Elements for Bringing a Research-Validated Intervention to Scale: Implications for Leadership in Educational Reform

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Abstract

An emerging reform emphasis is the identification and sustainability of research-validated initiatives for improving student achievement. Many researchers have noted that the lack of sustainability of effective programs is a barrier to advancing systemic school reform. Reported are findings from a multi-year NSF/IERI-funded project designed to develop and refine a multi-phase scale-up model (*Science IDEAS)* for concurrently initiating, sustaining, and expanding a systemic, research-validated, intervention in grades 3-5. Described in the paper are (a) the evolution of the scale-up model and (b) the leadership and organizational dynamics used for scale up of the intervention. In doing so, the paper offers perspectives and recommendations applicable to the scale up of any systemic instructional intervention within an ongoing school reform initiative.

Over the past 20 years, an increasingly important emphasis in school reform has been upon identifying research-validated, instructional initiatives that have the potential to improve student achievement. Building upon this, a complementary research literature has begun to address the related issue of identifying the conditions under which effective instructional initiatives can be sustained (Hargreaves & Fink, 2006) and expanded. For example, in his study of Chicago schools, Payne (1997; 2001) identified problematic elements which cumulatively undermined the implementation of effective reform initiatives. These included dysfunctional relationships among teachers, school administrators, and central administrators which interfered with actual program implementation -- even though all parties were in agreement about goals and means. As others (see Blumenfield, 2000; Coburn, 2003; Dede et al, 2005; Elias et al, 2003; Glennan et al, 2005; Klingner et al, 2003) have noted, the fact that highly effective programs often come and go with little lasting impact is a substantial barrier to advancing systemic school reform. Addressing such scale-up issues is presently an active area of research and development (Coburn, 2003; Dede et al., 2005; Glennan et al., 2004; Romance & Vitale, 2006a; Schneider & McDonald, 2006a, 2006b; Vitale & Romance, 2004, 2005).

This paper reports findings emerging from the initial four years of a five-year, NSF/IERI-funded project designed to develop, study, and refine a multi-phase scale-up model that addresses the issue of concurrently expanding and sustaining a systemic, research-validated, instructional intervention (*Science IDEAS*) in grades 3-5 (Romance & Vitale, 2001). In doing so, the paper describes (a) the evolution of the multi-phase scale-up model over the past four project years, (b) the organizational dynamics used to implement the scale-up model along with the criteria for establishing its effectiveness, and (c) the leadership and organizational factors necessary for sustaining advocacy for the instructional intervention. The paper also offers perspectives and recommendations for educational leadership in a form that are applicable to scaling up any systemic instructional intervention within an ongoing school reform initiative.

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Understanding the Science IDEAS Model as an Implementation Context for Research on Scale-Up

Overview of the Science IDEAS model. The issues addressed in the paper follow from an understanding of the *Science IDEAS* intervention for which the present scale-up model was developed. As described by Romance and Vitale (2001, 2006b), *Science IDEAS* is an integrated instructional model for teaching in-depth science understanding in grades 3-5 within which reading comprehension and language arts are integrated. *Science IDEAS* is implemented through daily 2-hour instructional blocks that replace traditional reading/language arts instruction. Across daily 2-hour lessons, teachers involve students in activities that focus on understanding science concepts (e.g., reading from text and trade books, hands-on activities, constructing propositional concept maps, journaling, and writing). Implemented within a cumulative inquiry framework, teachers use core science concepts as curricular guidelines for identifying, organizing and sequencing the different instructional activities in which students engage (see Figure 1).

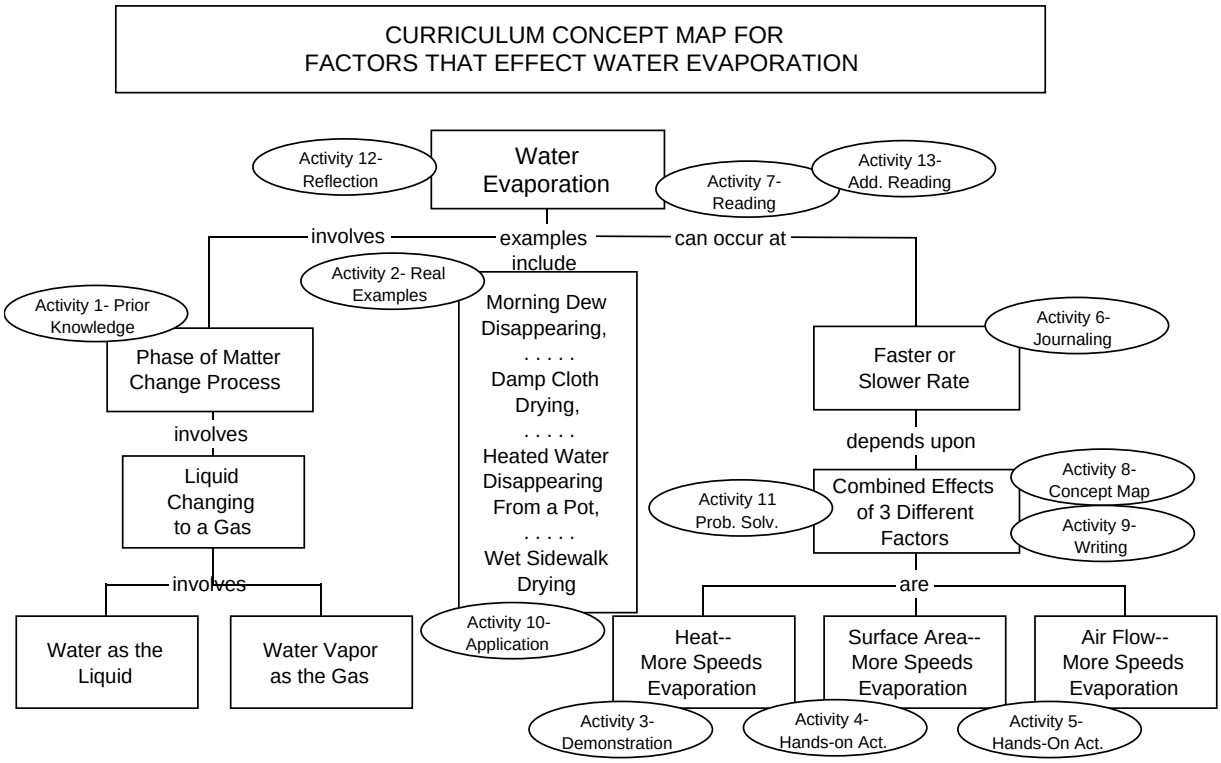

Figure 1. Illustration of the type of *Science IDEAS* multi-day lesson plan developed through a grade-level planning process.

Both within and across lessons, all aspects of teaching in *Science IDEAS* emphasize students learning more about what had been learned previously in order to engender cumulative, in-depth science understanding. Within a multi-day lesson plan such as Figure 1, teachers are able to elaborate instruction by adding different types of activities at different points of instruction. As a systemic classroom intervention involving the application of a "constraint-oriented" model (rather than the following of "step-by-step" lessons), *Science IDEAS* provided a stringent test of the project multi-phase scale-up model.

Within this instructional context, the scope of the project scale-up initiative necessarily included continuing professional development supporting the enhancement of teacher understanding of science knowledge and proficiency with the *Science IDEAS* instructional elements (e.g., collaborative curriculum planning, reading comprehension strategy, propositional concept mapping, hands on activities, journaling), along with the monitoring and reporting of

classroom-level fidelity of implementation and the establishment of an advanced teacher leadership component as key capacity development elements.

Multi-year findings reported by Romance and Vitale (2001, 2005) have shown that *Science IDEAS* students consistently obtained significantly higher achievement than demographically-comparable controls on both reading comprehension and science as measured by nationally-normed tests (e.g., *ITBS, SAT, MAT*). Across these studies, *Science IDEAS* achievement effects were consistent for both average/above average, and low-SES/minority students (see Romance & Vitale, 2001). Research findings also showed that *Science IDEAS* students displayed a more positive attitude and greater self-esteem in science learning and reading comprehension. Parallel results have been obtained in the present IERI/NSF project (see Romance & Vitale, 2003-2006 NSF yearly project reports).

Status of scale-up of Science IDEAS. Beginning with two schools in year one, the project has been able to implement the *Science IDEAS* model on a schoolwide basis in grades 3-4-5 over the past four years (2002-2006) in 13 elementary schools. During this time, the project has worked to clarify and address the requirements the literature (see Blumenfield, 2000; Coburn, 2003; Dede et al, 2005; Elias et al, 2003; Glennan et al, 2005; Klingner et al, 2003) has identified as necessary to transform a research-validated, instructional intervention from being researcher-initiated on a small scale to school-system-adopted on a large scale (see Vitale & Romance, 2004, 2005).

In working toward the development of a generalizable scale up model, the present *Science IDEAS* NSF/IERI project has been designed to operate within a leadership and organizational framework that focuses upon two keys recognized as critical for sustained school adoption of any research-based initiative: (a) the adoption of a multi-faceted scale-up process (e.g., Ball & Cohen, 1999; Tyack & Cuban, 1995) and (b) the associated development of the capacity and infrastructure necessary to implement the scale-up process itself (e.g., King & Newmann, 2000; Mussel, 1998). With this in mind, the present project scale-up model (Vitale & Romance, 2004, 2005) has focused on developing the capacity of a district (and district schools) to implement the instructional intervention on a large scale through an evolutionary process that is feasible within applied school settings.

Overview of the project scale-up design. The multi-year project research goal was to initiate and support the expansion of the *Science IDEAS* intervention as a means of studying the evolution of a project-developed *multi-phase scale-up model* from a research perspective. The purpose of such a research pursuit was to identify knowledge and tools that would contribute toward the understanding of how to better scale-up research-validated interventions in K-12 school settings. In a complementary fashion, the criteria for determining the validity of the multi-phase scale-up design were based on its success in initiating and sustaining the implementation of the *Science IDEAS i*ntervention as it was expanded to new schools. Given the establishment of the validity of the scale-up model itself, the goal of the project was to explicate the elements of the scale-up process in a fashion that would allow them be transportable to other interventions and settings.

Before overviewing the multi-phase scale up model itself, it is important to recognize that the present *Science IDEAS* scale-up initiative reflects an explicit research and development (R&D) perspective. The emphasis of such an instructional systems design perspective (e.g., Dick et al, 2004) is that the successful preparation of any educational product requires two major elements: (a) that the desired outcomes can be obtained consistently under specified implementation conditions and (b) that the implementation of the instructional "product" in applied settings is engineered to fall within the capacity of the system that is to utilize it (minimizing capacity development requirements). Within the context of the present project, the "reverse-engineering" of such an R&D approach provided an architectural framework for approaching the question of how to scale-up research-based initiatives within regular school settings. Therefore, in the present project our definition of scaling is a functional one (see Figure 1) that establishes as success criteria and links together (a) the fidelity of implementation of an intervention and (b) the performance outcomes

established through the prior research for the intervention that are to be met as performance standards. By these standards, if the fidelity of implementation and the associated outcomes can be maintained at existing sites (i.e., are sustainable) while the intervention is being expanded to new sites, then scale up can be considered successful.

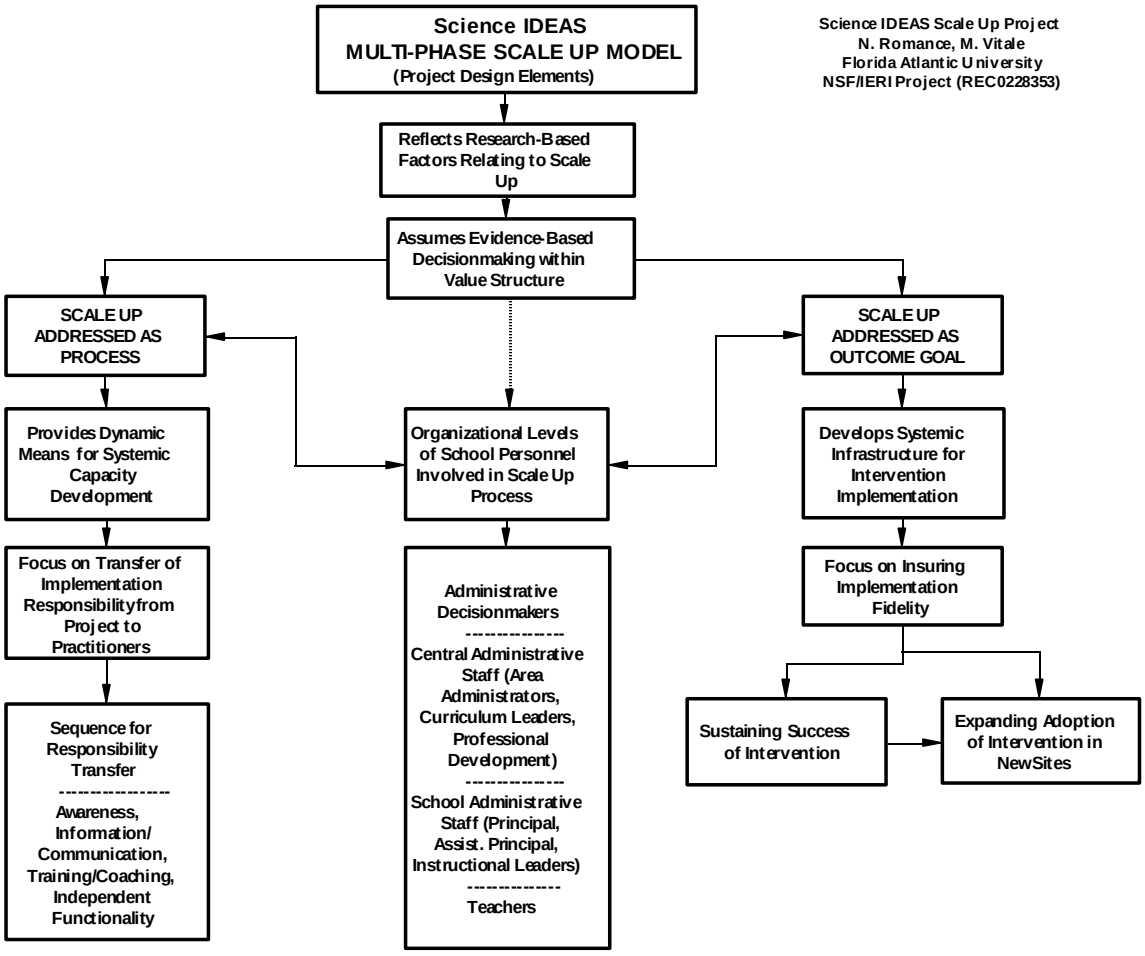

Figure 1. Major elements of scale up in school/district settings.

Facets of the Project Multi-Phase Scale-Up Model

In the present project, scale-up is considered from three different perspectives that provide the dynamics for accomplishing the two sets of scale-up criteria (fidelity of implementation, student performance outcomes) over time. The first perspective (see Figure 2) considers scale-up as a multifaceted process that encompasses three overlapping and interdependent components following the initiation of any instructional intervention: (a) sustainability of implementation, (b) expansion to new sites while maintaining sustainability, and (c) the institutional dynamics that are necessary to provide the leadership and support needed for scale up (and sustainability). Here, the overarching key factor is the presence of a systemic capacity for supporting the expansion of the initial implementation to new sites in a fashion that insures the sustainability for all others. In our scale up design, the establishment of model schools which are able to sustain implementation of an intervention with fidelity and obtain consistent performance outcomes provide a major internal systemic capacity for scale up. These model schools are used to coordinate and provide teacher

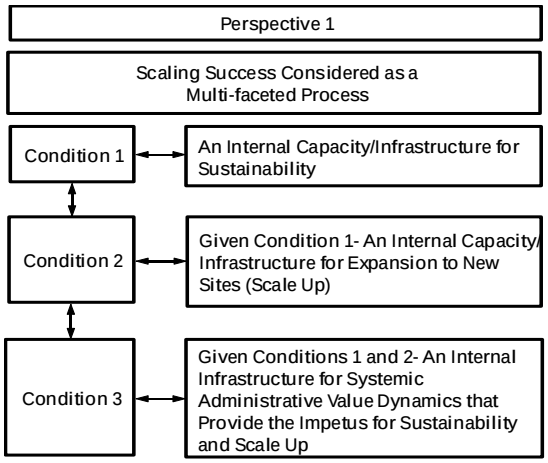

Figure 2. Scaling considered as a multifaceted process.

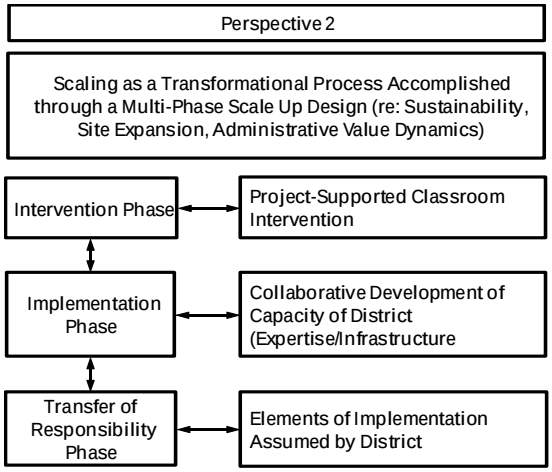

Figure 3. Scaling considered as a transformational process.

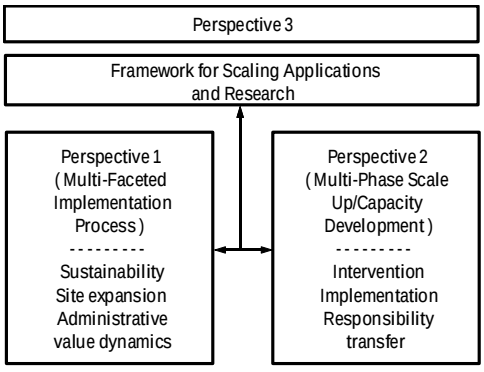

Figure 4. Framework for representing scale up operations and research.

mentoring assistance in conjunction with a project-developed teacher leadership cadre that provides initial and continuing professional development.

The second perspective of the model (see Figure 3) considers scaling as a transformational process whose scope encompasses an ordered evolution from researcher implementation, to collaborative implementation with school and central administrative personnel of an operational infrastructure for capacity development, and the transfer of the responsibility of the implementation from the researchers to school and central administrators. This second perspective recognizes that an "agent" having specialized expertise is initially needed to enhance the resource capacity of regular school system operations by serving in a prosthetic fashion to develop the capacity of the school system to sustain and scale up an intervention. In our study, this agent consists of the project staff. The operational details of these phases are discussed in the following section.

The third perspective (see Figure 4) consists of combining the preceding two perspectives into a conceptual framework that represents essential project scale up operations in a form that is transportable to other settings and for framing research on scale up itself. In doing so, however, an additional element critical to the process of scale-up must be addressed (Vitale & Romance, 2004). This additional element has to do with the establishment of institutional perspectives that recognize the "added systemic value" provided by the intervention in the form of increased performance expectations (e.g., student achievement, classroom instruction, professional development). In turn, such value-expectation components, once established, provide a continuing systemic incentive for sustainability and scale up.

Figure 5 overviews the major operational framework of the present multi-phase scale up model. As Figure 5 shows, instructional interventions at the classroom level are considered to result in student achievement (and affective) outcomes. This implies that as a research-validated intervention, the implementation of the intervention with fidelity results in desired student achievement outcomes. In turn, the required degree of implementation fidelity is accomplished by the project system through implementation support (e.g., initial/follow-up professional development, curricular planning assistance, principal support). Finally, both the implementation at the classroom level and associated implementation

support activities are coordinated through an implementation management system. Together, these scale up dynamics, with the involvement of project staff as external agents, provide the means to initiate and implement the intervention effectively.

Although Figure 5 does provide a well-structured framework for scale-up, making the elements in Figure 5 operational also requires the two important dynamics noted above. As a point of emphasis, the first dynamic is the development of the capacity of district staff to adopt the management and support elements of the project in a fashion that is sufficient to insure classroom level fidelity. This transfer process is a major element of the multi-phase scale up model used in this project. Initially, the project staff assumes all responsibility for implementation. But, as the project evolves, project staff work collaboratively with appropriate levels of district staff (e.g., teachers, principals, curriculum directors, central administrators) until they gain the necessary expertise with regard to all aspects of the classroom implementation, support, and management, at which time the project staff withdraws.

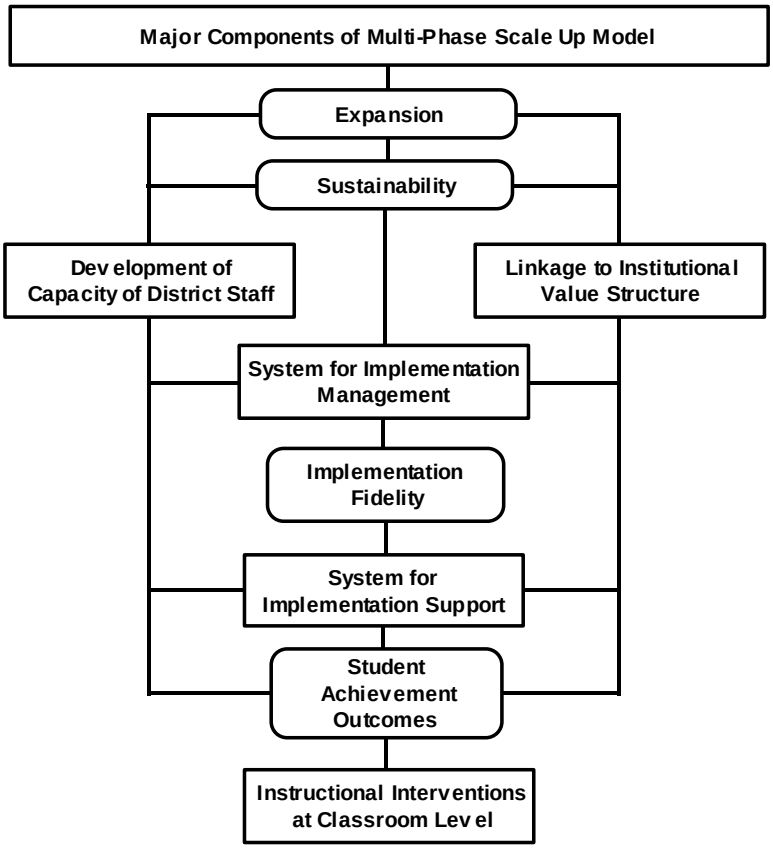

Figure 5. Major components of multi-phase scale up model for the current project. Boxes show major components that comprise the scale up model; ovals represent major forms of criteria that reflect the effectiveness of the scale up model (see text for details).

The second dynamic is the establishment of the "value added" to the institution by the intervention itself. As noted above this is a critical element for sustainability, because if the intervention is not valued within the structure of the institution, then it will not be sustained. The implementation of a phasing process that addresses the development of institutional value is a recent addition to the scale up model. Finally, as Figure 5 suggests, the expansion of the intervention to new sites requires the capacity to sustain existing sites as a foundation for any future expansion. However, once the capacity necessary to sustain the intervention is developed and operational, then expansion can be readily accomplished.

Figure 6 presents major elements of the multi-phase scale up model using a "workflow" format. In viewing Figure 6, it is clear that an administrator intending to initiate and sustain implementation of the *Science IDEAS* model in one or more schools would face a dauntingly complex planning task. At present, as a potential dissemination tool, the project is developing a series of computer-based support tools as a means of providing guidance and support to administrators engaged in *Science IDEAS* implementation planning and management (see following section for details).

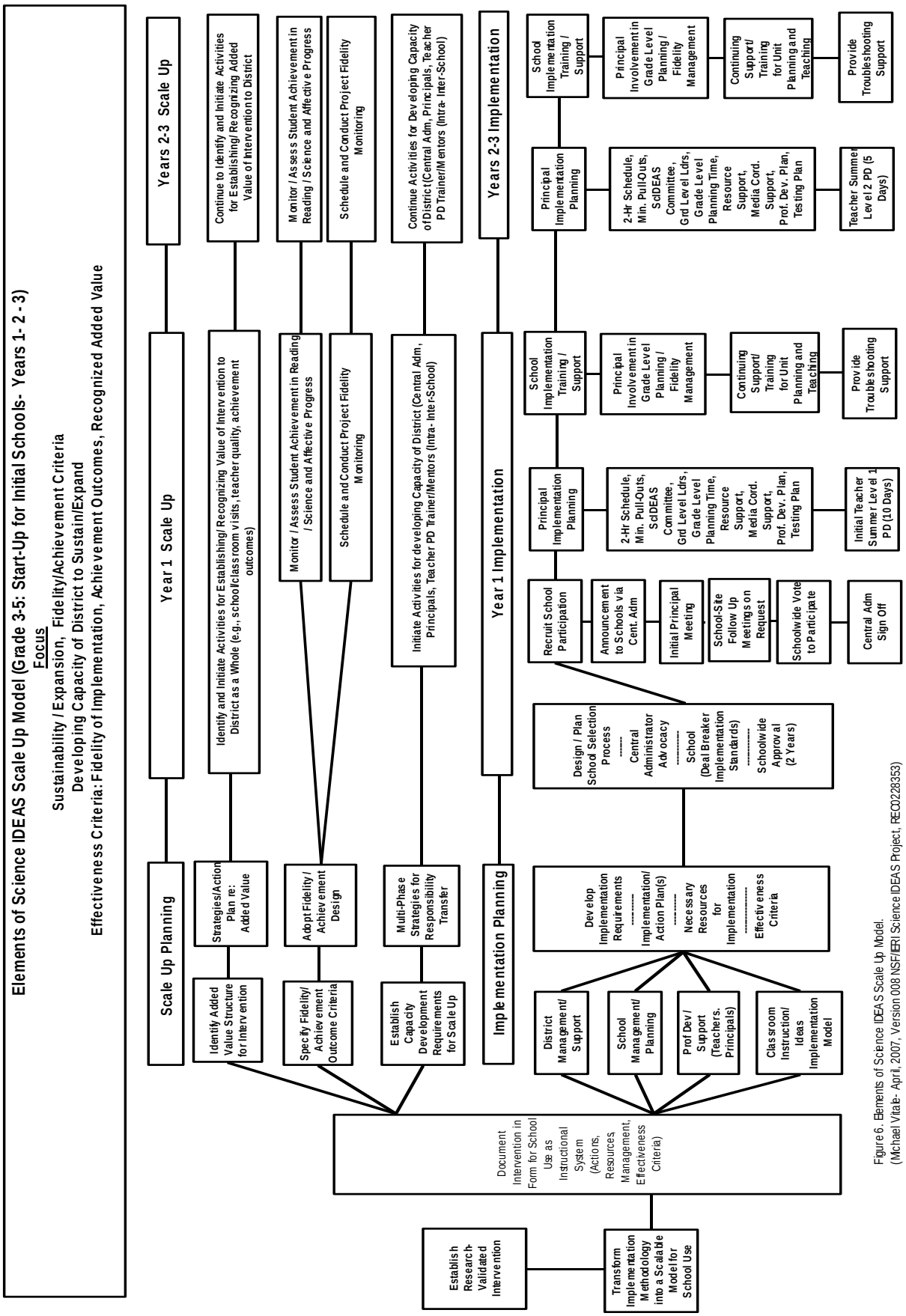

Figure 6. Elements of Science IDEAS Scale Up Model.
(Michael Vitale- April, 2007, Version 008 NSF/ERI Science IDEAS Project, REC0228353)

Multi-Year Project Highlights for 2002-2006: Elements for Bringing Research-Based Interventions to Scale

Rather than attempting to describe all elements of the project, this section overviews key elements associated with scale-up.

Project setting. The project is being conducted in two large and diverse urban school districts in southeastern Florida. Overall, the project includes 13 schools/principals, 260 teachers, and 6200 grade 3-5 students. Data sources include fidelity of implementation ratings and school performance outcomes on nationally-normed and state-administered accountability tests.

Major project scale-up elements. This section overviews project elements having major implications for scale-up as they were identified and addressed by the project in an evolutionary sequence.

- ***School operational issues faced by scale-up initiatives.*** These reflect the fact that school systems and schools are continuously changing elements. Such changes complicate the scale-up process, but must be addressed for scale-up to be accomplished. The changes faced by the present project (which were typical of most systems) were (a) changes in central administrative staff, (b) changes in principals, (c) changes in teachers, (d) changes in state (and districtwide) mandates, (e) an over emphasis in instructional priorities that focus only on year-to-year performance on state accountability basic skills tests (rather than measuring cumulative student content-area learning), and (f) a tendency for schools to continually involve themselves in "new" instructional and instructional-support initiatives (vs. maintaining sustainability of present initiatives).

- ***Initial scale-up operations addressed***. These included (a) adding a formal start-up planning component for new schools to the original scale-up model, (b) limiting new schools to those who had no competing instructional initiatives, (c) expanding the roles of the teacher leadership cadre from model classroom implementation to involvement in professional development for new schools, (d) providing initial and follow-up professional support for teachers to gain an in-depth understanding of science concepts within grade level curriculum planning.

- ***Revisions of key project scale-up strategies.*** These included (a) working with schools and teachers to increase implementation fidelity, (b) working with principals to involve them in the fidelity monitoring process (a key capacity development scale-up component), (c) developing project "talking points" to enhance principal communication (advocacy), and (d) developing district-level commitment to and advocacy for the project in a form that raises the level of both teacher/classroom instructional and student performance expectations held by the institution itself.

- ***Effective project scale-up performance outcomes.*** The overall project design provides for (a) an analysis of the project impact on the longitudinal achievement growth of students vs. comparable controls across grade levels 3-8 (grades 6-8 measure transfer effects) and (b) for linking achievement trends to cumulative years in the project and to instructional fidelity. This analysis will not be completed for some months; however some representative year-specific project outcomes can be summarized.

  These included (a) an increase in the percent of teachers implementing with fidelity from 43% to 90% percent from 2002-2003 to 2006-2007, even with an increase in the number of teachers/schools included in the project, (b) school-level achievement summaries from the *Florida Comprehensive Assessment Test*s (FCAT) showed the average *SAT-9* median percentile ranks in grades 3-5 for the project schools in reading

were 69 and 70, respectively, for 2002-2004, while the percent of students in grades 3-5 judged proficient by the *FCAT* in reading were 68% and 70%, respectively, over those same two years (even though the districts' regular reading/language arts basal reading programs were not used), (c) school-level achievement comparisons from the project-administered *ITBS Reading* and *Science* subtests in 2005-2006 showed that project schools performed significantly better than comparable controls on science in grades 4-5 and on reading in grade 5 (again without using the regular reading/language arts basal program), and (d) the ratings of all summer (2-week) professional development sessions conducted by Leadership Cadre Teachers for new schools have been consistently rated as highly effective by participants (mean of 3.6 on a 4 3 2 1 scale or 90 percent of maximum positive agreement). The overall effectiveness of the Teacher Cadre has been a significant project capacity development accomplishment.

- ***Initiation of computer-based (web-accessible) scale-up components.*** This has evolved into a critical project component over the past several years from the standpoint of transportability of the *Science IDEAS* model and from the standpoint of designing generalizable tools that support scale-up with a variety of instructional interventions. These initiatives include re-formulating a number of project components so that they are computer-deliverable. These include prototype design/development of: (a) an information system for administrators that provides school/grade implementation status reports and links fidelity of implementation to student achievement trajectories in support of instructional management decisionmaking, (b) a web-based planning/management tool that provides direct support to administrators engaged in planning and then supporting implementation of *Science IDEAS* in one or more schools, including the development, coordination, and utilization of specialized teacher expertise as a form of capacity needed for professional development and mentoring, (c) a web-accessible database for archiving "added value" components, and (d) a re-designed project web-page that provides increased support for teachers (e.g., Curriculum Resource Binders, access to teachers modeling different *Science IDEAS* instructional elements, teacher sharing of curriculum/lesson materials).

Implications of the Project for Enhancing the Success of School Scale Up Initiatives

Together the *Science IDEAS* intervention and the project-developed multi-phase scale up model address a significant issue for advancing the potential of school reform initiatives to improve student achievement. Because the *Science IDEAS* intervention is primarily "constraint-oriented" rather than prescriptive (i.e., within specified limits, teachers have a great deal of flexibility in how it is implemented operationally), it provides a stringent test of the project scale up model that enhances potential applicability to many different types of interventions. By framing the process of scale-up as a coordinated system of organizational actions adopted by different school leaders within school systems, the project described in this paper is suggestive of the means to enhance the success of school-based implementations of research-validated instructional interventions by capturing and then supporting their implementation requirements through an instructional systems approach (see Dick et al, 2001).

In a related fashion, the elements of the project multi-phase scale up model not only are suggestive of reasons why many promising scale-up initiatives within school reform have failed; but also of what institutional actions are necessary and sufficient to insure that scale up is successful by explicating and supporting the explicit actions necessary for scale-up success in a detailed systems-oriented form that precludes the occurrence of events that in the past have engendered such failure. In order for systemic educational reform to progress (see Cuban, 1990; Vitale et al., 2006), providing educational leaders with the means to adopt and successfully scale up research-validated interventions is necessarily a logical requirement. In this regard, the multi-

phase scale up model presented in this paper is suggestive of how such scale up initiatives should be pursued if they are to be successful.

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