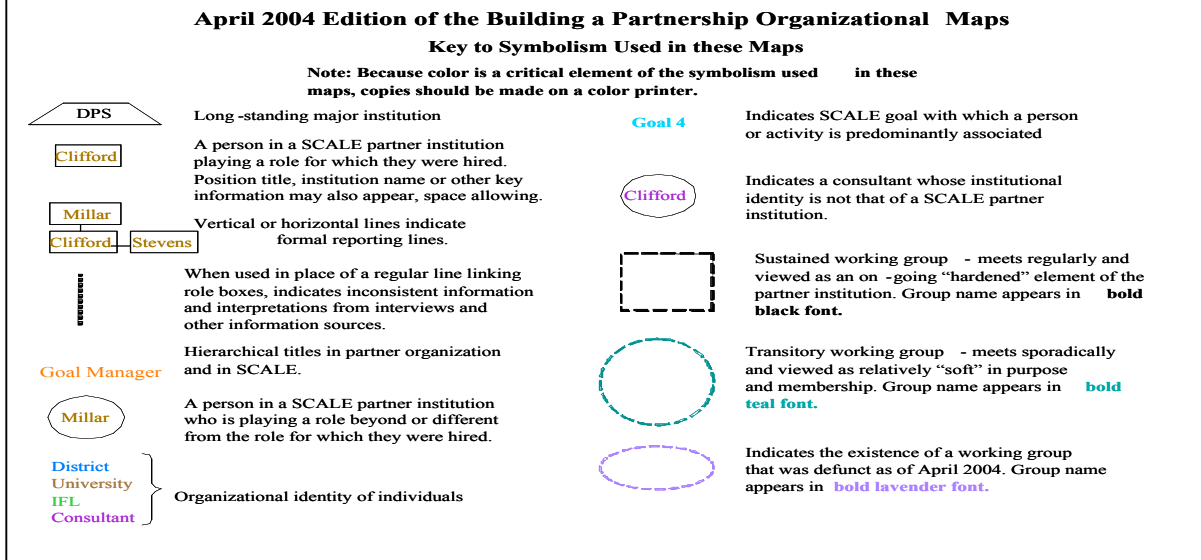
Interviews, documents, and observational data are the sources of data used to build both organizational maps and organizational charts. However, the data gathering methods differ in the details of interview process, and member checking. Drawing upon document and observation data, we drafted initial organizational charts. We then gathered substantially more mapping data during our first round of interviews (in March and April 2004) with a sample of 68 individual SCALE participants. Each of these interviewees was “actively engaged” in partnership activities that Rowan (2001) associates with the instructional change industry: producing materials, designing activities, conducting research, allocating resources, or re-engineering district operations. During semi-structured interviews, we used our draft maps as instruments for eliciting data and redesigning maps. Pens in hand, our interviewees redrew the maps to be more inclusive and in the process, discussed their partnership experiences. Then, we reconciled individual interviewee maps with an emerging collective map, highlighting conflicting reports or differences in interpretation. Member checks sought and provided further clarification on the maps.

In creating organizational maps, we strove to build upon the strengths of organizational charts while also addressing their apparent limitations for representing important features of the partnership’s situation. We have produced one iteration of the maps, and plan a second iteration in June, 2005. Diagram 1 shows icons and features included on the maps.

As Diagram 1 and our explanations below indicate, these organizational maps extend organizational charts to make visible:

- partnership structure located within various partner organizations, by creating maps from perspectives of the partnership as a whole and local partner perspectives;
- the formal and informal nature of groups and individual participation through map symbols;
- the fluid, temporal nature of the partnership structure through the sustained, transitory, and defunct working group symbols; and
- multiple individual and group roles in SCALE and local organizations by allowing for individuals to occupy many places on the maps.

Diagram 1: Organizational map legend



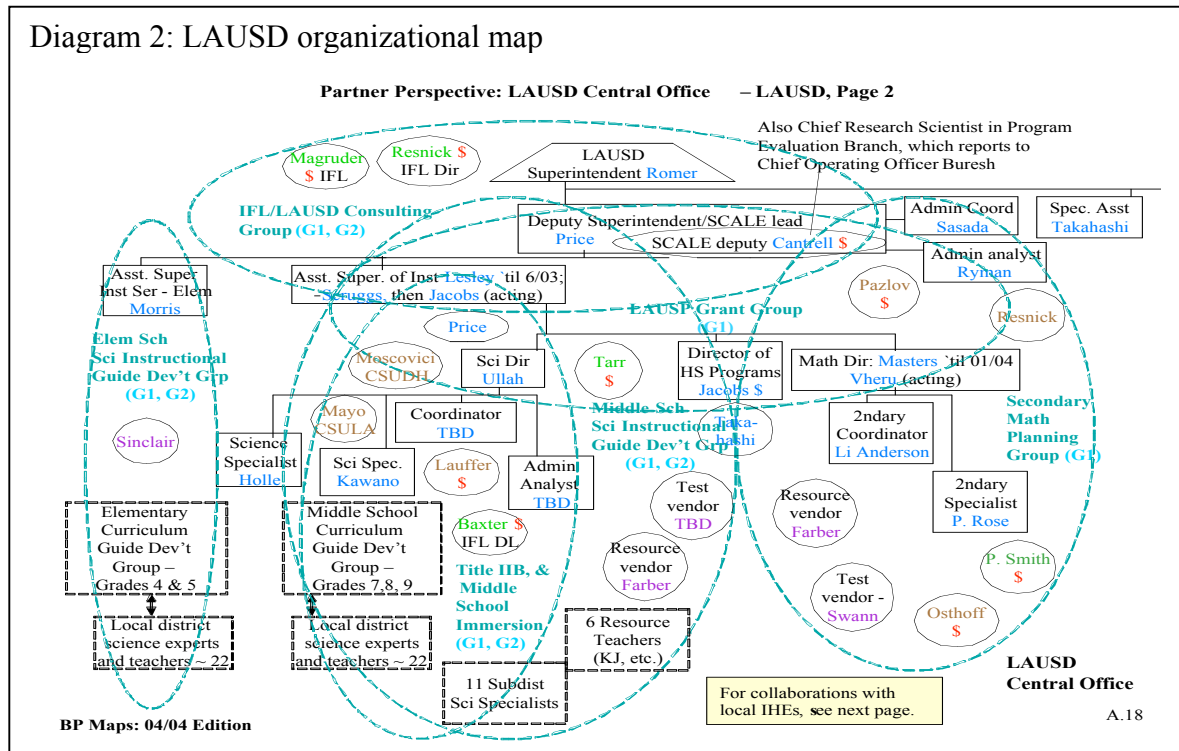
## 2.2 Reading and Analyzing Organizational Maps

As a means of explaining our method, we describe aspects of a portion of the Los Angeles Unified School District (LAUSD), and a portion of the “immersion units” (SCALE Goal 2)<sup>9</sup> organizational maps. Diagram 2 focuses on SCALE activities in LAUSD’s curriculum & instruction administrative offices, showing where and with whom partnership activities occur. Diagram 3 depicts the structures and working groups managed by the SCALE Goal 2 manager. We chose these maps to present our mapping methods because several features of these maps are relevant to our findings.

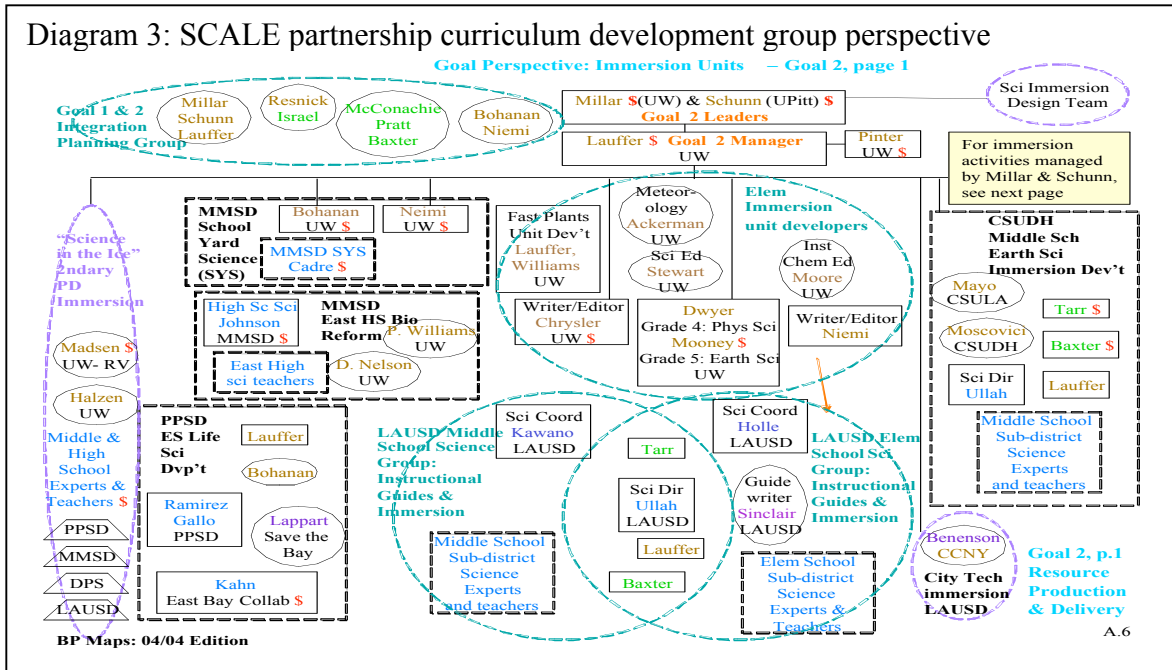
First, Diagram 2 represents SCALE from the district perspective, meaning that it shows how partnership activities are located within LAUSD’s administrative infrastructure. By contrast, Diagram 3 represents SCALE from the partnership perspective, showing how organizational structures and individuals are organized around SCALE administrative operations. For example, a group working on Middle School Science Instructional Guides appears on both maps. Placing this working group on both maps was necessary to (a) represent how SCALE goal-focused activities play out in districts and (b) provide a map useful to all SCALE participants, including those with limited knowledge or interest in central partnership administrative operations or conceptions. (Note that, when counting the total number of working groups in the partnership, groups that appear on more than one map, such as the Middle School Science Instructional Guides group, are counted only once.)

<sup>9</sup> SCALE administration is presently organized and recognized by operations associated with its goals. Goal 2 seeks to develop “immersion” units in science for use in every grade in every SCALE district. An immersion unit is a designed learning opportunity in which students are engaged in the scientific process over an extended period of time (4 weeks), focusing intensely on a particular concept or big idea in the content area, and aligned with state standards.

Second, the LAUSD map (Diagram 2) shows the role of integrative, often informal, working groups in SCALE. By “integrative,” we mean that working group activities bring people with vertical (or line responsibility), horizontal (cross-organizational level), or no formal relationships together to accomplish work. For example, the Middle School Science Instructional Guides group includes LAUSD administrators in formal vertical LAUSD relationships (deputy superintendent Price, acting assistant superintendent







Jacobs, science director Ullah, science specialist Kawano), and horizontal line relations (science director, and director of high school programs). The Middle School Science Instructional Guides working group also includes SCALE personnel from other partners (i.e., Moscovici from CSUDH, Mayo from CSUN, Lauffer from UW, Baxter from IFL, Tarr from IFL), and non-SCALE personnel (test vendor TBD and resource vendor Farber). Thus, the map shows that this working group brings together people from seven organizations. By cross-walking this map to partner-focused maps, it also is possible to learn about the various professional roles held by at least some of the members of this working group. The LAUSD map shows that Price, for example, is an upper-level district administrator, the UW map shows that Lauffer is academic staff, and so forth. While our maps show these relationships and attributes, they do not characterize the nature or relative productivity of individual relationships.

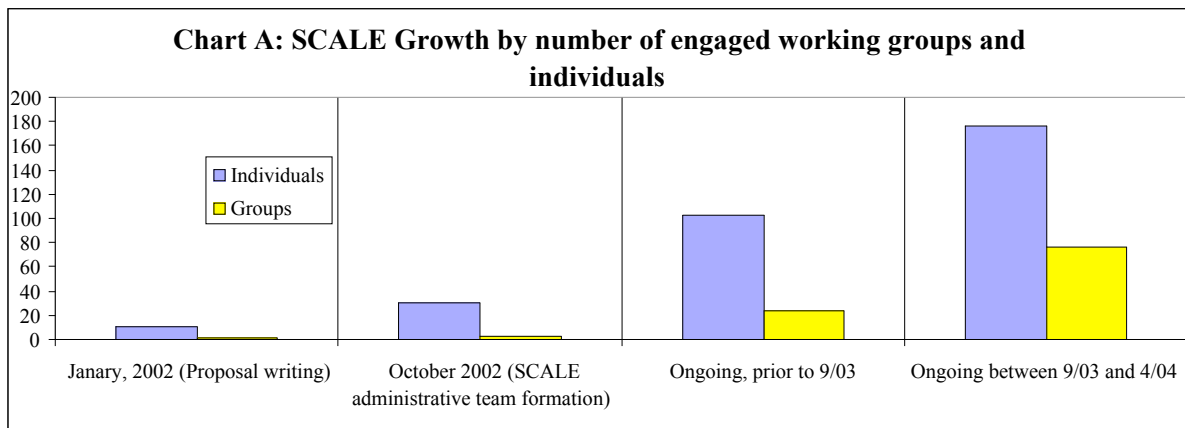
Third, as the green and purple dashed ovals show, all working groups on the LAUSD map are “transitory,” meaning that these working groups recently emerged to perform discrete tasks. In addition to transitory working groups, the Goal 2 map presents black dashed rectangles, indicating that Goal 2 also has “sustained” working groups, which are institutionalized elements of the SCALE Goal 2 organization that have performed multiple functions. Organizational maps produced from data obtained at future points in time (for example, the next iteration of maps will show SCALE as of June 2005) will enable us to show which, if any, of the April 2004 transitory groups became defunct, are still considered transitory, or became institutionalized (sustained) within their organization. We believe that this feature of our maps will be valuable for detecting and understanding change in organizational structures (meaning the partnership or its partners) and processes over time.

Fourth, the maps show how individuals participate in multiple working groups, and also how they may play different functional roles. For example, Lauffer appears in seven working groups in the Goal 2 map and in two groups in the LAUSD map. In the Goal 2 map, he appears in a manager role (rectangle near the top), worker roles (rectangles inside working groups) and collaborator roles (circles inside working groups). (Note that when counting the total number of individuals actively participating in SCALE, individuals that appear more than one time on one or more maps, such as Lauffer, are counted only once.)

### 3.0 Findings

Mapping the partnership from partner and SCALE Goal perspectives required us to produce 14 maps. These organizational maps can be analyzed in multiple ways. For the purposes of this paper, we focus on descriptive census statistics on individuals and organizational structures by drawing on two rounds of data collection, ending in September, 2003, April, 2004, respectively.

We begin by noting that SCALE, over its first 16 months (January 2003 – April 2004) grew substantially both in the number of active participants and working groups. To us, working groups are temporary or permanent, formal or informal organizational sub-groupings of personnel who perform tasks. Chart A shows SCALE growth, in terms of the number of active working groups and individuals between grant application and April 2004.<sup>10</sup> As expected, the transition from grant development to implementation over this time period was accompanied by rapid growth in personnel.<sup>11</sup>



As of April 2004, 178 individuals representing 16 organizations were active in 80 SCALE working groups. Three of the working groups were “pan-SCALE” (meaning that

<sup>10</sup> Data for this chart are drawn from Millar & Clifford (2003, 2004).

<sup>11</sup> Here, we use the past tense because data for this report was collected as of April, 2004. For the complete report on which this paper is based, see Millar & Clifford, M (2004).

they were not sponsored by a particular local partner), and the rest were located in one of the six (at the time<sup>12</sup>) SCALE partners (presented alphabetically):

- Denver Public Schools (DPS)
- Los Angeles Unified School District (LAUSD);
- Madison Metropolitan School District (MMSD);
- Providence Public School District (PPSD);
- University of Pittsburgh (UPitt), including the Institute for Learning (IFL) and Learning, Research and Development Center (LRDC); and
- University of Wisconsin-Madison (UW), including the Wisconsin Center for Education Research (WCER).

### 3.1 Organizational structure analysis: What does SCALE do and how does it accomplish its tasks?

As Weick (1976), Meyer and Rowan (1978) and others observe, organizations are often constituted by sub-structures that perform work with relative independence to the parent organization. We mapped and classified SCALE sub-structures, or “working groups.”

We classified 17 of the 80 working groups (as of April 2004) as sustained working groups (meaning that leaders identified them as ongoing, “hardened,” formal elements of their organization), and 63 as transitory or emergent (meaning that leaders consider them relatively “soft” in both their organizational purposes and membership (Chart B, below). Of the 63 emergent groups, all but 7 were still functioning as of April 2004, and 6 of the 7 ended because the task with which they were charged was completed.

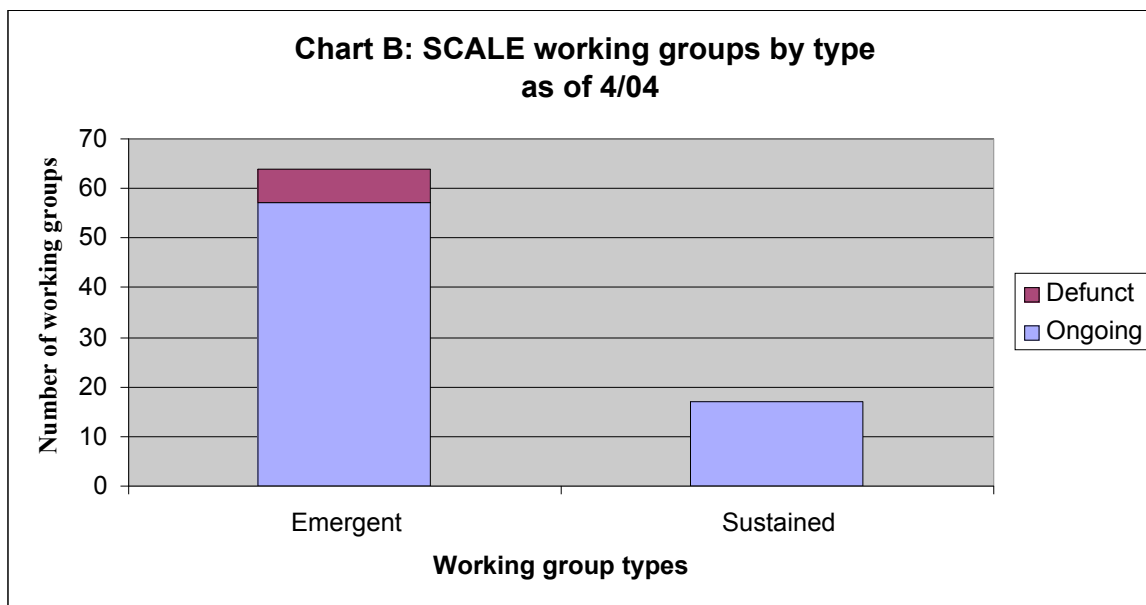


Chart C, below, shows that during the period between September 2003 and April 2004, SCALE more than doubled its number of active working groups, with an increase of 58

<sup>12</sup> More recently, California State University Dominguez Hills has become a SCALE partner.

groups. Chart C also shows that we disaggregated the data by working group location within a “sponsoring organization.” A sponsoring organization is one that supports working group operations by providing the majority of personnel, resources, and meeting space. The distribution of working groups shows SCALE operations located within each of the 6 partner organizations. The Universities of Pittsburgh and Wisconsin-Madison housed, during the period of our data collection, the largest number SCALE working groups (24 and 22 respectively). Moreover, the number of university-sponsored working groups grew from 14 to 46 between September 2003 and April 2004. Similarly, the number of university personnel who were active participants in SCALE was higher than the number of district personnel: 72% of individuals doing partnership work were employed by partner universities.

DiMaggio and Powell (1991) and other theorists suggest that organizational efforts reflect leaders’ impressions of the problems associated with goals. If true, Chart C suggests that leaders were positioning the partnership to achieve its goals through creation of working groups housed at universities. We posit several reasons for this phenomenon, including: (1) participating universities currently lack capacity, in their current forms, for accomplishing needed tasks, (2) university structures have greater latitude than district structures to support emergent or transitory working groups, and (3) the tasks associated with SCALE goals fall within the university domain of expertise. This finding appears to align with NSF’s premise that integrated engagement of K-20 resources is necessary to achieve changes in mathematics and science instruction. What university working groups and representatives do within the partnership and how their work relates to K-12 district instructional reforms will be the subject of future reports.

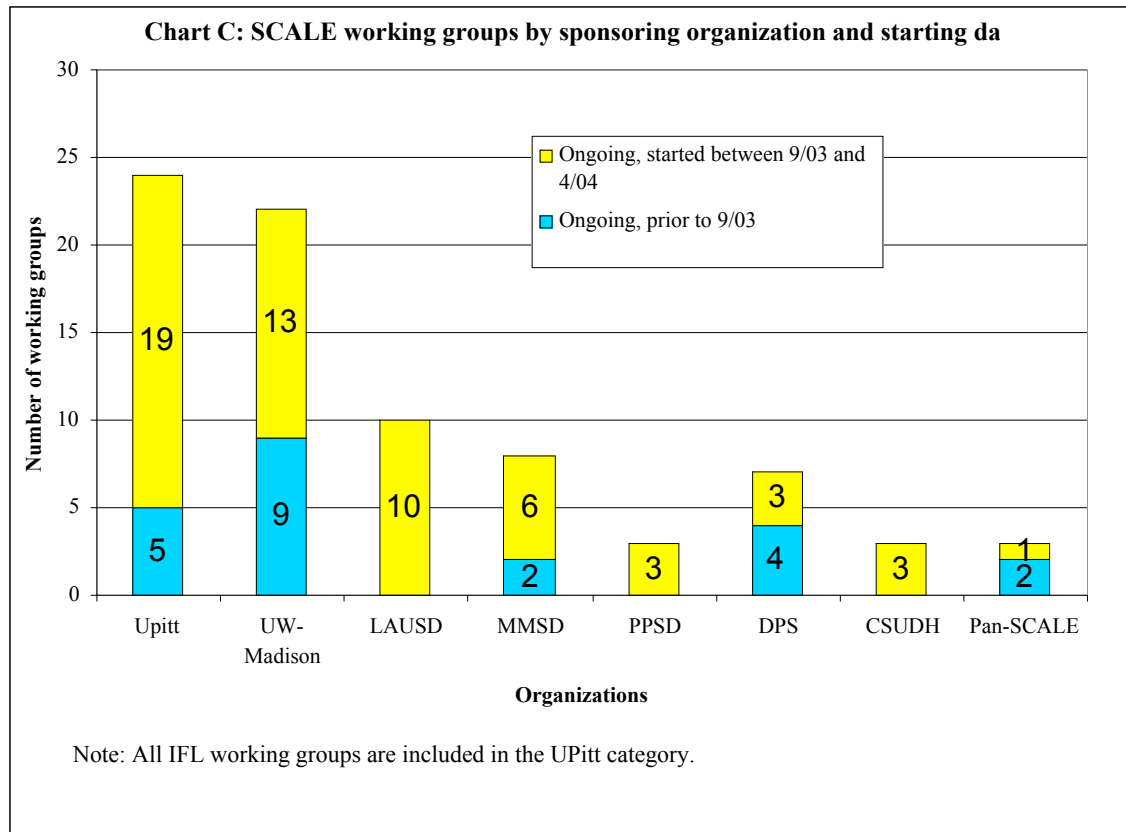


Chart D, below, presents working group functions and tasks. To categorize groups by function, we held interviewee descriptions of group goals against established group functions. Group functions are defined as follows. Examples from Diagrams 2 and 3 are provided.

- *Problem identification:* The working group helps individuals, organizations, and other working groups to identify and articulate problems that, if solved, can help SCALE achieve its goals. An example is the IFL/LAUSD Consulting Group (Diagram 2).
- *Development:* The working group develops tools, event designs, and processes that help SCALE achieve its goals. This work is broadly defined, and may entail the reconceptualization, repurposing, modification, and tailoring of existing resources. An example is the Middle School Science Instructional Guides working group (Diagram 2).
- *Coordination:* The working group leverages SCALE-developed and non-SCALE-developed tools and resources to address problems. An example is the Goal 1 & 2 Integration Planning Group (Diagram 3).
- *Dissemination:* The working group delivers information, materials, and professional development through some direct service. An example is the “Science in the Ice” Secondary PD Immersion Group (Diagram 3).
- *Evaluation and research:* The working group collects data about the relative effectiveness of activities and provides feedback to appropriate teams. An

example is the Targeted Study Team of the Research and Evaluation Team (not shown in the maps provided here).

With our data and these definitions in mind, we then categorized each group by its primary and secondary official functions. (Note that the distribution of work effort, as measured by, for example, actual allocation of percent time, cannot be inferred from the data in this chart.)

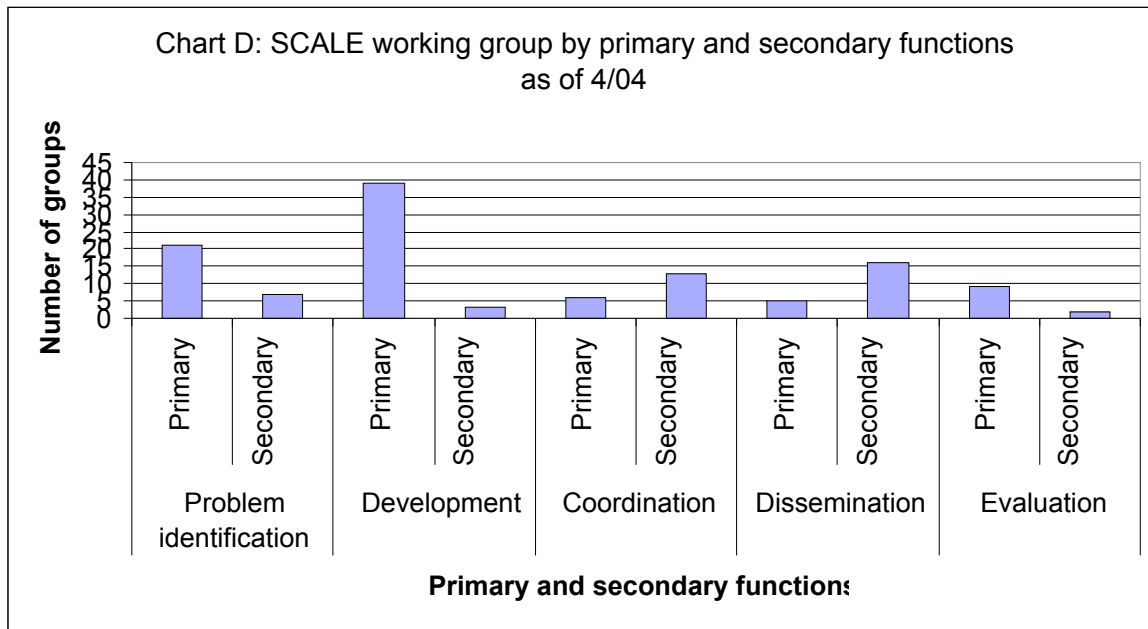
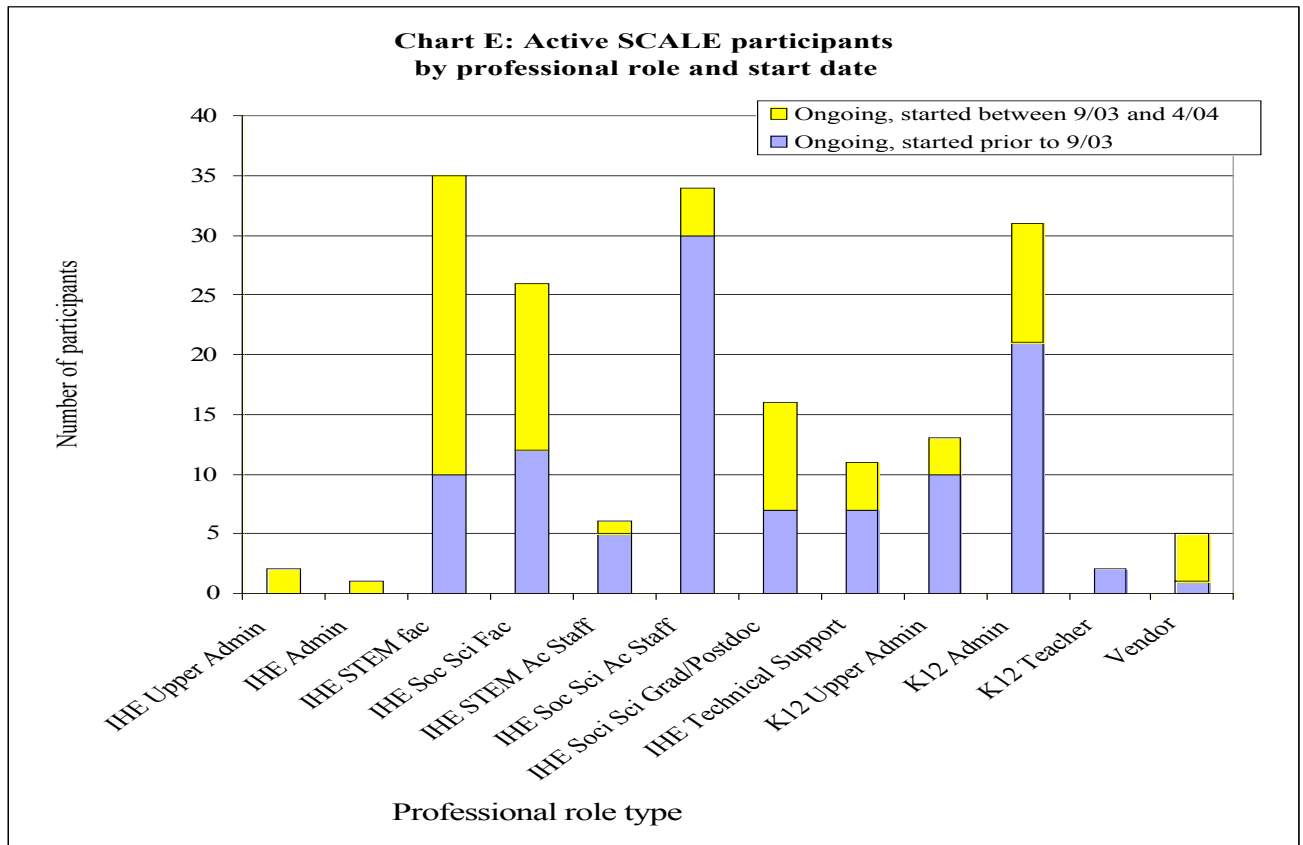


Chart D shows that SCALE working groups were primarily occupied in developing products for partnership activities. Drawing again on DiMaggio and Powell (1991), the distribution may reflect leaders' beliefs that there is a paucity of materials suited to meeting goals, that goals can be achieved, in part, through development of products (e.g. events, materials, curriculum), and that considerable partnership labor is necessary to develop appropriate products. Chart D shows that problem identification was the second most frequent function of SCALE working groups. Again, drawing upon institutional and organizational theory, this finding suggests that SCALE leaders view the detection and/or articulation of problems as labor best distributed across a large number of working groups. Of note, few working groups were primarily responsible for coordination, dissemination, and evaluation. Overall, the data in Chart D suggest that:

- SCALE problem identification and development processes were not yet well developed as of April 2004, and thus occupied the attention of many working groups, and
- relatively few groups were primarily devoted to coordination, dissemination, and evaluation and research functions, either because leaders considered existing partner capacity for these functions adequate or because these functions required the attention of only a few working groups.

### 3.2 Role analysis: Who participates in SCALE working groups and how do they participate?

Charts E through G describe individuals who are “actively engaged” in SCALE (see definition of “actively engaged” in Section 2.0). As does Chart C, Chart E shows that the majority of actively engaged SCALE participants hold positions in institutions of higher education. It also shows substantial growth between September 2003 and April 2004 in the number of participants in the STEM and social science higher education faculty and staff categories. In the chart, note that “IHE” means an “institution of higher education.”



Closer analysis of data supporting Chart E points to additional findings.

- IHE faculty (STEM and social science) comprise the largest professional role group, followed by IHE social science academic staff, graduate students, and postdoctoral employees. It also shows that STEM and social science faculty began participating in SCALE later than social science staff. By contrast, fewer K-12 representatives became active in SCALE during the same period.
- The “K-12 administrator” category includes primarily mathematics and science curriculum and research/evaluation specialists and directors who tend to be K-12 district middle management. The category does not include school principals.
- SCALE district participants include researchers/evaluators, technology support, administrators, curriculum developers, and professional developers. District participants tend to include upper administrators or district/sub-district

- administrators whose responsibilities include mathematics and science curriculum policy development, provision of teacher professional learning opportunities, or data management.
- Given the SCALE goals and theory of action, it is surprising that few K-12 teachers, few IHE upper administrators, no K-12 principals, and no union representatives were actively engaged in SCALE.

From our perspective, the uneven distribution by professional role and by organizational affiliation shown in Chart E largely aligns with SCALE’s theory of action and NSF’s premise that university faculty involvement is an important ingredient in K-12 reform. We would expect, for example, that K-12 administrators and upper administrators would be active because SCALE has proposed to build capacity for improved mathematics and science teaching by working through district offices. The data shows participation of certain groups, but further inquiry is needed to ascertain whether or not SCALE is sponsoring fruitful, catalytic actions through a process of collaborative co-construction. The absence of certain role groups (i.e. school principals, EEN coordinators, and the majority of teachers) may, however, indicate areas in need of partnership growth.

Analysis of participants in terms of their involvement in working groups yields another set of findings. Chart F, below, presents information about the production roles that individuals play in the working groups. To categorize individuals in terms of production roles, we consulted map and interview data for descriptions of each individual’s roles in SCALE working groups. We then held these descriptions against common roles within organizations. Upon determining that many SCALE individuals’ roles did not fit into any of the standard production role categories, we added a new category, the “collaborator” role. The role categories are:

**Table B: Production role definitions**

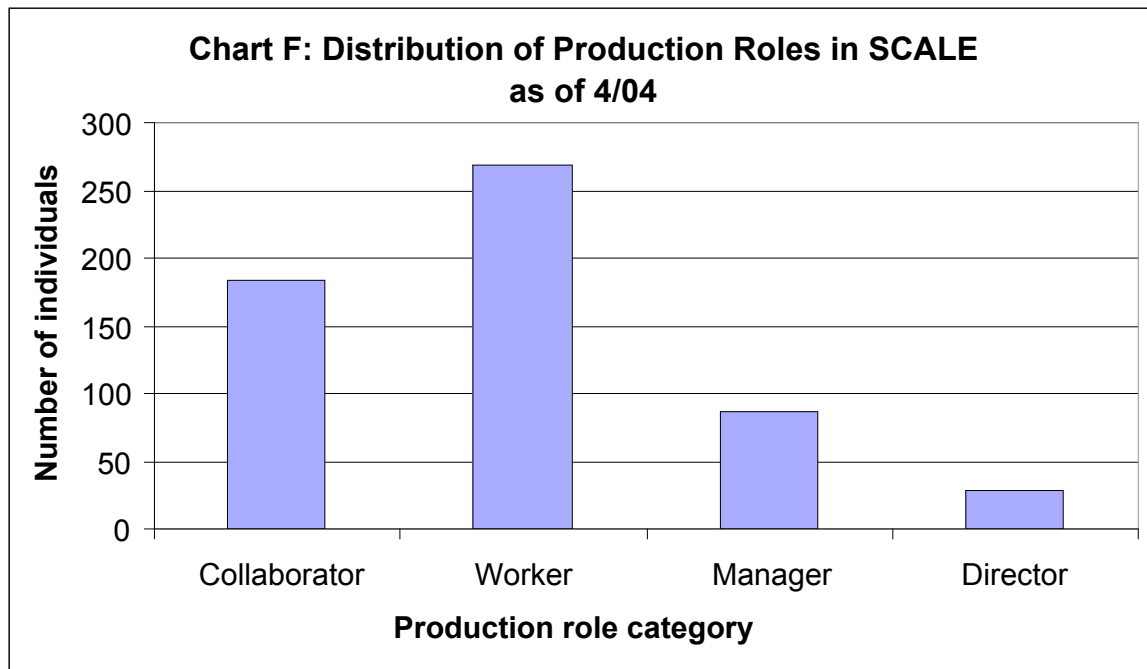
Title	Definition
Worker	A person who assumes responsibility for developing the group's products.
Manager	A worker who, in addition to assuming responsibility for developing the group's products, <sup>13</sup> is tasked by a director or other manager and holds responsibility for accomplishing a SCALE activity.
Director	A person who tasks and supervises managers and is finally responsible for a SCALE activity.
Collaborator	A person who provides input or participates in design or analysis of the group's products.

Chart F shows the distribution of individuals across the production role categories. When reading the chart, note that numbers are duplicative, meaning that individuals are counted in one of these four roles for each working group in which they participate. That is, if each “role in a group” is considered a “position” within SCALE, the partnership has 567

<sup>13</sup> In these definitions, we use the term “product” broadly, to refer to materials, events, policies, and so forth that are developed to achieve group goals. A product may or may not have physical properties.



positions. Workers (47%) and collaborators (32%) constitute the majority of positions within SCALE.

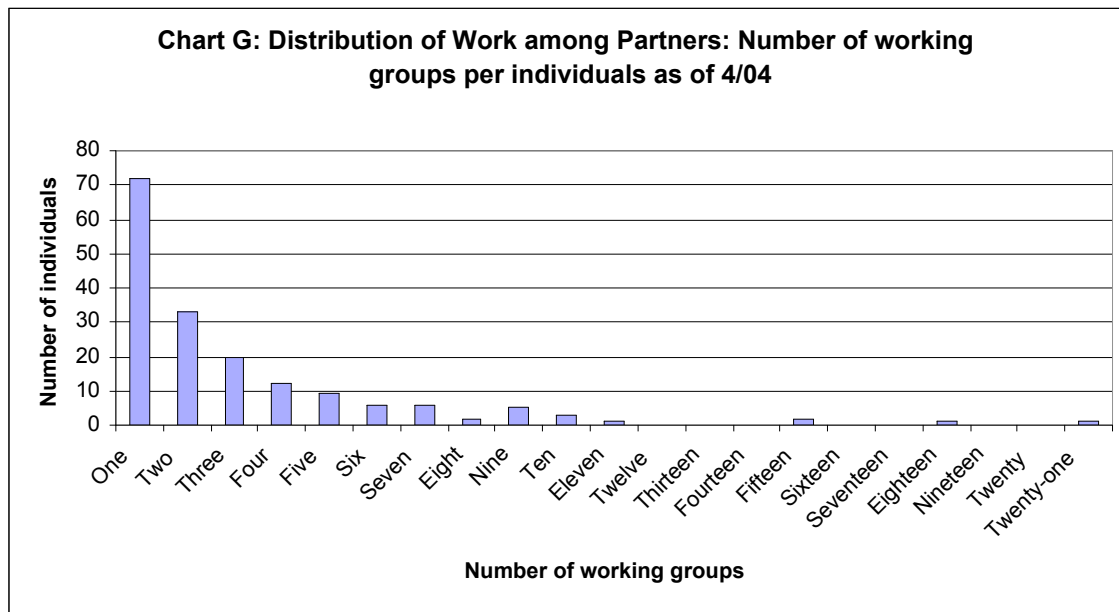


We disaggregated the production role categories by professional role and institution to begin describing the nature and focus of individuals' work. We found that:

- Individuals playing “collaborator” roles tended to be IHE STEM faculty (20%), IHE social science academic staff (23%), IHE social science faculty (19%), and K-12 administrators (19%). In most cases, individuals playing a collaborator role did so as an “add-on” to their primary roles within SCALE and/or their local institution. That is, they stepped outside of their line responsibilities within SCALE and/or non-SCALE organizations to collaborate with others. K-12 administrators were less likely than IHE representatives to collaborate with people outside their own institution. The large proportion of collaborator roles is of special note in the development of this partnership.
- Individuals playing worker roles tended to be IHE social science academic staff (35%), K-12 administrators (13%), IHE social science faculty (10%), IHE STEM faculty (10%), and IHE technical support (10%).
- SCALE manager and director roles were held primarily by SCALE primary investigators, goal managers, and K-12 subject-area directors.

Chart G, below, shows the numbers of working groups per SCALE participant. Of note, 61.8% of all production roles were held by individuals active on one or two working groups (75 and 35, respectively), 32.6% (58) were active in 3 to 9 groups, and 5.6% (10) of the individuals were active in 10 or more working groups. With one exception, these last 10 individuals worked part-time for SCALE, and all but two were either members of the senior Management Team or goal managers. These 10 people held 163 (29%) of the 567 SCALE positions. With one exception, they played all four types of production roles

in one group or another. Further, inspection of the maps indicates that these 10 people (as well as some individuals who participate in between 5 and 9 groups) held multiple professional roles (and titles) within the organizational hierarchies of both their local institutions and SCALE. Close analysis of the organizational maps also indicates that these individuals were sometimes responsible for tasking and supervising groups that, in turn, they lead. For example, four of them played worker roles in groups that they in turn also managed, and held manager roles in groups that they in turn also directed.



In organizations, division of labor is often useful to efficiently accomplish difficult, multi-faceted tasks. In addition, hierarchical relationships can establish systems of checks and balances. Upper level leaders usually hold supervisory roles and bring systems perspectives. Our data suggest that, while SCALE involves many individuals, just a few individuals were charged with not only overseeing systems and supervising work, but also with playing “worker” roles. It may be that this distribution was necessary to achieve partnership goals. However, it also may be the case that the full benefits of the partnership’s organizational structures were not realized during its first 16 months due to the uneven distribution of the “leadership burden.”

## 4.0 Implications

We structured our study to (a) inform the field partnerships as aspects of the “instructional change industry” and (b) provide formative data to SCALE leaders. Although our study is still in progress, early findings have implications for both of these audiences.

### 4.1 Implications for the Field

Understanding how and why the instructional change industry connects and works with K-12 organizations may be an important step in explaining the relative success or failure of reform efforts (Rowan, 2001). Just as partnerships play an important role in fostering innovation in business, health, and non-profit sectors, we believe they also are emerging as important in the educational change industry. Over the past two years, the SCALE partnership has allocated human and financial resources in ways that improve K-12 student performance in mathematics and science. Using “organizational maps,” our analysis conveys how people from multiple partner organizations were organized to design, implement, evaluate and coordinate activities and materials. Although it is only one case, we believe our findings to date about SCALE have implications for the understanding of instructional change. We organize implications thematically.

#### *Partnership flexibility and constancy*

The SCALE case points to the importance of establishing a productive blend of flexibility and constancy in the way people are organized to effect instructional improvement in large, urban school districts. On the one hand, SCALE’s transitory working groups offer flexibility in tailoring partnership activities to local conditions. Located within a partner organization and involving both local people (who know the organizational history and use the lingua franca) and people from other partner organizations (who bring needed outside expertise and perspectives), the SCALE working groups are positioned to effectively ascertain the need for, plan and develop resources for, disseminate, or evaluate, instructional improvement efforts. For example, in LAUSD, the partnership works through district efforts to write instructional guides for mathematics and sciences, while in the Madison Metropolitan School District the partnership assists with district curriculum alignment efforts. Some of these transitory working groups enable different partners to ascertain how and where work is needed. Other quickly form to undertake that work.

This flexible working group structure also means that SCALE can respond to emergent issues by ending working groups, a key purpose for partnerships (Dutta & Weiss, 1997). For example, when Denver Public Schools upper administration called upon SCALE personnel at the Universities of Pittsburgh and UW-Madison to provide research-based recommendations on curriculum quality, the partnership responded by forming a temporary working group. Weick (1976) describes as “loosely-coupled” organizations that, in part due to their weak central control functions, are optimally positioned to respond flexibly to changing conditions in sub-units of the organization. The self-organizing flexible responsiveness of SCALE working groups operating in geographically far-flung partner organizations suggests that SCALE fits Weick’s definition of a loosely-coupled organization.

On the other hand, some SCALE working groups provide constancy to partnership operations and to the pursuit of a coherent agenda. SCALE working groups are positioned within existing organizational hierarchies, with related working groups managed and coordinated by highly-placed leaders of those organizations. This structural feature allows the working groups to extend, and in some cases add substantially to, pre-

existing initiatives within the sponsoring organization. For example, SCALE participants added to a pre-existing LAUSD NSF-funded project by providing additional labor and ideas, and thus expanding that project's capacity to meet its needs, while simultaneously achieving SCALE goals. Similarly, at DPS, discretionary funds provided by SCALE helped the district develop a mathematics reform agenda begun several years prior that is aligned with the SCALE goals and theory of action. The constancy thus far afforded by SCALE's organizational structure has the potential to extend work and embedded relationships (Kingsley and O'Neil, 2004) in ways that, thus far, have been welcomed by partners. However, maintaining the constancy of partner initiatives may come at the expense of change and innovation, as partner organizations are inclined to maintain their status quo.

We believe that it is important for an instructional change K-20 partnership to establish an optimal mix of flexibility and constancy. Flexibility, enabled by apparent loose-coupling, allows the partnership to act in an agile manner in response to emerging, often unexpected, opportunities that may be very different from one district or university to the next. However, too much flexibility can derail the laser-like focus that the partnership must maintain in order to achieve its goals. Partnership efforts could easily be made ineffective if distributed thinly to address myriad issues that press on teachers and district administrators, or if university personnel freely pursued their many, often distracting, ideas and resources.<sup>14</sup> Constancy positions SCALE to do its work in organizations that have a sophisticated history and language associated with instructional change. Working group management by local leaders may allow partnership innovations to avoid "faddish" reform stigmas.

#### *Many partnerships in one*

Writ large, the SCALE partnership's organizational configuration differs from other types of partnerships. When researchers in other sectors describe partnerships, they commonly identify elements of the contact architecture (Perkins, 2002) that are designed to support pan-organizational knowledge- and resource-sharing, with the expectation that this sharing will lead to the production of new knowledge and technology or the distribution of knowledge in innovative and fruitful ways (Hardy, et al, 2000; Kingsley and O'Neil, 2004). A single organization may have many partnerships, but single partnerships frequently have their own purposes (see Section 1.0) and organizational structures (Halliday et al, 2004). Our findings point to SCALE as a single, yet complex partnership seeking to achieve multiple purposes, including the production and distribution of knowledge and technology, hastened response to emerging local conditions, and organizational adaptation. These purposes align with SCALE goals and theory of action, which asserts that instructional improvement can be achieved through multi-level interventions (see Clune 2005).

While SCALE is a single partnership organization, it hosts multiple partnerships with differing structures. Taking just LAUSD as a case in point, the purposes and structures of its various SCALE working groups are very different. On one end of a continuum is the

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<sup>14</sup> See the summary of a presentation by Sally Mentor Hay in Millar & Clune, 2004. Mentor Hay also presented this point in a January 2004 presentation to the MSPNet in Washington, D.C.

LAUSD/IFL Consulting Group, whose purpose is to facilitate organizational adaptation on the most comprehensive scale by combining top-level outsiders' scholarly expertise and knowledge of diverse districts with top-level insiders' deep knowledge of the local situation. On the other end are working groups such as the Middle School Science Instructional Guide Development Group. This group, a task force focused intensively on researching and producing tools to guide instruction, combines local expertise of central administrators and sub-district teacher specialists with the resources and ideas contributed by local university science faculty, a UW-Madison science expert (drawing on expertise of his entire Goal 2 team), and an IFL fellow with deep knowledge of assessment. Two LAUSD top administrators (Price and Jacobs) participate in both groups, helping to ensure that the latter group's work on specific products that soon would be in the hands of teachers and students throughout the district is aligned with the district's and SCALE's broad goals.

*Who does the work: Local anchors, outside collaborators*

As just noted in the examples from LAUSD, organizational map analysis shows that partnership personnel hail from various professional roles. A close examination of maps indicates that working groups are commonly populated by representatives from multiple partner and non-partner organizations. Members from the local organization tend to both participate in and manage these working groups, while collaborators from outside organizations work with them to achieve their ends. Such configurations are a prerequisite of inter-organizational learning, (Wenger, et al, 1999). Inter-organizational groups that include members with diverse expertise tend (assuming effective patterns of communication) to share knowledge and tools that are new to others in the group, which enables group members to rethink their work and knowledge bases, and develop effective new tools and processes (Derry et al, 1998; Derry et al, 2000).

A trend in SCALE working group representation by partner organization is apparent. In district-sponsored working groups, university members commonly act as collaborators while district members anchor the groups in the district through their group leadership. Cross-district interactions within working groups are infrequent. At the time of our data collection, it was primarily university staff—particularly from WCER, IFL, and LRDC—who participated in district-sponsored working groups. University-sponsored groups tended to be populated by individuals in diverse academic departments (particularly science, mathematics, education and social sciences), often from more than one university. Since our April 2004 data collection, many more collaborators from universities in the Los Angeles and Denver areas have joined SCALE working groups, presaging an increase in university faculty involvement in district-sponsored groups and a new pattern of K-12 involvement in university-sponsored groups. Our next iteration of SCALE organizational maps will show this shift. As we develop in-depth cases of working group operations, we will explore the roles, relationships and exchanges among group members. Bearing in mind the NSF's hypothesis that STEM faculty involvement is a critical element for K-20 mathematics and science reform, we will pay particular attention to the roles that faculty play in SCALE working groups and the partnership overall.

## **4.2 Methodological Implications**

As Section 2.0 suggests, organizational mapping developed out of our need to document partnership organizational structures, particularly the transitory working groups. The organizational maps we developed have greater capacity to document formal and informal groups, and inter-organizational relations. Such capacity was necessary for documenting SCALE because, as a partnership, the organizational structure was located within and beyond the individual partner organizations. Our readings of the partnership literature and NSF MSP discussions suggest that SCALE's organizational complexity is not unique. Our initial data collection and analysis points to organizational mapping as effective for the relatively dynamic type of census-taking represented in Section 3.0.

What surprised us was the maps' usefulness not only for eliciting interview data but also for helping SCALE administrators better understand the partnership. We found that our interviewees, who are busy leaders in their organizations, were drawn to the maps and poured over them. We encouraged our interviewees to redraw and reshape the maps and the map legend to better depict the partnership and its place in the partner organizations. They happily co-constructed the maps with us. In the process, we asked interviewees to "think aloud" as they resketched the maps, and thus learned much about the context for SCALE action and how the partnership fits into ongoing change efforts. The interviewees frequently took our pens—and control—of the interview as they strove to represent their understanding of the organization. Mapmaking engaged interviewees in (a) telling organizational history, (b) sense-making about SCALE's present form and (c) planning improvements to work flow. Interviewees frequently commented that this mapping activity newly informed them of many partnership operations or personnel activities, which bolsters our conclusion that the partnership is a loosely-coupled organization. Interviewees said that the maps heightened their awareness of the organization, its resources, and processes. While interview results will be included in forthcoming papers, we already have concluded that mapmaking provided data and insights useful to both interviewers and interviewees.

Once the maps were published (Millar & Clifford, 2004), they became an organizational tool. The organizational maps were hung in offices and used to orient new SCALE members to the partnership. As Harley (1988) suggests, the mapping process represents multiple perspectives, and in the process of representation, the map becomes reality. The maps also helped leaders identify disjunctions in interviewee understanding and disconnections within the organization that informed their planning

## **4.3 Evaluation Implications**

While we hope that our organizational mapping methods and findings are valuable to the field, we have evidence (as noted above) that these methods and the findings ensuing from them already have been useful to SCALE leaders as they assess their progress toward goals and adjust their strategies. In addition to providing SCALE leaders findings that are quite detailed and specific, we have drawn their attention to broader, more

interpretive findings by posing a series of questions. Examples include the following, which also are presented in an evaluation report.

- In light of SCALE’s goals and theory of action, is the partnership engaging the right individuals, in the right roles, in appropriate numbers and at a sufficiently high percentage of effort to achieve all SCALE goals?
- Is the fact that new partnership working groups are primarily emerging in university partners an indication that districts already have structural capacity to achieve and sustain SCALE goals, or are new structures needed in the districts as well? Or, if districts do not or cannot build this capacity, are the university partners capable of sustaining SCALE work into the future?
- Do the benefits of the “leadership burden” indicated by SCALE’s division of labor—where a few people take on many tasks at multiple levels of the partnership—outweigh the costs? Or, is SCALE’s work appropriately distributed in order to maximize its capacity to achieve its stated and emerging goals in an efficient manner?
- We found that many SCALE participants used the maps presented in this report to get obtain their first overall understanding of, and orientation to, the SCALE partnership. How can SCALE more proactively orient its participants so that they can more readily take advantage of its varied resources and expertise?

## **5.0 Conclusion**

Rowan (2001) and others have commented that an examination of instructional change organizations can help explain the relative success (or failure) of reform. Partnerships are, in other economic sectors, engines for innovation as they provide multiple organizations opportunities to collectively work on complex issues. Through organizational maps, we have shown that one partnership, SCALE, is leveraging district and university personnel and resources to achieve instructional change in science and mathematics. The primary organizational vehicle through which SCALE does this is “working groups.” These informal and, possibly, transitory organizational structures nestled within the partnership’s various local districts and universities, are guided by a coherent theory of action, yet operate in a loosely-coupled manner. We view working groups as useful in providing the partnership with the constancy and flexibility needed if the instructional change industry is to help both districts and universities realize sustained improvements in mathematics and science education.

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