Building Teacher Expertise and Leadership as a Form of Scale-Up Capacity Development in School Reform [1, 2]

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Abstract

A key issue in school reform is the scale-up of research-validated instructional interventions in applied settings. Critical to successful scale-up is building the capacity of schools and school systems needed to sustain such interventions in existing sites while supporting the expansion to new sites. This paper reports evaluative perspectives of a multi-year professional development model being utilized in a 5-year NSF/IERI project whose goal is the study of critical elements of the scale-up process associated with *Science IDEAS*, an integrated model for enhancing learning in science combined with reading comprehension proficiency in grades 3-5 (Romance & Vitale, 2001). This paper specifically focuses on the linkage between the professional development for all teachers (in terms of institute learning outcomes and classroom fidelity of implementation of the Model) and the development of a teacher leadership cadre as key supportive elements essential for capacity development and sustainability of the intervention. In turn, the project leadership cadre serves as a professional development resource in expanding the *Science IDEAS* intervention to new schools. Discussed are the general implications of the findings for implementing a conceptually-oriented and sequenced series of initial and on-going professional development opportunities for teachers in schools.

A current issue in the systemic reform of education involves the question of scale-up as the implementation, sustainability, and expansion of research-validated interventions (Coburn, 2003). The recent research literature in identifying the conditions under which such scale-up can occur has highlighted the necessity for building the capacity of a multilevel school infrastructure necessary for sustaining scale-up initiatives (Healey & DeStefano, 1997; Massell, 1998.) A critical component in developing this infrastructure is building new forms of expertise among implementers (classroom teachers and administrators) that provide the leadership and support for expansion while external sources of support remain constant. This is an important consideration in effective scale-up because if external support resources must expand at the same rate that an intervention expands to new sites, then these resources will eventually become exhausted and scale-up is likely to be unsuccessful.

The purpose of this paper is to report results regarding the professional development of teachers as a key factor in successful scale-up from the initial two years of a five-year NSF/IERI-supported project designed to study the processes involved in the scale-up of a research-validated instructional model in grades 3-5, *Science IDEAS* (Romance & Vitale, 2001). Specifically, the paper describes the design of the professional development component of the model for building teacher expertise across key project elements as a form of enhanced capacity that is necessary for successful sustainability and scale-up. In doing so, the paper will explain (a) the overall professional development model, (b) the on-going support used to implement it, and (c) the development of the teacher leadership cadre component of the professional development model that ultimately becomes the critical support element necessary for sustainability and scale-up.

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The NSF/IERI Science IDEAS Scale Up Project.

The topic addressed in the paper requires a general understanding of *Science IDEAS* as a research-validated school reform intervention (Romance & Vitale, 1992; 2001; Vitale & Romance, 2000; Vitale et al, 2005). *Science IDEAS* is an instructional model for teaching in-depth science in grades 3-5 within which reading comprehension, language arts, and writing are integrated (see also). The model is implemented through a daily two-hour instructional block that replaces traditional reading-language arts instruction. During the *Science IDEAS* block, students are engaged in inquiry-based science learning involving hands-on science activities, reading science texts/trade books/internet-accessed science materials, writing/journaling about science, and propositional concept mapping as a tool for building and representing knowledge. Teachers use core science concepts as curricular guidelines for identifying, organizing and sequencing multi-day instructional plans. All aspects of teaching emphasize learning more about what has been learned to build student in-depth science understanding.

As reported by Romance and Vitale (2001), multi-year research findings indicated that *Science IDEAS* students displayed significantly higher achievement in both science and reading comprehension compared to demographically similar controls as measured by nationally-normed (ITBS and SAT) tests. These results were significant for both average/above average and low-SES/minority students. In addition, students participating in the *Science IDEAS* model demonstrated a more positive attitude toward science learning and reading comprehension.

The present NSF/IERI *Science IDEAS* project, funded by the National Science Foundation Interagency Educational Research Initiative (REC 0228353) in 2002, focuses on the development of the school capacity required for sustaining the implementation of the instructional model while successfully adding new schools to the project as the capacity of the school system is developed in order to assume responsibility for future scale up. The general project scale-up design is recursive, involving the use of model schools as partners for new schools that, in turn, serve as model schools for others. This structure requires the development of a strong cadre of model teachers to serve as mentors for new teachers, both within their own schools and with newly implementing schools (Charles & Cummings, 2001; Wallace et al, 2001).

Elements of the Science IDEAS Model for Teacher Professional Development

A critical component for implementation of an effective instructional intervention that leads to increased learning by students is high quality professional development for teachers (King & Newman, 2001; Loucks-Horsley et al, 2003; Massell, 1998; Payne, 1997, 2001; Porter et al, 2000). However, traditional staff development formats are not structured to meet the cumulative needs of teachers involved in continuing reform efforts. The *Science IDEAS* project addresses teacher professional development in an evolutionary fashion over a three year period in terms of a comprehensive and school-wide, ongoing, cumulative process consisting of summer institutes, follow-up workshops, grade-level planning, sharing success seminars, and classroom support visits.

Initial Professional Development for Science IDEAS. During the summer before the initial year of implementation, all teachers in grades 3-5 in participating new schools attend the two-week (60 hour) summer Level I *Science IDEAS* Professional Development Institute. The institute, carefully designed and validated over a series of implementations (Romance & Vitale, 2001), addresses key project elements associated with in-depth science learning and development of reading comprehension and language arts proficiency. A major thrust of the initial institute is the development of teacher understanding of core science concepts and their application across several related domains of science (Thompson, 2003). Utilized, as an instructional component during the institute, is an interactive videodisk core concepts in science program (see Vitale & Romance, 1992) supplemented with relevant hands-on and inquiry-based science activities (Vasquez & Cowan, 2001). Second, teachers learn how to apply knowledge-based instructional practices (Bransford et al, 1999) to the teaching of science concepts and reading comprehension through the *Science IDEAS* instructional model. Throughout the institute, the six key elements of *Science IDEAS* are modeled and practiced: *Reading Comprehension Routine, Propositional*

Concept Mapping, Prior Knowledge Review, Hands-on Science Activities, Writing/Journaling, and *Project Application Activities*. Participating teachers receive resource materials, in-service points and a stipend for attending the institute. Two additional days added to the professional development provide a further opportunity for collaborative grade level instructional planning for initial implementation of the model at the beginning of the school year (Knapp, 1997).

Follow-Up Professional Development and Support During the Initial Implementation of the Science IDEAS Model. Teacher implementation of the model begins within the first week of school in the fall. Prior to this time, principals have worked with staff in establishing the two-hour instructional schedule for all students in grades 3-5 and during this time project staff conducts follow-up classroom support visits at a rate of approximately three visits per month for the first two months. The classroom observations and visits serve the dual purpose of providing support and technical assistance to teachers (e.g., troubleshooting support, modeling lessons, assisting with lesson planning, and pacing) and providing the project staff with important information regarding initial teacher implementation of the model. In turn, this information factored in as part of the planning for follow-up professional development workshops and classroom support.

Project funding is provided for substitute teachers allowing the *Science IDEAS* teachers release time from school to attend five grade-specific professional development workshops scheduled periodically during the first year of project implementation. These workshops are designed to: (a) increase teacher content-knowledge in science necessary for continued high quality science teaching, (b) fine-tune teacher proficiency in implementing specific *Science IDEAS* elements and routines, (c) provide a forum in which project staff and teachers from different schools who teach the same grade level can interact and share ideas regarding both curricular and pedagogical issues, including instructional issues that were identified during classroom support visits. As part of the workshop series, participating teachers receive in-service points and curricular resources at each of the five workshops throughout the year.

Support for Grade Level Curriculum Planning. Each quarter, teachers within their own school collaborate by grade level in a full day of *Science IDEAS* curriculum planning. This activity has been identified as a key factor for implementation with fidelity and for capacity development for sustainability. Within this context, grade level planning is a curriculum elaboration activity that includes clarification of science concepts, instructional sequencing and pacing of lessons, and support the integration and development of reading comprehension and language arts proficiency. Initially, school-based teacher teams (accompanied by a school administrator) and supported by project staff work through specific curricular and instructional details for implementing each unit of study, including careful consideration of state-assessed standards in both science and reading/language arts, the nature of science and ensuring curriculum coherence across all elements of the planning process, especially in regard to science concepts.

As an additional supporting framework for curricular planning, teachers from all project schools participate in a Sharing Success Seminar, an evening in which they share best practices by exhibiting teacher-developed materials and student work samples. As an open forum, teachers engage in rich conversations and the share new ideas while simultaneously creating a community of practice. In turn, teachers are encouraged to communicate and share approaches and materials using the project-supported web-page (www.scienceideas.org).

During subsequent years of project involvement, professional development is provided in a similar format but with decreasing frequency (Year 2: 3 days/18 hours for Level II Summer Institute, 4 grade-specific workshops; Year 3: 2 days/12 hours for Level III Summer Institute, 3 grade-specific workshops). Classrooms visits decrease to one time per month in years two and three while school-based, school-supported grade-level planning days remain the same. Teachers in additional years are also invited to the Sharing Success Seminars and encouraged to become involved in the web-based communication and sharing process.

The teacher leadership cadre. The *Science IDEAS* Teacher Leadership Cadre was created originally to encourage schools to accomplish high-levels of implementation fidelity. In turn, the Leadership has evolved more broadly into a capacity development component for sustainability and

school reform (Wallace et al, 2001). The initial expansion of the concept Leadership Cadre consisted of their joining project staff in assisting with the presentation of Level I professional development institutes and, in the following year, presenting the entire 2-week Level I institute to teacher in new schools. This enhanced role for teacher leaders resulted in other benefits to other project teachers and the project as a whole. First, they provided critical support for teachers in their own schools. Second, as a Cadre, they shared best practices across the two participating school districts. Third, their leadership, enthusiasm and expertise enabled the project to add new school sites (i.e., scale up) without the need to increase the number of project staff. Weiss et al (2003) have described the importance the role of teacher leaders as professional developers while still maintaining a collaborative relationship with their colleagues.

Membership in the *Science IDEAS* leadership cadre resulted from the combined components of teacher self-selection, principal recommendation and project staff recommendation. Often, teacher enthusiasts are identified during the first two-week institute, at which time initial conversation begins. In making a strong commitment to the project, cadre members agree to meet weekly to: (a) refine their own proficiency in implementing the *Science IDEAS* elements and routines at a faster rate than regular IDEAS teachers in order to develop their classrooms as models, (b) gain further understanding of the theory behind and research supportive of the model, including reviewing current literature on reading comprehension and science learning, (c) develop their capacity as mentors for new teachers and schools, and (d) collaborate with project staff in reviewing and editing professional development curricula and prepare to present summer institutes and follow-up support workshops to new participants. The teacher cadre members, in turn, receive graduate credit from the university, stipends for being professional developers, memberships to professional organizations and opportunities to attend and present at professional conferences such as the National Science Teachers Association meeting. The current cadre consists of 19 teachers selected from the 11 *Science IDEAS* schools, with more to be added in summer, 2005.

During the first year of scale-up, that is, extension of the project beyond four initial Model Schools, cadre teachers fulfilled their roles successfully as models, collaborators, mentors and presenters. Included among these activities were participation in round table discussions regarding implementation issues with teachers from prospective new *Science IDEAS* schools who had visited classrooms and had questions. In summer, 2004, clusters of Leadership Cadre teachers, under the supervision of project staff, delivered the Level I Professional Development Summer Institutes to over 150 new *Science IDEAS* teachers and participated in follow-up curriculum planning days with approximately half of these in facilitator roles.

Overview of Evaluative Findings

Fidelity of implementation. Over the course of years one and two, the overall fidelity of implementation for all participating teachers improved substantially (the increase in teachers implementing *Science IDEAS* fully (vs. partially) rose from 43 to 65 percent), a significant accomplishment of project professional development and support. In comparison, however, Leadership Cadre teachers obtained virtually perfect (100%) fidelity ratings during the same initial implementation phases, suggesting that the accelerated project development and support did indeed "fast-forward" teacher leaders' proficiency in implementing the model.

Professional development institutes. Evaluation data from sessions conducted by Leadership Cadre teachers during year 2 were rated as highly effective by participants (mean of 3.4 on a 4 3 2 1 Likert scale), a rating comparable to delivery by project staff in previous years (Romance & Vitale, 2001). After analyzing evaluation data from two concurrent Level I sessions, Leadership Cadre members in collaboration with project staff revised and refined specific aspects of the institute resulting in even higher ratings (3.8) in a subsequent Level I institute. In addition, pre-post test scores on a mastery test of participant science content knowledge also indicated effectiveness in terms of teacher understanding of core science concepts resulting from their participation in Cadre-delivered Level I institutes.

The evaluative findings provided strong evidence of the effectiveness of the project professional development model for building the expertise of participating teachers to implement *Science IDEAS* and

of development of the Leadership Cadre as a means to support the sustainability of *Science IDEAS* in present project school and the subsequent expansion of *Science IDEAS* to new schools.

Future Project Expansion of the Leadership Cadre Roles.

Building upon the success of the present project development of the Leadership Cadre as a form of capacity necessary to support sustainability and expansion of the *Science IDEAS* model, the next phase of project implementation will broaden and formalize the role of the Leadership Cadre. Within the project scale up model (Vitale & Romance, 2004, 2005), the leadership and support roles of the Cadre serve as a resource in two settings: (a) in their own schools to support sustainability and (b) in new schools to support expansion. Cadre roles within their own schools include (a) providing support to teachers new to their school, (b) providing leadership and support for grade level curriculum planning, (c) providing problem solving assistance to their teacher peers, and (d) facilitating general communication and sharing across all teachers. Cadre roles in support of other schools as the project evolved include: (a) assisting new schools who are planning to implement *Science IDEAS,* (b) providing the initial summer Level I 2-week (and curricular planning component) for teachers in new schools, (c) through release-time form schools, providing teachers in new schools with follow-up professional development and support on grade level curricular planning, (d) serving as professional mentors to groups of new teachers, and (e) facilitating professional communication among *Science IDEAS* teachers in different schools. Based on the evaluative findings to date, the project Leadership Cadre development component is expected to continue to be successful as the roles of Cadre members are expanded in the coming year.

Summary and Conclusion

The issue of teacher capacity development for scale up addressed in this paper is a critical factor in school reform. In the multi-year *Science IDEAS* scale up project, the development of a systemic professional development model for developing the capacity of teachers to implement and then support the expansion of the intervention to new sites is a critical element in scale-up success. In particular, the continuing development of teacher expertise and the accelerated development of teacher leaders as a source of capacity development is crucial if a research-validated interventions are to be sustainable and transportable to additional sites.

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