

Interventions/Outcomes Involving Teacher Leaders' Strategy of Demonstration Lesson or Modeling

Excerpted from Balfanz, R., MacIver, D.J., Byrnes, V. (2006) The implementation and impact of evidence-based mathematics reforms in high-poverty middle schools: A multi-site, multi-year study. *Journal for Research in Mathematics Education*, 37(1), 33-64.

This article reports on the first 4 years of an effort to develop and implement a comprehensive and sustainable set of evidence based curricula, professional development, and supportive whole school reforms aimed at raising mathematics achievement in high poverty middle schools. Four related analyses examine the levels of implementation achieved and impact of the reforms on various measures of achievement in the first 3 schools to implement the Talent Development (TD) Middle School Model's mathematics program that combines coherent research-based instructional materials from the University of Chicago School of Mathematics Project with a multi-tiered teacher support system of sustained professional development and in-class coaching. The first section of the article reviews the evidentiary basis for the enacted reforms, describes them, and provides information on the schools that participated in the study. The results of the study (the level of implementation achieved and the impact of the reforms on multiple measures of mathematics achievement) are detailed in the second section. The final section discusses the overall impact of the reforms and explores additional steps needed to achieve high levels of mathematical learning in high poverty middle schools.

A moderate level of implementation was achieved. TD students outperformed students from control schools on multiple measures of achievement. The average effect size, Δ , by the end of middle school was .24.

All of the middle schools in the study are large non-selective neighborhood schools that serve low-income minority populations in the School District of Philadelphia.

Intervention: A central feature of the TD Mathematics Program was the school-wide use of research-based instructional materials. In Grades 5 and 6, the schools implemented Everyday Mathematics, from the University of Chicago School Mathematics Project (UCSMP) elementary curriculum; in Grade 7, they used UCSMP *Transition Mathematics*; and in Grade 8, UCSMP *Algebra*. One of the three middle schools participating in the project was attempting to teach all students algebra in eighth grade, and one teacher at the school was already using the UCSMP series, so in this school the UCSMP *Algebra* text was adopted school wide during the 1st year of implementation. The other two schools phased in the *Algebra* text over a 3-year period in order to allow time to build both student and teacher skills. In these two schools, both seventh and eighth graders used the UCSMP *Transition Mathematics* text during the 1st year of implementation. During the 2nd year, eighth graders completed units from the last half of the *Transition Mathematics* text and the first half of the *Algebra* text. In year 3, the *Algebra* text was used from the start of eighth grade. All three schools introduced

Everyday Mathematics Grades 5 (in the two 5-8 schools) and Grades 6 in the 1st year of implementation. Thus, by the start of year 3, all three schools were offering all students the same mathematics curriculum and sequence of courses, culminating with all students taking an algebra course using a challenging *Algebra* text in the eighth grade.

Teachers were offered multiple tiers of professional development linked to the implementation of the new mathematics curriculum. Three days of summer training were followed by monthly 3-hour workshops on Saturdays. Make-up sessions were offered during the week after school. In all, teachers had access to over 36 hours of professional development per year. Following the union contract attendance was voluntary, and teachers were paid the district rate for attending training outside the school day (approximately \$20 per hour). Beginning in the 2nd year, arrangements were made with a local university to give teachers three graduate course credits if they completed 36 hours of training and related assignments. The goal was to provide teachers much more professional development than has been typically received by most mathematics teachers in the United States.

From the start, experienced peer teachers and users of the curricula led the professional development workshops. The sessions were grade specific and focused on the unit or lessons the teachers would be using during the following month. Those leading the sessions typically previewed and modeled key activities, reviewed core content knowledge and discussed appropriate classroom management strategies.

In addition to monthly professional development sessions, teachers had access to in-classroom implementation support from a curriculum coach. Each school was assigned a curriculum coach who spent 1 to 2 days per week in each school working with teachers in their classrooms. Implementation support was nonjudgmental and varied from classroom to classroom but included modeling, explaining, and co teaching, assisting with lesson planning, observing lessons and providing confidential feedback, and making sure that the teacher had all the materials needed to implement the lesson. The curriculum coach also worked with the teacher to make modifications to the curriculum based on the needs of the classroom. Overall, the coach's job was to do what it took to provide teachers with the support they needed to achieve strong implementation in their classrooms.

During the 3rd year of the effort, an initiative was started to train two to three teacher leaders from each school to be on-site trainers and implementation support personnel, with the goal of making the schools self-sustaining over time. These teacher leaders received an additional 30 hours of training per year for 2 years and provided an additional layer of support in the schools. In each school, two teacher leaders were successfully recruited and completed the 2-year training sequence, which included both professional development sessions devoted to specific topics like assessment, student engagement, and mathematical discourse, as well as opportunities to shadow curriculum coaches as they worked with teachers, engaged in lesson study, and led professional development sessions.

Each summer, the teachers were invited to work in summer work groups to develop supplemental materials to help further customize and localize the instructional materials. During the first 2 summers, four two-teacher teams developed sets of teacher notes for each unit that provided instructional and organizational tips, pacing guides, and extra-practice problem sets and homework books. During the 3rd summer, September Introductory Units were developed. These units are designed to compensate for the “broken supply lines” found in many urban schools at the start of most school years.

Excerpted from Brown, C.J., Fouts, J.T., & Rojan, A. (2001). *Teacher Leadership Project 2001: Evaluation report*. Fouts & Associates, L.L.C. (ERIC document 475748

The Teacher Leadership Project was started in the summer of 1997 with a core of 27 teachers from schools across the state. Initial participants developed a vision, mission, and a model for creating technology-rich classrooms and integrating technology into curriculum. Since that time, program funding has increased and the project has expanded considerably, adding 185 teachers during the 1998-99 school year, and 215 more teachers during the 1999-2000 school year. An additional 1,000 grade K-12 teachers from public and private schools in Washington were selected to participate in the program for the 2000-2001 school year, and it is anticipated that 2,000 more teachers will be added over the next two years.

Each TLP grant recipient receives, through their district, \$9,000 worth of hardware and software, including a laptop computer, printer, and presentation device. Computers are provided at a 4:1 student to computer ratio, and recipients receive Office software, as well as Encarta Reference and Africana, Publisher, Front Page, and access to SchoolKit. Teachers are also provided with 11 days of training over the course of their first year in the program, attending a 5-day summer session, and three 2-day sessions during the school year. Training sessions are intended to help teachers (1) develop technical skills, (2) design curriculum that utilizes technology and is aligned with the state's Essential Academic Learning Requirements, and (3) identify leadership opportunities for sharing their knowledge and skills.

TLP participants are grouped geographically for training sessions, and each "regional" group typically consists of 25-30 teachers. Regional coordinators, each of whom is supported by several other trainers, as well as a technical support person, lead the sessions. Coordinators and trainers come from within the TLP, having participated in the program for at least a year prior to taking on this leadership position. Teachers bring their laptops to training sessions, enabling them to share materials and experiment with software during their time together. Training sessions, which are held in hotel conference rooms across the state, are intense and include instructional time (philosophy, research, curriculum design and alignment, software and skills, etc), help desks (short sessions which are focused on specific technical issues), sharing, and goal setting. In addition to attending all training sessions, teachers also agree to participate in the evaluation of the project.

Each participant's school district must meet certain requirements to support their TLP teachers. Most importantly, the district must (1) agree to provide release time and classroom coverage so that teachers can attend training sessions, and (2) agree to provide technical support to maintain the equipment.

Excerpted from Edge, K. & Mylopoulos, M. (2008) Creating cross-school connections: LC networking in support of leadership and instructional development. *School Leadership and Management* 28 (2) 147-158.

One potential district-level remedy for decreasing teacher isolation and improving support is establishing mechanisms for teacher leaders to network across schools, share their experiences and collectively develop their personal and professional efficacy in their roles. A recent early years literacy project within the Toronto District School Board in Toronto, Canada presents an interesting case study of an effort to provide teacher leaders with opportunities to connect with peers to support their own school-level implementation of the reform initiative. Teacher leader networking was initiated during the third year of the Early Years Literacy Project (EYLP) when the Project's Management Team began to acknowledge a disturbing trend in teacher leader retention. There was one key factor that appeared to lead to teacher leader retention: informal networking.

At the time of this research, the Toronto District School Board (TDSB) was the fourth largest school District in North America, educating over 200,000 elementary students in its 451 elementary schools. Some 41% of TDSB elementary students speak English as their second, or third, language. The EYLP targets kindergarten to grade three classrooms. During data collection for this research, the fourth year of implementation, 93 schools were in the project.

Literacy Coordinators

At the beginning of the initiative, the decision was made to fund a half-time teacher leader, the Literacy Coordinator, within each school. These in-school teacher leaders work with teachers to support the development of their literacy teaching expertise. Throughout all 93 schools, Literacy Coordinators provide in-school needs-based professional development to all teachers. As such, LCs act as in-school literacy experts providing professional development to their peers via coaching, modeling of teaching strategies, and maintaining their school's EYLP library. Most Literacy Coordinators work in regular classes or positions within the schools in the afternoons.

LC Networks

EYLP leadership mandates that each Literacy Coordinator participate in a cross-school LC network. The project had managed to maintain the flexible parameters of the informal LC Networks by allowing LCs to select membership in existing LC networks of their choice or create new LC Networks. Within the new more formalized system, LC Networks were to meet once a month, at a time and location of their own choosing and set their own agenda and structure.

Methodology

In support of sample selection, the Project leadership provided us with a list of all active LC Networks, from which we randomly selected two of the eight active LC Networks to participate in our research study.

In the first phase of our research we engaged all 15 members of LC Network A in semi-structured individual interviews. Phase 2 involved attending a regular meeting of LC Network B and observing the process, focus and structure of their session. In Phase 3, we conducted a focus group with eight members of LC Network B, exploring their perceptions of their LC Network participation and its impact on their work, professional development and engagement within the EYLP. All interviews and groups were recorded and transcribed. Analysis of the transcriptions provided the framework for the analysis we are reporting of this research.

Excerpted from Frechtling, J., Katzenmeyer, C. (2001). Findings from the multi-agency study of teacher enhancement programs. In C.R. Nesbit, J.D. Wallace, D.K. Pugalee, A.S. Miller, & W.J. DiBiase (Eds.), *Developing teacher leaders: Professional development in science and mathematics*. Columbus, OH: ERIC Clearinghouse for Science, Mathematics, and Environmental Education.

Working through DEWG, six agencies initiated a study of professional development programs: the Departments of Energy (DOE), Education (ED), and Health and Human Services (HHS), the National Aeronautics and Space Administration (NASA), the National Science Foundation (NSF), and the Smithsonian Institution. The work was coordinated by NSF and carried out by three independent research firms—Westat, SRI International, and the National Center for Improving Science Education. In the long term, the evaluation and other efforts of the DEWG were designed to meet two basic goals:

- Identify those government-supported professional development programs in science, mathematics, and technology that are most effectively implementing and encouraging “best practice,” and
- Assessing the extent to which these programs are contributing to the national effort to improve science education in the schools.

More immediately, this evaluation was designed to document the teaching practices promoted in the selected professional development programs believed to represent best practice in science education at the time of study initiation. The study examined the impact of these programs on teachers and their teaching, assessed the extent to which dissemination took place, and determined participant satisfaction with the programs and their outcomes. In addition, the study tried to identify the contextual factors that affect a teacher’s ability to apply new learning and use new approaches in the classroom setting.

Based on an extensive review of the professional development literature available in 1994, best practice was defined in terms of four elements:

- An instructional approach that emphasizes hands-on/minds-on activities;
- A standards-based approach that aligns curriculum, instruction and assessment with local, state, or national standards or frameworks;
- Development activities that extend over time, including followup when participants return to their schools; and
- Direct involvement of participants in the scientific process.

Using these and other selection criteria, program officers from each of the six agencies nominated professional development programs they considered successful in delivering professional development in science teaching. Additional considerations governing selection were 1) stability; 2) inclusion of teachers who themselves were from populations traditionally underrepresented in science or who work with significant numbers of students from those underrepresented groups; and 3) inclusion of programs that were carried out within a systemic reform context.

Excerpted from Gersten, R. & Kelly, B. (1992). Coaching secondary special education teachers in implementation of an innovative videodisc mathematics curriculum. *Remedial and Special Education*, 13(4), p40-51

Videodisc Curriculum Prior to implementation, the four teachers attended two 1-hour training sessions in which they were provided with an overview of videodisc technology, a demonstration of how to operate the videodisc equipment, an introduction to Mastering Fractions curriculum, and guidelines for implementing the program in the classroom. This initial training taught some of the theory behind the program, demonstrated what a typical lesson should look like, and provided approximately 20 minutes of practice with the new technology.

The quantity and nature of the training were designed to parallel what is generally provided by publishers of standard curricula. The teachers were encouraged to spend time familiarizing themselves with the equipment and the content of the lessons before presenting the first lesson to their students.

Beginning in early October, participating teachers used the Mastering Fractions program with their students for a period of 6 weeks. The number of lessons each teacher covered during this time was contingent upon the day-to-day progress of the students. Most covered 20 to 25 lessons.

The teachers were “coached” for a designated period of time by the second author, an experienced special education teacher trainer familiar with both the instructional design and the technological features of the videodisc, as well as with research-based instructional strategies for teaching students with disabilities.

Coaching Coaching consisted of classroom observations, provision of specific feedback to the teachers on those observations, and evaluation of the changes and improvements in teacher performance and the impact on the students. In addition, the coach attempted to provide support for the teachers as they went through the process of implementing new teaching strategies.

The coaching process centered on instructional variables and issues deemed essential by the researchers based on our understanding of the principles underlying the program and the research on effective mathematics instruction for students with learning disabilities (Cawley, 1985; Engelmann et al., 1991; Gersten et al., 1986). Five aspects of implementation served as the focus of the observations and postobservation coaching lessons:

- Using clear, consistent language and providing explanations congruent with the videodisc curriculum’s conceptual framework;
- Spending sufficient time on each concept so that the *entire group* can successfully solve problems;
- Providing students with informative feedback when errors are made; and
- Avoiding criticism and providing encouragement and praise to students.

The coach's verbal and written feedback was intended to be constructive and nonjudgmental. It dealt with positive aspects of the observed lesson, as well as areas where improvement was desirable. The coach virtually always phrased her comments in terms of student learning and observed student behavior rather than teacher performance (e.g., "Sometimes, several of the students are waiting while you check individually whether everyone has each problem completed. Focusing a little more on your lower performers and spot-checking the others might let you pace things a little more quickly for the others.").

Occasionally the coach provided brief, in-class demonstrations or models of new techniques to further clarify the desired teaching behaviors. At other times, she made suggestions only. The suggestions were followed up in subsequent feedback sessions in her written comments regarding teacher and student progress.

Issues raised by the teachers were addressed during the feedback sessions. When responding to the teacher concerns about problems in learner behavior, the coach always stressed the link between the teacher's use of an instructional strategy and the students' learning performance. The coach tried to subtly shape the teachers' thinking about instructional interactions so that they came to better understanding the relationship between their teaching actions and student learning and behavior (Kennedy, 1991; Leinhardt & Greeno, 1986; Woodward & Gersten, 1992).

The coach also responded to logistical questions about the technology (e.g., how to operate the remote control device, where to position the monitor for best viewing), offered advice on optimal teaching behaviors for effective implementation of the program (e.g., providing feedback after quizzes, checking student classwork), and suggested classroom management strategies (e.g., seating of difficult students, reinforcing appropriate verbal responses).

Excerpted from Gigante, N.A., Firestone, W.A. (2007). Administrative support and teacher leadership in schools implementing reform. *Journal of Educational Administration*, 46(3), 302-325.

This paper aims to explore how teacher leaders help teachers improve mathematics and science teaching. Research focused on a purposive sample of seven teacher leaders selected to vary in their time allocated to teacher leader work and their content knowledge. Each teacher leader was interviewed, as were two teachers and at least one administrator working with that teacher leader. Each interview was first subjected to a mix of deductive and inductive coding before a case study was written for each teacher leader. Teacher leaders conducted two sets of leadership tasks. The paper finds that support tasks helped teachers do their work but did not contribute to teacher learning. Developmental tasks did facilitate learning. All teacher leaders engaged in support tasks, but only four did developmental tasks as well. Teacher leaders who engaged in developmental tasks had access to one material resource and three social resources not available to other teacher leaders: time to work with teachers, administrative support, more positive relations with teachers and opportunities to work with teachers on professional development.

Methods

This study is part of a larger study of teacher leadership undertaken in the context of the implementation of the New Jersey Math Science Partnership. The New Jersey Math Science Partnership (NJ MSP) was a collaboration among two universities and 11 school districts to improve students' achievement in mathematics and science across all grade levels. An important theme of the partnership was to strengthen organizational support of inquiry-oriented instruction. One way to do that was to conduct summer institutes for teacher leaders. In conjunction with these institutes, the NJ MSP encouraged partner districts both to integrate teacher leaders into their school improvement planning and to provide teacher leaders with the support needed to effectively sustain such improvement.

This study was conducted in a qualitative research tradition, specifically as a comparative case study using a naturalistic approach (Marshall and Rossman, 1999). Information about teacher leaders' work and the organizational factors influencing teacher leaders' roles was collected from teacher leaders and other informants in the setting. Interaction with these participants in their naturalistic settings helped to better understand the situational factors at play within these contexts (Spillane et al., 2001).

Sample

The population from whom the sample was taken was the group of teacher leaders who participated in the 2004 Teacher Leader Institute (TLI). Purposeful sampling (Patton, 1990) was used to select the teacher leaders who would be "information rich" in terms of this particular study, three colleagues of each, and both the district administrator and building administrator of each. The teacher leader's description of whom he/she most closely worked with determined the persons contacted for

interviews at each level. Each teacher leader provided names of his/her colleagues, three of whom were contacted for interviews.

This study was part of a larger investigation of teacher leadership by the NJ MSP. The larger study called for selecting teacher leaders who vary on two dimensions. The first was the amount of time teacher leaders are formally released to work with their colleagues. In previous studies, release time has been a substantial influence on the success or failure of a teacher leadership initiative (Lord and Miller, 2002). Release time affected teacher leaders' opportunity to interact with their colleagues as part of their teacher leadership work. The other dimension on which teacher leaders were sampled was their content expertise (see Table I).

Seven teacher leaders from the 11 NJ MSP school districts who participated the TLIs during the summer of 2004 were chosen for this study. Three of these seven participated in the 2003 TLI and a pilot study conducted that year; therefore, in these three cases, longitudinal data were utilized. All the teacher leaders worked with teachers in kindergarten through grade eight. Six teacher leaders came from school districts that were among the poorest in the state. Five of these districts had student bodies that were predominantly Hispanic. The seventh teacher leader came from a district that was in the middle of the state's income distribution and was predominantly white.

In addition to the teacher leaders, information was obtained from 19 colleagues of the teacher leaders (one to three for each of the seven teacher leaders) and 13 administrators with whom the teacher leaders worked (one was the district administrator for two of the seven teacher leaders). Some colleagues and administrators whose names teacher leaders provided to the researchers did not return calls and/or e-mails requesting their participation. In addition, one teacher leader in the non-content expert/no release time category requested that the researcher not speak to her building administrator.

Excerpted from Glazer, E., Hannafin, M., Polly, D., and Rich, P. (2009) Factors and interactions influencing technology integration during situated professional development in an elementary school, *Computers in the Schools*, 26(1), 21-39.

This study examined factors that influence K-5 teachers' technology integration efforts during a semester-long Collaborative Apprenticeship. Teacher-leaders initially modeled exemplar applications of technology-enhanced lessons and gave advice on their classroom use. Subsequently, the community of teachers brainstormed ideas collaboratively as teacher-leaders supported peers to develop original lessons independently.

Collaborative Apprenticeship has been proposed as a framework to support teaching communities during the school day and applied to promote technology-enhanced curriculum and teaching practices. Teacher leaders with advanced knowledge, skill, and experience provide situated, ongoing, just-in-time support to peers as they develop and refine knowledge, skills, and resources to use in their classrooms.

Study setting

A suburban elementary school located in the southeastern United States. Fifth-grade teachers were purposely selected. Roughly 45 minutes of shared planning time and space were allotted per day for grade-level teams to meet. Two teacher leaders and nine peer teachers participated in the study.

The first author, as participant-observer, introduced the structure of Collaborative Apprenticeship, collected data, responded to the teacher leader thoughts and concerns, and supported them through the mentoring process. Primary data sources included interviews, field notes, and reflection journals. Interviews, conducted before implementation to characterize participants' knowledge and use of technology and support for peer learning and development, were shared with teacher leaders. Throughout the study, we conducted informal interviews in response to teachers' needs or requests for clarification. We also conducted a post-interview upon completion of the study to assess technology use, to identify factors and interactions, and to establish how or whether teachers planned to continue the technology integration process. All interviews were transcribed. Field notes, focusing on support needed to integrate technology effectively, were collected on 15 occasions to document interactions during planning meetings and in shared work areas. We documented the first-author's participation with the teacher leaders to guide analysis of the field notes. As teachers implemented technology-enhanced activities, they wrote reflection statements about the activity and their plan for subsequent efforts. Teacher leaders maintained biweekly journals to document support of peers' development and strategies used for collaborative planning.

Analysis

Nine preliminary reciprocal interactions elements and six related elements were used to organize data. Thematic analysis of the coded data initially focused on patterns that emerged in prevalent reciprocal interactions and factors. As data were added, initial

assertions were generated regarding relationships and distinctions and refined based on new information or discarded in the presence of conflicting information until saturation. More than 200 assertions were posited by a six-member research team to account for the classifications. Findings were shared for a member check with the teaching community and codes were revisited to resolve assertions in questions.

Excerpted from Manno, C.M., & Firestone, W. (2006). *Content is the subject: How teacher leaders with different subject knowledge interact with teachers.* Unpublished manuscript submitted for publication.

This study focused on eight teacher leaders who participated in a professional development program for teacher leaders—the Teacher Leader Institute—presented by the New Jersey math Science Partnership (NJ MSP). The NJ MSP was a consortium of two universities and 11 school districts working together to improve student achievement in mathematics and science through a variety of means. One strategy was to strengthen leadership for change, in part by helping districts to identify and prepare teacher leaders to support other changes being supported by the MSP. TLIs were held in the summers of 2003 and 2004 with follow-up activities during the year and the following summers. Districts sent cohorts of teacher leaders to develop a vision for improved math and science instruction, improve their content knowledge, and learn how to work with their peers.

A two-person team observed the 2003 TLI for two days and interviewed 18 participants. These observations were repeated during the 2004 TLI. More important, a sample of eight teacher leaders was identified to follow during the upcoming academic year to learn about a variety of issues, including how their content knowledge influenced their work as teacher leaders. Here we briefly describe the sample, methods of data collection, and data analysis strategies.

Sample

A purposive sample was selected among participants in the 2004 TLI to obtain variation on two dimensions. The most important was content expertise. A *content expert* was defined to have a minimum of an undergraduate major in the teacher leader's content area and teaching certification in that area. A non-content expert was defined to be a teacher leader without a major and certification in the content area, either mathematics or science.

Excerpted from Moore, J.L. (1992). The role of the science co-ordinator in primary schools. A survey of headteachers' views. *School Organisation*, 12(1), 7-15.

Following the introduction of the National Curriculum it may be expected that the role of curriculum specialist has been further enhanced as schools are called upon to deliver new sets of content and meet new standards. The co-ordinators' role may be especially significant in science, a core subject of the National Curriculum and one in which many primary schoolteachers have traditionally felt under-qualified.

Training in a subject specialism such as science is now an established part of primary courses of ITT. Subject specialism modules are regarded by some as basic training for assuming the role of co-ordinator. Pre-service training needs to be extended through suitable programmes of In-service Education and Training (IN-SET). Regardless of how they are trained, co-ordinators have to apply their skills in the context of their own school. The Headteacher plays a key part in determining this context and in deciding the role of the co-ordinator. To be effective change-agents science co-ordinators need resources, time and the moral support and encouragement of their Headteachers to carry out clearly defined duties.

Because Headteachers determine both the context and purposes of the coordinators' work, it seemed worthwhile to try to discover their views about science co-ordination. The study was guided by a wish to discover Headteachers' views per se rather than to determine whether or not they were congruent with a particular model of co-ordination or a chosen set of recommendations.

Method

In a pilot survey to be reported elsewhere 20 Headteachers of one local education authority (LEA) were interviewed and asked to describe the role of the science coordinator. If they were not mentioned spontaneously, direct questions were asked about the co-ordinator's role in curriculum development, their responsibility for resources, and the ways in which he or she helped colleagues with science teaching. The pilot survey confirmed that there was a range of Headteachers' views on the work of science coordinators and that a wider survey would be worthwhile.

A questionnaire was drawn up from the pilot survey interviews. Small revisions were made after consultations with two primary Headteachers. The questionnaire which was limited to a single folded A3 sheet, contained four parts. The first asked for a statement of the co-ordinator's role, work in developing the science curriculum and responsibility for resources. The second part asked the Headteacher to indicate on a list the ways in which they wished the co-ordinator to support colleagues in their science teaching. The third part asked about sources of help and information for co-ordinators and the skills needed for the role. The final section asked for the Headteachers' views on the responsibility the co-ordinator should have for deciding on resources, teaching methods and teaching activities.

Excerpted from Race, K.E.H., Ho, E., & Bower, L. (2002). *Documenting in-classroom support and coaching activities of a professional development program directed toward school-wide change: An integral part of an organization's evaluation efforts*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA.

The Teachers Academy for Mathematics and Science is a non-profit organization located in Chicago. The Academy offers an intensive 3-year professional development program designed to meet the needs of under-prepared elementary school teachers in Chicago and select school districts in Illinois (Brett, 1996). The program is directed toward high-risk schools, where the proportion of students that are not making grade-level standard in mathematics as well as science is high and evident across grades. The program recently underwent a major redesign effort to better serve the needs of its target audience. As revised, the program content is offered by instructional level (i.e., primary, intermediate and upper grade levels) that blends mathematics and science curricula with technology. The program is designed to provide 60 hours of professional development instruction per year for two years that is developmentally appropriate by grade-level, based on national and state standards in mathematics and science, content driven and inquiry based using nationally recognized curricula.

In addition, 15 contacts occur, which involve coaching and reflective instructional support in the classroom per year during the first two years. The intent of these classroom visits is to facilitate the transfer of program content and pedagogy by the teacher into the classroom through modeled lessons by professional development staff, co-taught lessons, and observed lessons. This implementation support offered through the Academy program differs in at least one important feature from the *clinical teaching experiences* that are reported in the literature. The latter approach involve observing and providing feedback to teachers who are attempting new methods in an environment away from the classroom where they typically teach. Assessment of these clinical teaching experiences suggests, however, that these teachers have had difficulty applying these newly learned practices once back and their home schools (Miech, Nave & Mosteller, 2001). In contrast, the Academy's program component offers this support during visits conducted *in the actual classroom where the teachers typically teach* with reflective discussion and planning conferences happening before and/or after these visits. Also, during the course of these visits it is intended that this implementation support move from a high level of intervention in the classroom by professional development staff (by modeling a less9s) or co-teaching) to less involvement by the professional developer based on observation-only classroom visits. Thus, the potential for transfer of best practices from program instruction to classroom teaching theoretically should be greater using this model. The program is also supported by distributed teaching materials, student manipulatives, and technology resources (Feranchak, Avichai, Langworthy & Triana, 2001). The overall program intervention occurs within the context of a school-wide systematic effort that requires that a high percent of mathematics and science teachers within each school participate in the program and includes a program outreach to principals and school administrators as well as parents and community members. The third year provides a year of transition to help the school sustain progress after the program.

Excerpted from Ruby, A. (2006). Improving science achievement at high-poverty urban middle schools. *Science Education*, 90, 1005-1027.

A large percentage of U.S. students attending high-poverty urban middle schools achieve low levels of science proficiency, posing significant challenges to their success in high school science and to national and local efforts to reform science education. Through its work in Philadelphia schools, the Center for Social Organization of Schools at Johns Hopkins University developed a teacher-support model to address variation in science curricula, lack of materials, and under prepared teachers that combined with initial low levels of proficiency block improvements in science achievement. The model includes a common science curriculum based on NSF-supported materials commercially available, ongoing teacher professional development built around day-to-day lessons, and regular in class support of teachers by expert peer coaches. One cohort of students at three Philadelphia middle schools using the model was followed from the end of fourth grade through seventh grade. Their gains in science achievement and achievement levels were substantially greater than students at 3 matched control schools and the 23 district middle schools serving a similar student population. Under school-by-school comparisons, these results held for the two schools with adequate implementation. Using widely available materials and techniques, the model can be adopted and modified by school partners and districts.

In this study, the author examines whether the Talent Development model improves science achievement.

The Talent Development model provides four tiers of support: (1) an implementable curriculum, (2) ongoing intensive teacher professional development, (3) in-classroom support from peer coaches, and (4) mechanisms to foster and sustain changes in science instruction, including opportunities for science teacher cooperation and development of teacher leaders.

The TD model uses science curricula developed with the support of the National Science Foundation including the Full Option Science System (FOSS) developed by the Lawrence Hall of Science, University of California—Berkeley, and Science and Technology for Children (STC) developed by the National Science Resources Center. These science materials focus on depth of understanding of a topic rather than breadth over multiple topics. Built around hands-on activities but requiring significant amounts of student planning and analysis, these materials allow students who may be behind in not only science but also reading and math to readily take part in lessons and learn the concepts and vocabulary.

Outside the classroom professional development is provided through a multiyear sequence of monthly workshops that is grade, curriculum, and content specific for which teachers can earn graduate credit. During the first year, the workshops focus on the materials and lessons teachers will be teaching in the next month, the content knowledge behind the lessons, and the pedagogical techniques to use while teaching them. This focus on what will be taught in the next lessons distinguishes the model's professional

development from the traditional generic workshops that have failed to change teacher practices and student achievement (Killon, 1999; McLaughlin & Oberman, 1996). In later years, the focus shifts to deepening teacher content knowledge, increasing student-generated inquiries, and pedagogic challenges. At the same time, the basic professional development continues to be provided for new teachers in response to teacher mobility.

In-classroom support available on a weekly basis over the entire school year is provided by expert peer coaches familiar with the curriculum and middle grades' pedagogy. Teachers and classes vary in their abilities and needs. Peer coaches see the teachers and classes in action and help teachers adapt the professional development and materials to the specific needs of their classes using such techniques as model teaching, co-teaching, and critical observation with confidential feedback. In this way, they help the teacher customize the science reform to their class and their own needs in a way that maintains its desired impact. For example, teachers may not be comfortable with use of hands-on activities done in cooperative groups because they themselves lack the skills to manage this type of work or their students cannot successfully work together. In response, a teacher may turn to demonstrating the activities, which solves their own classroom management concerns but frustrates the purpose of using a hands-on centered curriculum. A peer coach in the classroom sees why the teacher has turned to demonstrations. They can offer the teacher specific responses to the problem, such as explicit teaching of social skills students need to work in groups, strict student roles within groups that offer the teacher more control, or better teacher preparation and time management to avoid lags during class, which will allow the use of student activities. As both teacher and students become accustomed to hands-on instruction, the peer coach can advise the teacher on reducing the structure and increasing the role of students.

In-school leadership and supporting structures are needed to maintain the sustainability of the instructional changes. Peer coaches' knowledge of the science faculty and the curriculum, and their ability to work with the school administration allows them help establish such structures as regular science faculty meetings, times for teachers to observe others' teaching, and mentoring of new teachers. These structures allow teachers to support one another, share ways to improve instruction, and help induct new teachers. Such structures built into the school schedule (versus remaining informal) are easier to maintain and receive greater support from school administration. Peer coaches are in position to identify excellent teachers who can become the trainers for new science teachers. These teachers receive additional professional development in how to train new teachers, then act as co-trainers with the coach, and finally take the lead in training workshops.

Matched Schools: The study features 3 Philadelphia schools in which the TD model was implemented, which were matched with control schools. Treatment schools 1, 2, and 3 are briefly described below.

School 1 – School 1 had the weakest implementation for the cohort studied due to an initial lack of funds to purchase materials. In the first year, the program provided supporting materials and training through classroom visits and after-school trainings. FOSS and STC science materials were purchased first with grants from the Urban

Systemic Initiative and later using school funds. These were incorporated into the curriculum first in the fifth grade and moving up through the sixth and seventh grades over time, often too late to have a major effect on the relevant cohort and teacher in-class and after-school training were provided.

School 2 – School 2 had the strongest implementation for the cohort studied. After developing a school wide science curriculum, School 2 used school funds to purchase the science materials and supplemented these with others from the Franklin Institute science Museum. Additional materials for all grades were purchased with a grant from the Urban Systemic Initiative. With the provision of monthly professional development and in-class support, implementation was strong for the next 2 years of the study, especially for the lower grades. Seventh grade suffered from extreme science teacher turnover but the continued provision of the basic level of professional development maintained a strong implementation.

School 3 – had a medium level of implementation for the studied cohort, but these students received 1 less year of exposure to the treatment as they entered the school in sixth grade. In Year 1, the science faculty developed a standard curriculum and attended after-school and in-class professional development built around the science materials purchased by the school for sixth grade. The next year saw the purchase of materials for the seventh grade and the continuation of the same level of professional development leading to strong implementation in the sixth grade and medium implementation in the seventh grade.

Excerpted from Silva, D., Gimbert, B., & Nolan, J. (2000). Sliding the doors: Locking and unlocking possibilities for teacher leadership. *Teachers College Record*, 102 (4), 779-804.

This article contributes to our understanding of third wave teacher leadership by describing the findings of three exploratory case studies of teacher leaders who lead from within the classroom on behalf of students. When the stories are taken individually, they may be considered as just another case of failed teacher leadership. However, this study is a collection of stories recounting the experiences of classroom teachers who have tried to lead. Collectively, these stories provide us with a deeper understanding of the components of teacher leadership and an appreciation for those who try to lead from within their classroom. A case study approach was selected for this study in an effort to gain rich and meaningful insights into the work of these teacher leaders. Specifically, the study raises the voices of three teacher leaders who describe what it is like to lead from within their own classrooms. Their stories allow us to capture (1) what teacher leadership *is* from within the classroom and (2) how teachers, who predominantly lead from the classroom, experience teacher leadership.

These leaders were selected using a “unique case selection” procedure, which encourages participants to be selected based on a unique attribute inherent in the population (Goetz & LeCompte, 1984). Each of the teachers selected met the following criteria: they had taught 10 or more years, they were nominated as teacher leaders by at least three peers within the district, they viewed their primary responsibility as a classroom teacher, and they have a history of serving the district in recognized leadership roles (e.g., curriculum writing committee). Nominations for teacher leaders were solicited through phone interviews asking both elementary and high school teachers within the district to nominate colleagues they felt demonstrated teacher leadership from within the classroom. The teachers selected were nominated by at least three colleagues as teacher leaders. These teachers were then invited to participate in the study and each teacher who was asked agreed to participate in the study. Additionally, I feel it is important to acknowledge that I have had the opportunity to work in some capacity with each of the three teachers prior to this study, which I believe provided a heightened level of trust between myself and the participants.

Excerpted from Vesilind, E.M., & Jones, M.G. (1998). Gardens or graveyards: Science education reform and school culture. *Journal of Research in Science Teaching*, 35(7), 757-775.

Two elementary teachers and their schools were randomly selected from a pool of 24 lead teachers from 12 schools participating at one of eight sites in a statewide reform project (See also Franklin, 1992, 1993; Miller, 1995; Nesbit & Wallace, 1994; Nesbit, Wallace, & Miller, 1995; Vesilind & Jones, 1993.)

The project sought to integrate school-based planning, leadership development, and peer training to improve elementary mathematics and science education. Two teachers from each school participated in a 3-week institute, 3 follow-up training days during the school year, and a 1-week institute during the second summer. One goal was that lead teachers would “work with their colleagues to implement plans for improving mathematics or science instruction at schools.” A second goal was for lead teachers to become “peer teachers” at their schools (Franklin, 1993). As researchers, we were not part of the project implementation.

When lead teachers joined the project, they were asked to work with their principals to administer an assessment instrument to all teachers in their schools and to use the results to develop a vision for their science or mathematics program. At both schools in this study, the school improvement plans were about science programs. After the school improvement plans were designed, lead teachers attended a 3-week summer institute at a nearby university. For both schools in this study, only one lead teacher participated fully in the summer institutes.

The regional institute attended by the teachers in this study focused on resources and materials for teaching, with some presentations about science content knowledge. Teachers also learned about staff development materials and workshops such as Project Learning Tree and LifeLab. Instructors hoped to build lead teachers’ confidence and enthusiasm through group activities and hands-on demonstrations. Instructors expressed concern about the teachers’ comfort level with content knowledge and said they did not want to threaten teachers with more science content than the teachers were ready for. One lead teacher told us that the main idea she got from one of the more didactic science content presentations was the insight that she herself does not learn by listening. She asked, “So how can I expect my students to learn that way if I can’t do it myself? They have to be active, just like me.”

Through voluntary sharing among teachers, issues of school culture emerged as part of the informal institute agenda. For example, both lead teachers in this study described to us their excitement about working as colleagues with their principal or assistant principal to draft the school improvement plans. When lead teachers shared news in the institutes and follow-up meetings, they frequently described evidence of their principals’ interest or lack of interest in the project. According to lead teachers, a most valued sign of principals’ support was the giving of extra planning time to lead teachers.

Although peer coaching was recommended by institute leaders as an effective tool for staff development, the lead teachers in this study neither received training in peer coaching nor perceived any expectations to use peer coaching. Rather, the lead teachers left the first institute with notebooks of resource information and plans for exemplary classroom activities, which they intended to use and share in their schools.

Excerpted from Wallace, J.D., Nesbit, C.R., & Miller, A.S. (1999). Six leadership models for professional development in science and mathematics. *Journal of Science Teacher Education*, 10(4), 247-268.

The project on which this study is based was conducted by the University of North Carolina's Mathematics and Science Education Network (MSEN) and funded by a three year-grant from the U.S. Department of Education's Fund for the Improvement and Reform of Schools and Teaching (FIRST). The FIRST project was developed to improve elementary school science and mathematics in North Carolina by supporting teams of two lead teachers and their principals from 180 schools across the state.

To bring about this improvement, the teams of lead teachers made an assessment (Franklin, 1990) of the strengths and weaknesses of their schools' science or mathematics programs. Each team then developed a School Improvement Plan (SIP) designed specifically to meet their school's needs. Based on these School Improvement Plans, Program Coordinators at each university site planned a unique two-year professional development program for lead teachers that was designed to help each school carry out its plan.

The project was conducted at seven sites during years one and two and eight sites during years two and three—thus a total of 15 separate programs were provided. Seven programs focused on science, six on mathematics, and two on both subjects. The professional development programs included:

1. Orientation and Planning Presessions—Lead teachers and their principals learned about the project, completed a science and/or mathematics needs assessment, and each team analyzed their school's results. At most sites, these preliminary sessions also included some “visioning” activities; that is, teachers and principals were shown what an ideal elementary mathematics or science program might look like according to current national standards. Finally, lead teachers used needs assessment data and input from their faculty to develop a School Improvement Plan.

2. Summer Institute—Lead teachers at each site attended a three-week Summer Institute (approximately 75 hours) designed to help them implement their School Improvement Plans.

3. Academic Year Follow-up Sessions—During the year, teams at each site met approximately six times to receive additional training and to discuss successes, problems, and strategies.

4. Summer Workshop—A final one-week workshop (approximately 25 hours) provided additional professional development activities and future planning for the project's lead teachers.