7-2010

Collaborative Evaluative Inquiry: A Model for Improving Mathematics Instruction in Urban Elementary Schools

Iman C. Chahine
Georgia State University, ichahine@gsu.edu

Lesa M. Covington Clarkson
covin005@umn.edu

Journal of Urban Mathematics Education
July 2010, Vol. 3, No. 1, pp. 82–97

Collaborative Evaluative Inquiry: A Model for Improving Mathematics Instruction in Urban Elementary Schools

Iman C. Chahine
Georgia State University

Lesa M. Covington Clarkson
University of Minnesota

In this article, the authors describe the cyclical process of a collaborative evaluative inquiry project and the data collected throughout the project—data that not only informed "next steps" during the project but also show promise in documenting the benefits of such projects. Over a period of 18 months, seven elementary teachers from a K–6 urban elementary school collaborated with university personnel using Parsons's (2002) Evaluative Inquiry Model, a 5-stage, cyclical model that includes defining, planning, and investigating challenges; collecting, analyzing, and synthesizing data; and communicating findings that transpire through collaborative inquiry. Overall, the project focused on improving the elementary teachers' skills of inquiry and, in turn, their mathematics instruction and students' learning outcomes. The long-term goal was to enhance teachers' roles in their schools by affording them the opportunities to make informed decisions throughout their teaching based on an effective and skillful use of data.

KEYWORDS: collaborative inquiry, data-based decision making, mathematics instruction, urban schools

Attempts to improve mathematics instruction within school-based communities have become an increasingly prevalent topic in the reform era. Stories of successful collaborative endeavors within the discipline of mathematics education between schools and professional development institutions have been reported worldwide (see, e.g., Kooper, Wagner, Breen, & Begg, 2003). Such promising experiences are inspiring and involve collaborative efforts between teacher educators and K–12 teachers within preservice and inservice teacher education and professional development programs immersed in school contexts.

In this article, we aim to assist mathematics teacher educators and elementary teachers in planning and engaging in collaborative projects by describing the cyclical process of a collaborative inquiry project and detailing how data were collected throughout the project—data that not only informed "next steps" during

IMAN C. CHAHINE is an assistant professor in the Department of Middle-Secondary Education and Instructional Technology in the College of Education, at Georgia State University, P.O. Box 3978, Atlanta, GA 30302; email: ichahine@gsu.edu. Her research interests include ethnomathematics, situated cognition, problem solving in nonconventional settings, and multicultural mathematics.

LESA M. COVINGTON CLARKSON is an assistant professor in the Department of Curriculum and Instruction at the University of Minnesota, 159 Pillsbury Drive, SE, Peik Hall 230, Minneapolis, MN 55455; email: covin005@umn.edu. Her research interests include urban mathematics education, the gap in mathematics achievement, and the teaching and learning of problem solving.

the project but also show promise in documenting the benefits of such projects. While a few studies have empirically investigated the effects of collaboration, still fewer have assessed the fidelity of implementation of such efforts and the possible long-term impact (Hagen, Gutkin, Wilson, & Oats, 1998). The absence of evaluative research on collaborative projects often makes it difficult to correctly infer such projects' actual success in schools. Consequently, several researchers have endorsed evaluative research that incorporates mixed methods approaches that aim at assessing quantitatively and qualitatively possible changes in student academic performance and shifts in teachers' attitudes and beliefs as a result of participating in collaborative projects (Gable, Mostert, & Tonelson, 2004). With the various encouraging findings reported about collaboration in school-based settings, one goal is ubiquitous: to evaluate the success or failure of collaboration in improving students' learning.

Collaborative Endeavors: A Brief Review

Over the past 2 decades, a handful of research projects have explored the issues of collaboration worldwide and across several educational contexts. Using a variety of research designs across multiple settings, emphasis has been placed on exploring possible ways through which collaboration influences instruction in the mathematics classroom. For example, Nelson (2009) examined the effects of using collaborative inquiry on secondary mathematics and science teachers' learning when immersed in professional learning communities in a U.S. school. A number of critical questions that addressed potential gaps between a communal vision of student learning and achievement were generated and prospective challenges and difficulties emerged, specifically when questions regarding the teachers' practices unfolded.

Southwood and Kuiper (2003) examined the experiences of primary grade teachers involved in the Mutual Support Project for encouraging and facilitating collaborative support among teachers in South Africa. In this naturalistic and biographical case study, Southwood and Kuiper highlighted several dimensions that emerged during collaboration, including the dynamics and complexities of interpersonal relationships.

In a larger-scale project, Nisbet, Warren, and Cooper (2003) investigated potential ingredients for the success of professional development projects on performance-based assessment in Australia. Approximately 300 teachers serving as facilitators for their peers were involved in 107 professional development courses delivered as workshops and seminars. Although only 10% of the teachers continued as facilitators by the end of the project, Nisbet et al. reported a number of successful school-based events that they related to essential characteristics for teachers/facilitators, including teachers' beliefs and knowledge base, skills in performance assessment, and perceptions of improvement in students' mathematical performance.

Huffman and Kalnin (2003) described the collaborative professional development efforts of using student achievement data to improve the teaching of mathematics and science in Minnesota school districts. An explicit goal of the professional development project was to build partnerships between schools and communities through joint involvement in collaborative inquiry that employed data-based decision making to enhance the academic performance of students.

Despite the growing body of studies investigating collaborative efforts across educational settings, the majority of empirical research remains somewhat porous. Interestingly enough, studies on collaborative efforts that focus on teacher professional development often place greater emphasis on the process of collaboration and less attention toward the outcomes of those efforts (Gable, Mostert, & Tonelson, 2004).

The Collaborative Evaluation Communities Project

The Collaborative Evaluation Communities (CEC) project is a National Science Foundation (NSF) funded project that was created through a leadership collaboration between faculty at the University of Kansas and the University of Minnesota and aimed at building partnerships between schoolteachers, university professors, and graduate students. The CEC project has a number of long- and short-term goals. For example, one long-term goal, engaging in collaborative inquiry, aims to encourage teachers to develop the necessary skills as teacher action researchers in their respective classrooms. Another long-term goal is to provide teachers with the opportunities (and skills) to effectively use data to make informed decisions regarding instructional challenges. In somewhat similar fashion, one short-term goal aims to support teachers in finding potential solutions to immediate challenges posited by inquiry and to develop possible plans of action to resolve impeding issues that occur in their daily practice. The CEC project is currently in its final year.

Collaborative Evaluative Inquiry

In this section, we describe, in detail, how members of the CEC project used evaluative inquiry as the foundation for a collaborative project that focused on improving elementary teachers' skills of inquiry and, in turn, their mathematics instruction and students' learning outcomes. A fundamental motivation for the collaborative inquiry project was to support teachers as they built collegial relationships through inquiry: learning from each other in their day-to-day practices, assisting each other in solving teaching problems by sharing craft knowledge, and celebrating each other's successes. Over a period of 18 months, seven elementary teachers collaborated with university personnel using Parsons's (2002) Evaluative Inquiry Model, a 5-stage, cyclical model that includes defining, planning, and investigating challenges; collecting, analyzing, and synthesizing data; and communicating findings that emerge through collaborative inquiry. The long-term goal of the project was to enhance teachers' roles in their schools by affording them the opportunities to make informed decisions throughout their teaching based on an effective and skillful use of data.

Throughout the project, teachers were continually encouraged to practice and improve their evaluative inquiry skills by examining students' outcomes and reflecting on their daily teaching practices. Although the focus was primarily on students' learning throughout the inquiry process, instructional experiences were continuously examined by collaborative teams to understand how different practices relate to student attainment of the required mathematics skills elicited in the district's reform-oriented mathematics curriculum.

The Context

Banneker Elementary School is a K–6 urban magnet school in the Midwest with a focus on academic excellence. According to 2005 school records, the school is comprised of a team of 65 staff members; 26 are licensed teachers with varying degrees and experiences. Of the 26 teachers, 38% hold a Masters' degree and have more than 10 years of teaching experience. Banneker has been implementing *Everyday Mathematics* (University of Chicago School Mathematics Project, 2004); a reform-oriented mathematics curriculum adopted by the school district for grades 1 through 5.

Banneker serves approximately 350 students, from kindergarten through sixth grade with an average student–teacher ratio of 13:1. Though the school is regarded as "diverse," according to the 2005 demographic data reported by the State Department of Education, slightly more than 80% of Banneker's students were African American in comparison to less than 30% in the school district and less than 10% in the state. Additionally, 20% of the students received special education services in comparison to 17% in the school district and 13% in the state. Banneker earned a state rating of a 3 (out of 5) stars for mathematics, meeting the federal accountability requirement during the 2004–2005 academic year.

The Participants

Two teams were involved in the project**:** the *Action Team*, which had the lead role, and the *Evaluative Inquiry Team*, which acted as the support team (Parsons, 2002). The Action Team was comprised of four grade 1 and three grade 2 teachers. One of the 1st-grade teachers taught special education students in a selfcontained classroom; mainstreamed special education students were present in the other classrooms included in the study. Forty-six grade 1 and 52 grade 2 students filled the classrooms. The primary role of the Action Team was to identify potential challenges that impede students' learning and to design and implement sets of learning experiences that address these challenges as well as help achieve intended learning outcomes.

The Evaluative Inquiry Team included two university professors, one from mathematics education and the other from educational psychology, and several graduate students in mathematics or science education. Responsibilities of the Evaluative Inquiry Team included facilitating the entire inquiry process and providing step-by-step feedback to the Action Team by analyzing student assessment data, observing mathematics lessons, suggesting possible interventions, and reviewing literature for relevant information.

The Process

The Evaluative Inquiry Model (Parsons, 2002) cycle involved five basic tasks delivered chronologically over an 18-month period. The tasks or stages include: position the inquiry, plan the inquiry, collect data, analyze and synthesize data, and communicate findings (Parsons) (see Figure 1). At each stage, data were collected and analyzed in an attempt to hypothesize and test assertions that surfaced during the cycle.

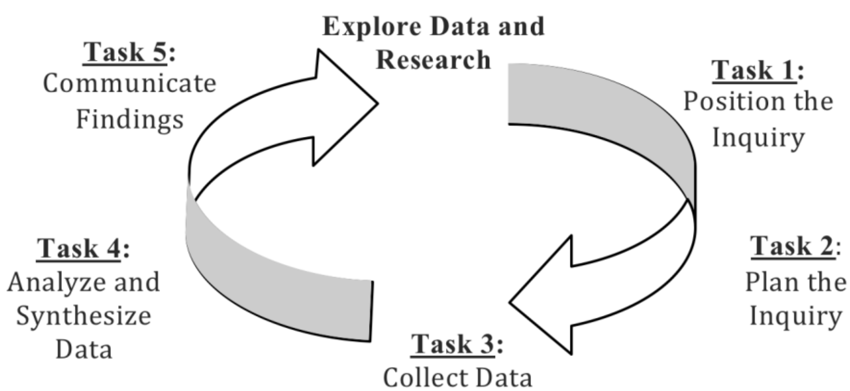

Figure 1. Evaluative Inquiry Model (Parsons, 2002)

Task 1: Position the Inquiry. This stage involved basic orientation for both teams by defining roles and responsibilities within and across teams, brainstorming needs, and developing clear challenge statements to be investigated. A five-scale Collaborative Evaluation Community survey was given to the participating teachers at the beginning of the project. This survey consisted of 41 items and was designed to examine teachers' initial attitudes and beliefs toward different instructional practices and various aspects of school climate. The same survey was administered at the end of the 18-month period and pre- and post-data were compared to assess the impact of the project on teachers' attitudes, beliefs, and behaviors.

Over 4 months, both teams attended regularly scheduled meetings. In addition, the Evaluative Inquiry Team regularly visited the school and observed participating teachers' classrooms. During the meetings, the Action Team presented preliminary statements of the curriculum challenges to be investigated and delineated potential inquiry plans. Such challenges included: determining appropriate pacing of the mathematics curriculum, prioritizing student attainment of learning goals, motivating students to learn mathematics, and meeting the district's pacing goals by so on and so forth.

An important outcome of this stage is the portrayal of an *Action Inquiry Map* (AIM) (Parsons, 2002) that includes a clear statement about the theme and target of inquiry. The theme of inquiry, developed collaboratively, was students' low mathematics achievement and the target of inquiry was students' attainment of short- and long-term learning outcomes (also known as *secure skills* in the *Everyday Mathematics* curriculum) on school and state-based assessments (see Figure 2).

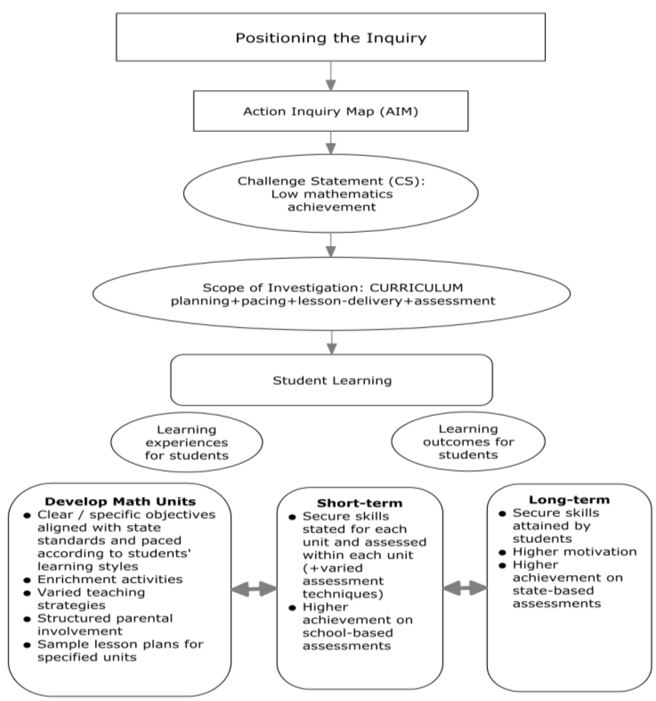

Figure 2. Evaluative Inquiry Model – Task 1: Position the Inquiry.

Task 2: Plan the Inquiry. The second task was initiated with a 2-day workshop organized and presented by the Evaluative Inquiry Team. The workshop provided the opportunity for the teams to set the stage for planning the inquiry by revisiting previous efforts, reviewing analysis of teachers' surveys, and finalizing the challenge statements. Tasks and timelines were also developed and decisions on what data were needed and which instruments to be used were discussed and agreed upon by both teams in preparation for the next task (see Figure 3).

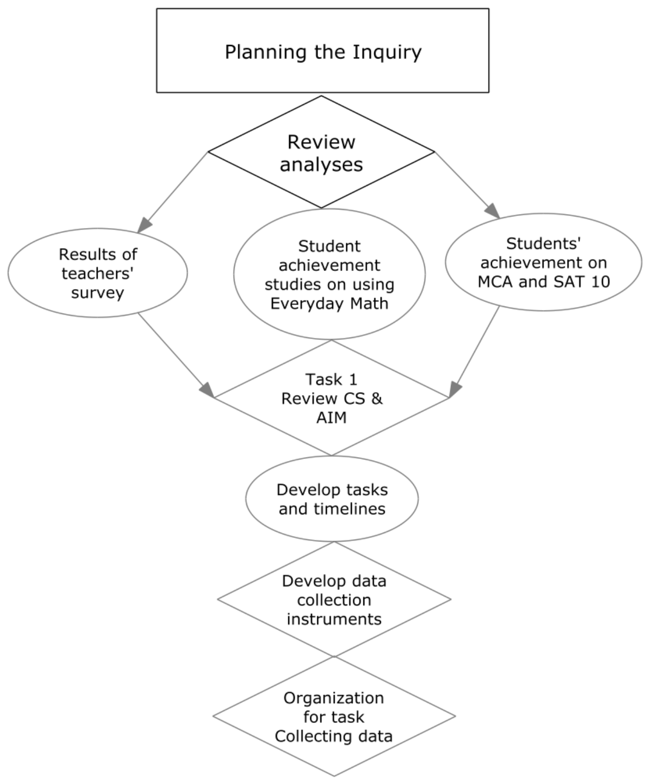

Figure 3. Evaluative Inquiry Model – Task 2: Plan the Inquiry.

Task 3: Collect Data. Building on the workshop recommendations, Task 3 was initiated. This task involved collecting data that provided sufficient information on students' performance, which, in turn, helped establish the basis for informing decisions regarding planning new learning experiences and developing different teaching strategies (i.e., interventions). During the project, we employed a mixed methods research design. Quantitative data included students' pre- and post-assessment scores as well as teachers' responses to survey questionnaires. Qualitative data included audio-taped and transcribed students' responses to questions asked during semi-structured clinical interviews, field notes of classroom observations, videotaped classroom interactions during the implementation of interventions, teachers' written explanations and reflections on videotaped classroom interactions, and audio-taped conversations within and across teams' focus group discussions. In collecting a combination of quantitative and qualitative data throughout the project, the often-discrete separation between data collection and data analysis collapses in favor of a more integrated cycle of actions and reflections that informs and documents progress. In other words, these multiple data sources not only informed next steps during the project but also show promise in triangulating findings when documenting the benefits of the project. It is important to note that, in the discussion that follows, we are not reporting conclusive findings but rather demonstrating how multiple data sources might inform collaborative projects and show promise in documenting the benefits of such projects.

Task 4: Analyze and Synthesize Data. A data collection and analysis sub-cycle was developed for each quarter of the academic year. This cycle motivated an interrelated chain of actions and reflections based on the data that evolved as a result of incorporating the Evaluative Inquiry Model (Parsons, 2002) in the daily teaching practices of the participating teachers. This sub-cycle was implemented in five stages (see Figure 4).

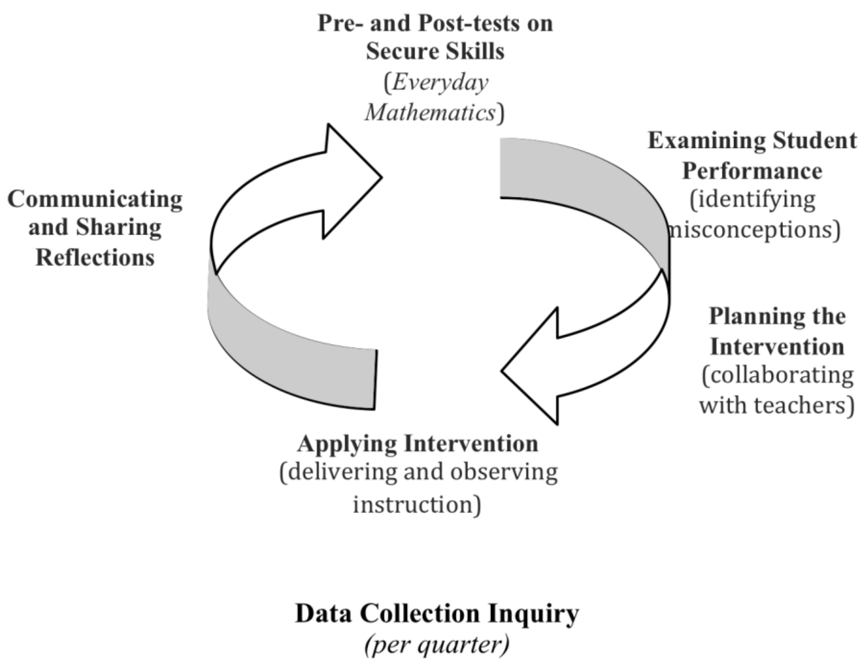

Figure 4. Evaluative Inquiry Model – Task 4: Analyze and Synthesize Data.

Stage One. The first stage included assessing students' prior knowledge of the secure skills that were required for the designated quarter. Written pretests were prepared by the Evaluative Inquiry Team and were administered for both grades. The pretest for grade 1 consisted of 12 items extracted from the *Everyday Mathematics* assessments and focused on the six secure skills required for the first quarter of grade 1. The pretest for grade 2 had 18 items and focused on the 13 secure skills required for the first quarter of grade 2.

Stage Two. This stage involved examining students' performance on the written pretests. Pretests for both grades were corrected, scored, and percentages of correct answers were computed for each grade and for each classroom. Students' scoring data were organized and represented in bar graphs. Both teams analyzed data representations that indicated the overall results of students' scores for all classes within the same grade, and individual classroom graphs.

Stage Three. The third stage involved implementing the collaboratively planned intervention derived from the analysis of students' scoring data gathered in the second stage. Members of the Action Team delivered the intervention during their regular instruction while a member of the Evaluative Inquiry Team observed the lesson. Separate intervention activities were developed for each grade. The intervention for grade 1 targeted basic secure skills on money concepts such as showing money with coins; exchanging and using fewer coins; and finding amounts of money using pennies, nickels, dimes, quarters, and so forth. The grade 2 intervention included enrichment activities for measuring length to the nearest inch and ½ inch and to the nearest centimeter and ½ centimeter, using a ruler to measure a specified length in both inches and centimeters.

Stage Four. In this stage, analyses of students' learning outcomes after the interventions and teachers' implementation of the interventions were conducted. An evaluative inquiry was carried out on three tiers: students' learning outcomes in each quarter, teachers' levels of implementation of the intervention, and the relationship between students' learning and teachers' levels of implementation.

Student learning. An analysis of students' learning outcomes was conducted on students' scores on pre- and post-tests within and across the four quarters. Descriptive bar graphs were used to represent data. Students' learning outcomes were computed by calculating percentages of correct answers, percentages of partially correct answers, and percentages of incorrect answers within and across the classes for each grade level. Results of the analyses of students' scores on the pretests varied across classes and across grade levels. Of the six secure skills pretested in grade 1, students scored lowest on counting and exchanging money skills. Money skills also seemed to be a stumbling block for grade 2 students. Of the 13 skills pretested in grade 2, the success rate for identifying the correct amount of money was only 8%.

Based on results of the pretests, a theme for inquiry was initiated and both teams set the stage for providing different learning experiences that might facilitate and support students' understanding of the secure skills related to money concepts. To obtain a deeper understanding of the obstacles that students faced in acquiring these skills, semi-structured clinical interviews were conducted with a random sample of four students from each grade level. These clinical interviews provided qualitative data on how students approached problems related to money concepts. Students were provided with manipulatives (i.e., coins), and without using paper and pencil they were asked to "talk aloud" and explain their reasoning as they solved money problems. Some of the questions posed during the clinical interviews were identical to the items on the written pretest. The clinical interviews were audio-taped and transcribed for further analysis.

During the analysis of the transcribed clinical interviews by members of both teams, one item of particular interest became clear, namely that students performed significantly better on the oral clinical interviews than on the written pretests. This discovery seemed to imply that students' had acquired the skills to identify, use, and exchange coins in the "real world," but lacked the skills to manipulate written symbols. Based on the pretest results and findings from the clinical interviews, both teams collaboratively planned a number of interventions to help address gaps on a selected number of secure skills related to money concepts.

Teacher implementation. The analysis of a particular teacher's level of implementation of intervention was based on four main data sources: a videotape during the teacher's implementation of the intervention within her respective classroom, the teacher's explanations and reflections on the videotape, field notes written by a member of the Evaluative Inquiry Team during the implementation, and within and across teams' focus group discussions of potential improvements to the observed implementation that might lead to "best practice" instruction on the designated unit or lesson for grades 1 and 2. The rationale behind assessing the level of implementation was to provide some evidence on the extent to which teachers were committed to the outcomes of collaboration and the value they bestow to the inquiry process.

As noted, to assess the level of teacher implementation, classroom interactions were videotaped during teachers' implementations of the interventions. Each teacher was then provided with a copy of the videotape from her respective classroom and asked to complete a reflection form to provide insight on how the intervention was delivered and what might be done in the future to further improve the intervention. Qualitatively, the videotaped classroom interactions were enhanced as each teacher was provided with the opportunity to explain and reflect on her implementation of the intervention from her perspective.

The videos from all participating teachers were then systematically viewed by the Evaluative Inquiry Team for evidence of a teacher's level of implementation of intervention in addition to students' participation and engagement during the lesson. The levels of implementation were classified as high, medium, and low. Teachers who engaged students in classroom discourse as a means of scaffolding students' knowledge during the intervention and used the pre-planned activity sheets explicitly with students were rated as "high" implementers, those who only gave students the activity sheets to work on their own without teacher's scaffolding were rated as "medium" implementers, and those who proceeded with the lesson without engaging students in classroom discourse nor using the activity sheets were rated as "low" implementers.

An analysis of teachers' explanations and reflections by the Evaluative Inquiry Team revealed two major assertions that are important to note. These assertions illustrate instances in which teachers alter their decisions regarding teaching a specific concept by negotiating alternative strategies that improve the lesson delivery. The first assertion is that, in most cases, teachers exhibited a significant shift from "explaining away" or defending their practices to openly reflecting on and considering alternative ways to otherwise use the intervention in more meaningful ways. When asked about what struck her most after watching her videotaped lesson, a grade 1 teacher commented:

> I do not believe that all the children were engaged as much as they could have been…. I really didn't tie the game that was to be played very well with the mini lesson…. Everything seemed like an unrelated skill. There did not seem to be a connection to how every coin or dollar fits in to make money.

And when asked what to do if given a chance to re-teach the videotaped lesson, a grade 1 teacher wrote: "Not spending so much time on counting and recounting by 25. Prepare coins in individual bags so it does not take so long to pass out coins."

The second assertion is that, in general, teachers' expectations and belief in students' ability to understand and engage in thought-provoking situations increased. A grade 2 teacher was surprised at "how much extra hands-on experiences students were able to do, using the model ruler for this specific skill." Similarly, a grade 1 teacher said, "[Students] do seem to be thinking and helping each other to find a solution to exchanging nickels for dimes." Another grade 1 teacher noted: "Students were attentive even though they were sitting for a long time. I did not raise my voice once, amazing!"

Relationship between student learning and teacher implementation. To analyze the link between learning experiences and students' outcomes, matched comparisons between teacher's level of implementation and gains of students' pre- and post-test scores were conducted (see Figure 5).

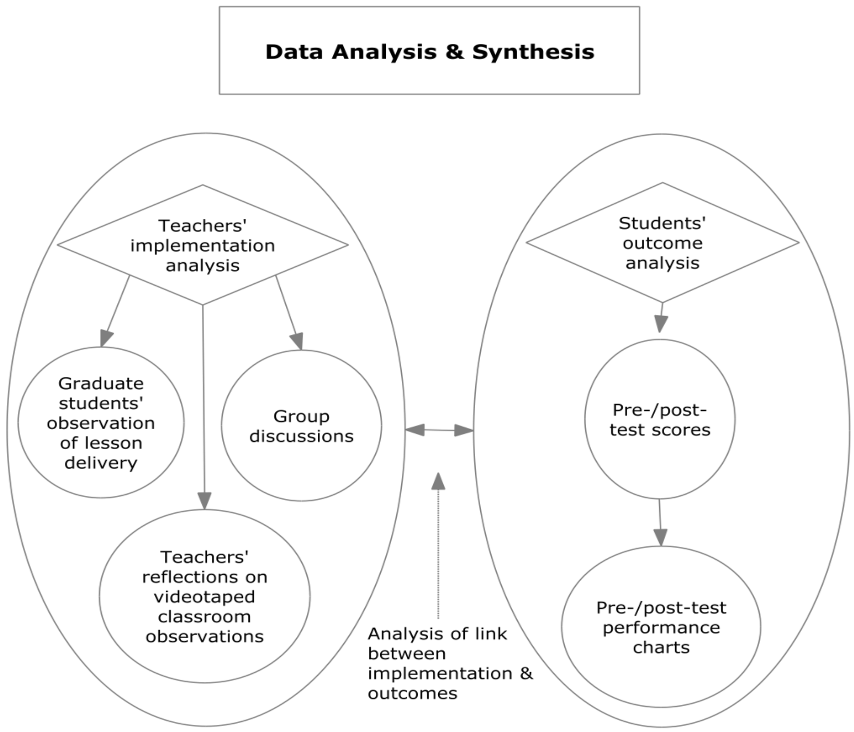

Figure 5. Relationship between learning and implementation.

Simple regression and correlation analyses were undertaken to provide explanation for the variation in grade 1 and grade 2 post-test scores by varying (a) level of implementation, (b) secure skills per grade, and (b) years of teaching experience.

An analysis of the quantitative data collected from classroom observations and students' scores on pre- and post-tests revealed a moderate positive Pearson correlation (r = 0.468) between students' gains and teachers' levels of implementation. The results suggest that a high level of implementation elicited greater gains in students' scores on the post-tests in both grades (see Table 1).

Table 1
Pearson Correlation between Students' Correct Answers on Post-tests and Teachers' Level of Implementation

	N	**Sig. (2-tailed)**	**Level of Implementation**
Correct Answers	39	.003	.468**

Note. *p<.01, **p<.001

More interestingly, a simple regression analysis using teachers' demographic data showed that around 49% of the gains in students' correct scores on secure skills can be attributable to the teachers' level of implementation and years of experience (see Table 2).

Table 2
ANOVA for the Regression Equation: Students' Correct Answers and Teachers' Level of Implementation and Teachers' Years of Experience

	Sum of Squares	df	Mean Square	F
Regression	12771.726	3	4257.242	11.341**
Residual	13138.040	35	375.373	
Total	25909.766	38		

Note. **p < 0.01

Furthermore, when testing the relationship between the percentage of correct answers and years of teaching experience, a moderate negative correlation of -0.502 was noted; that is, more than 25% of the variation in percentage of correct answers can be attributed to teachers' years of teaching experience (see Table 3).

Table 3
Pearson Correlation between Students' Correct Answers on Post-test and Teachers' Years of Teaching Experience

	N	Sig. (2-tailed)	Years of Experience
Correct Answers	39	.001	-.502*

Note. *p<.01

Moreover, a moderately negative correlation (r = -0.359) suggests that around 13% of the change in the level of implementation is accounted for by the change in teaching experience (see Table 4).

Table 4
Pearson Correlation between Teachers' Levels of Implementation and Teachers' Years of Experience

	Sig. (2-tailed)	Years of Experience
Level of Implementation	.025	-.359*

Note. *p<.05

Stage Five. The last stage in the data collection and analysis sub-cycle involved communicating and sharing reflections between the teams. Suggestions for best practice on teaching certain secure skills were brainstormed and recommendations for a next cycle were examined. A post-pretest was administered at the beginning of the next spiral of data collection and items from the original pre-test were included in the post-test in addition to new items that were designed to pre-test the secure skills for the next quarter.

This five stage data collection and analysis sub-cycle was repeated for the second, third, and fourth quarters. Throughout the academic year, a total of 11 secure skills were pre- and post-tested for grade 1 and a total of 38 secure skills were tested for grade 2.

*Task 5: Communicate Findings***.** The Evaluative Inquiry Model (Parsons, 2002) was concluded in a 1-day workshop that was held in the summer of the second year of the project and involved communicating findings and the experiences of the Action Team and the Evaluative Inquiry Team that emerged as a result of immersion in the evaluative inquiry project (see Figure 6).

The immediate purpose of the workshop was for both teams to explore possible challenges and opportunities for initiating the next inquiry cycle by possibly extending it to include other grade levels (e.g., grade 3), or to examine other subjects (e.g., science, social studies, language arts). The long-term goal of the workshop was to instigate and encourage future collaborative efforts between teachers and to help build confidence in their ability as action researchers by integrating the Evaluative Inquiry Model cyclical process into their lesson planning and daily instruction.

Concluding Remarks

While it was tempting to focus on common tasks of being involved in inquiry as the essence of collaboration, it was those relationships that evolved among teachers as collaborators that sustained the work. Shared values, beliefs, and goals about the nature of inquiry forged strong collegial bonds among members of the inquiry teams and fostered mutual relational trust. Throughout the 18-month duration of the project, the Action Team and Evaluative Inquiry Team worked collaboratively on building partnership between the school community and concerned university personnel. This joint venture was expressed by submitting proposals on the project’s achievements to be presented at national conferences to inspire other teachers and teacher educators to experiment and venture into collaborative evaluative inquiry—a step towards building capacities of teachers to become action researchers in their own classrooms.

The project now is in its final year. New teachers have come aboard, new spirals were studied and new challenges were investigated. Enthusiasm has grown among teachers at Banneker Elementary School to pursue further evaluative inquiry techniques in enhancing the teaching and learning in the mathematics instruction. Despite some difficulties that teachers faced across different stages of the project, the moral was high and there was willingness to extend the use of this approach to teaching other subjects and to other grades as well. Amidst all the challenges that teachers and students face in this reform era, it is essential to expose teachers to alternative approaches that *self*-empowers them as decision makers and problem solvers in *their* classrooms and beyond.

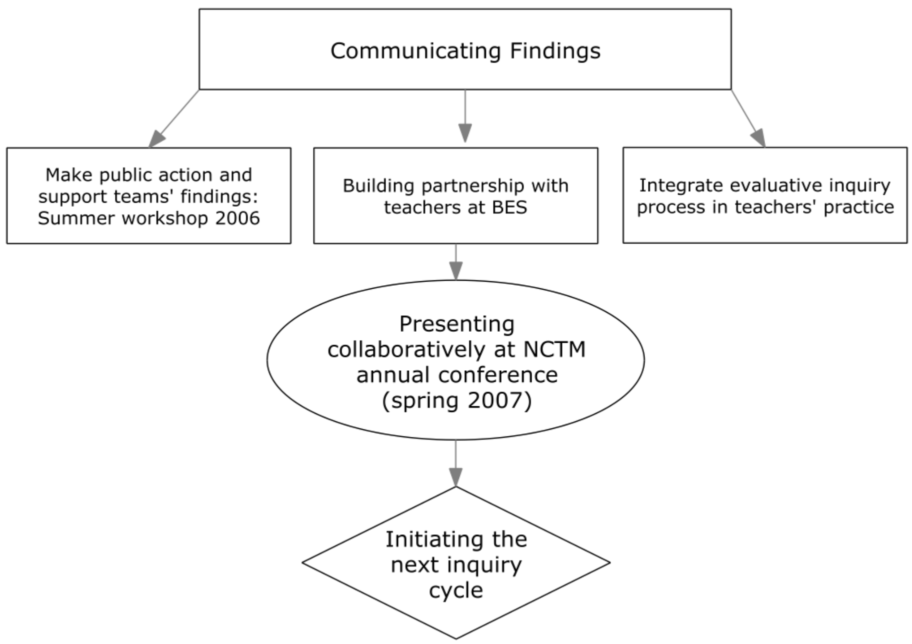

Figure 6. Evaluation Inquiry Model: Task 5: Communicate Findings.

References

Gable, R., Mostert, M. P., & Tonelson, S.W. (2004). Assessing professional collaboration in schools: Knowing what works. *Preventing School Failure*, 48(3), 4–8.

Hagen, K. M., Gutkin, T. B., Wilson, C. P., & Oats, R. G. (1998). Using vicarious experience and verbal persuasion to enhance self-efficacy in pre-service teachers: “Priming the pump” for consultation. *School Psychology Quarterly, 13,* 169–178.

Huffman, D., & Kalnin, J. (2003). Collaborative inquiry to make data-based decisions in schools. *Teaching and Teacher Education, 19*, 569–580.

Kooper, A. P., Wagner, V. S., Breen, C., & Begg, A. (Eds.). (2003). *Collaboration in teacher education: Examples from the context of mathematics education*. Dordrecht, The Netherlands: Kluwer.

Nelson, T. H. (May, 2009). Teachers' collaborative inquiry and professional growth: Should we be optimistic? *Science Education, 93,* 548–580.

Nisbet, S., Warren, E., & Cooper, T. (2003). Collaboration and sharing as crucial elements of professional development. In A. P. Kooper, V. S. Wagner, C. Breen, & A. Begg (Eds.*), Collaboration in teacher education: Examples from the context of mathematics education* (pp. 23–40). Dordrecht, The Netherlands: Kluwer.

Parsons, B. (2002). *Evaluative inquiry using evaluation to promote student success.* Thousand Oaks, CA: Sage.

Southwood, S., & Kuiper, J. (2003). A journey towards collaboration. In A. P. Kooper, V. S. Wagner, C. Breen, & A. Begg (Eds.), *Collaboration in teacher education: Examples from the context of mathematics education* (pp. 7–22). Dordrecht, The Netherlands: Kluwer.

University of Chicago School Mathematics Project (2004). *Everyday mathematics: Teacher's reference manual* (2nd ed.). Chicago: McGraw Hill.