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ABSTRACT

The purpose of this paper is to critically analyze collaborative work with teachers in the context of investigating inquiry-oriented instruction. The analysis is based on a review of empirical research and the personal experience of the author. The empirical component of this report is based on extended collaborative work in four studies, each of which lasted at least one year. The objective of this analysis is to answer the question, What is the role of teacher-researcher collaboration in research on inquiry-based instruction? (Contains 15 references.) (CCM)

The Role of Teacher-Researcher Collaboration in Research on Inquiry-Based Instruction

by

Lawrence B. Flick

THE ROLE OF TEACHER-RESEARCHER COLLABORATION IN RESEARCH ON INQUIRY-BASED INSTRUCTION

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The purpose of this paper is to critically analyze collaborative work with teachers in the context of investigating inquiry-oriented instruction. The analysis is based on a review of empirical research and the personal experience of the author. I have engaged in extended collaborative work in four studies each of which lasted at least one year. The empirical component of this report is based on the research processes in these studies.

The objective of the analysis is to answer the question, What is the role of teacher-researcher collaboration in research on inquiry-based instruction? This question is motivated by a recent focus on inquiry-oriented instruction created by the National Science Education Standards (National Research Council, 1996).

Incorporating scientific inquiry into the curriculum and instruction is the defining characteristic of the National Science Education Standards (NRC, 1996). Implications of this position impact curriculum, instruction, and assessment. With respect to instruction, inquiry can be both a model of teaching for learning science content and content in its own right leading to specific cognitive, affective, and psychomotor outcomes. The complexity of inquiry teaching models and the sophistication of instructional objectives pose new challenges for assessment. Both teachers and science education researchers have a vested interest in understanding how to translate scientific inquiry for use in the classroom.

Background

Emphasizing inquiry as a part of reform in science education comes at a time when the focus of contemporary reform has shifted from student achievement to teachers and classroom practices. Education has been hit by repeated calls for reform over most of this century. Shulman (1989) has observed that the "first wave" of contemporary reform of schooling focused on improving achievement for all students. He described the drive for excellence, which for science education began in 1952 with the post-Sputnik era, as taking on a "classical" character by relying on standardized test scores as the major criterion variable. However, within these data were hints that the broad brush of standard scores as dependent measures missed the effectiveness of some teachers and schools and important behaviors of individual students. Thus the "second wave" of contemporary reform, which for science education began with the National Council of Teachers of Mathematics Curriculum and Evaluation Standards (NCTM, 1991), targeted teachers, classrooms, and the environment that supported the profession. Assumptions underlying more recent reform efforts, including the National Science Education Standards (NRC, 1996) and Project 2061 (American Association for the Advancement of Science, 1993), sharpen the focus on teachers by recognizing instruction as highly complex, requiring extended education and experience beyond basic licensure requirements. Extended professional education places highly skilled teachers not only in the role of student but also in the role of teacher educator and mentor (Shulman, 1989).

Researchers in teacher education and classroom teachers are following parallel courses through this second wave of reform. The complexity of classrooms and of new instructional models require a detailed look at classroom interactions. As a result, teachers have become directly involved in educational research on inquiry-oriented instruction, curriculum, and assessment thus conferring on research what Black and Wiliam (March 1998) called ecological validity. Ecological validity establishes the relevance of data collected in the classroom to the relationships among teachers, students and their physical and social environments. Tikunoff and Ward (1983) described the first wave of reform as "linear" where research, development, dissemination, and implementation proceeded with each step isolated from the next. Teachers rarely found results from this work relevant or understandable.

The paper examines in depth four studies conducted by the author. The first study (Flick, 1995) was done with a fourth grade teacher and the science learning of her students. The study specifically examined application of discussion and questioning skills, her effectiveness in integrating portions of her language arts curriculum, her use of community resources, and her integration of hands-on activities to guide learning in a science topic of which she had only rudimentary knowledge. The teacher contributed to the planning and implementation of observations. Her participation came out of her own time, there were no external funds supporting this project.

The second study (Flick, 1996) was a collaboration with all 24 elementary teachers and the principal in an elementary school in south central Washington state. The student population of the school was 77% minority, 49% had limited English proficiency, and 70% were low income based on eligibility for free or reduced lunch. The principal had charged the staff to consider ways to balance skill-oriented instruction with instruction that addressed higher level thinking. Within this context, teachers were asked to reflect on the nature of explicit instruction and examine the merits of an inquiry-based model for science teaching.

The third study (Flick & Dickinson, 1997) involved collaboration with four middle level teachers selected from a National Science Foundation program focusing specifically on inquiry-oriented instruction and the nature of science. The questions addressed by the study were rooted in the thoughts of teachers and students operating in real classrooms. Semi-structured interviews and classroom observations using high inference techniques were used to create four case studies.

In the fourth study (Flick, 1998) two experienced teachers were selected from a field of eight in a "critical case" sampling process. Teachers and their classrooms were selected not only because teachers exhibited the knowledge, skill, and intent to create an inquiry-oriented instructional environment, but also presented teaching strategies used to provide a continuous thread of inquiry across lessons.

Inquiry instruction for this analysis has been defined by statements in the National Science Education Standards (NRC, 1996) and in related criteria validated in a recent study of inquiry teaching (Flick, 1999) based on the work of Rowe (1973) (see Figure 1). Intersecting components of inquiry was a definition for instruction comprised of six components from an analysis by Anderson & Burns (1989) including (a) Instructional format, (b) Grouping arrangements, (c) Time, pacing, and coverage, (d) Subject matter, (e) Student-teacher interactions, and (f) Task demands.

Figure 1

Criteria used to identify inquiry-oriented instruction based on Flick (1999).

Objectives for Teaching Inquiry

Problem identification - students actively examine a situation for problems to investigate or evaluate whether a given problem can be investigated in a given situation.

Information; facts; observations; data - students discuss, organize, or evaluate relevant previous knowledge (formal or informal) or observations and/or data made while investigating a situation.

Procedures; skills; design - Students describe, demonstrate, or evaluate the sequence of procedures or the design used during an investigation.

Inference; empirical relations - Students use evidence as the basis for stating relationships between variables or evaluate whether a stated relationship can be deduced from evidence.

Interpretation; explanation - Students link at least two ideas in sequence in order to explain how a system works or to compare two systems. Students evaluate an explanation based on the ideas used.

Application - Students interpret new experiences using concepts they already have or using concepts developed through instruction or students generate new examples for a concept or evaluate the application of a concept to a new situation.

Communicating - Students present results to others, share ideas or techniques.

Group Work - Students use social skills to engage in all elements of inquiry within a small group context.

Teaching practices that promote inquiry generally link segments of instruction together in order to provide opportunities for reflection, criticism, and analysis. Instructional formats must accommodate the cognitive and logistical demands created by these linkages. Teachers utilize a variety of formats from explicit instruction to open-ended discussion and investigation (Flick, 1998). The complex instructional formats have direct impact on time, pacing, and coverage. Typically more time is spend on less formal material. Pacing slows to allow for making inferences and interpretations and quickens to address specific facts and other background information. The teacher arranges the class in both small and whole group structures to afford appropriate interactions among students and between teacher and students. The task design and implementation are critical for they must foster developmentally appropriate higher level cognitive behaviors within students.

Analysis of Four Studies

Discussion of each study begins with the purpose and research questions. An analysis examines the role of the teacher-researcher collaboration.

The purpose of the first study (Flick, 1995) was to document the science instruction of a 4th grade teacher whose teacher education program of 20 years ago led to a major in teaching reading with no specific coursework in science or science education. The study focused on the planning and execution of a 31-day unit on the solar system with the teacher acting as a collaborator in the qualitative research design. The study had the following objectives:

1. Describe elementary science instruction planned and implemented by a skilled teacher whose academic training was in reading and language arts.
2. Describe teacher practice and teacher thinking as it compares to exemplary science teaching practice.
3. Identify implications for reform in elementary science education.

The collaboration involved 10 in-depth classroom observations of her, her students, and guest speakers. Discussions concerning the objectives of this study began near the start of the school year and continued through the follow-up interviews with her students and into the following school year. This study represents more than 17 months of intermittent to intense interaction around her classroom.

All six instructional components were directly determined by the teacher as part of her normal instructional sequence. The investigative work in the study involved pre and post-lesson discussions about planning and execution of lessons. The content of meetings included reflections on class observations, the conceptual focus of instruction, and the content of future lessons. Discussions addressed the following questions: (a) How does she achieve meaningful understanding of a complex topic: relationship of the earth, sun, and moon, (b) What is the role of reading, writing, and speaking in the science curriculum, and (c) How does her background influenced the preparation and delivery of the unit.

While the term "inquiry" was seldom used in teacher-researcher discourse, the investigation focused on how this teacher addressed major science education reform goals. As such, we discussed her strengths and weaknesses in subject matter and design of tasks. Of particular interest was the influence of her reading and language arts background on teaching science. Her reflections on her own abilities, plans, and execution of lessons formed major portions of the data used to interpret her instruction.

A brief example illustrate how her collaboration in the classroom research effort afforded important opportunities for understanding instruction. I suggested that students often harbor beliefs about a flat earth even when correctly expressing concepts about traveling around the earth or objects orbiting other objects. The teacher did some investigating of curriculum materials on her own and organized a debate that culminated this unit on the solar system. The demands of this task for the class were considerable and instructional formats and time had to be arranged to accommodate this activity. I interacted with the content of her instruction and her process of creating a new instructional context added significantly to the study.

The purpose of the second study was to document and interpret the thinking of elementary teachers concerning a generative learning model of instruction as they developed unit plans for teaching science (Flick, 1996). Observations focused on conflict and decision making as teachers were asked to specifically compare and contrast a particular generative learning model with an explicit teaching model prescribed by the principal. The student population included a high proportion of disadvantaged students where in many cases English was a second language. For the purpose of this report, GLM referred to generative learning models of instruction as a form of inquiry teaching suitable for elementary students. IPM referred to instructional process models of instruction representing explicit or mastery teaching. The questions for this study were:

1. What specific points of conflict do teachers perceive between GLM and IPM models of instruction?
2. In what ways do they see GLM as similar to their own teaching generally characterized as IPM?
3. What are implications for teacher education in science?

In terms of planning, all six instructional components figured into this collaborative, curriculum design process. However, in contrast to the previous study, the work of this collaboration took place almost entirely outside the classroom. The principal of the school supported the project which was made possible by a grant from the Department of Energy written by one of the second grade teachers. The grant provided release time for two, all-day, curriculum planning sessions for teachers at each of the grade levels K-5 to work together to design a unit in science. There were 12 sessions that formed the core of this study. I received a small stipend as an instructional consultant for the project.

The quality and productivity of the 12 sessions were critical for meeting the school's curriculum planning goals. Collaborative work was essential for obtaining worthwhile research data concerning teacher interpretation and use of generative and mastery learning models of instruction. Teachers needed to express themselves freely concerning their lack of knowledge, confidence, and/or skills with science content or technologies. In addition to these recordings, teachers turned in copies of their notes and drafts of unit plans. Visits were made to classrooms recommended by the principal to observe science lessons that presented a cross section of instructional approaches.

Collaboration also occurred at the level of staff-principal interactions. While not always in agreement with the principal's goals and requirements, the staff respected her guidelines recognizing her knowledge and skill as an instructional leader for disadvantaged students. I developed a collaborative relationship with the principal and consulted her frequently during the project concerning instructional format, student groupings, pacing and coverage, and task demands. The staff felt free to discuss issues of conflict and concern. I shared summaries of these discussions excluding teacher names with the principal three times during the project. Her collaboration was essential not only to the success of the curriculum design project but also central to the interpretive integrity of the research.

The purpose of the third study was to investigate how teachers initiate, conduct, and maintain a sense of inquiry as a part of instruction in science (Flick & Dickinson, 1997). Four middle level teachers collaborated in procedures for examining the alignment between instructional goals and observations of classroom teaching. The instructional goals were derived from an National Science Foundation (NSF) inservice project designed to improve teacher knowledge of science and inquiry-oriented teaching. With teacher input, we also examined what students perceived the goals to be.

Specific research questions were:

1. Are teacher intentions for instruction valid representations of recommended classroom practice presented in ISC workshops?
2. Do live and video tape observations of teaching practice align with teacher's verbalized intentions?
3. Are student interpretations of teaching practice aligned with teacher intentions?
4. Are student interpretations of teaching practice aligned with observed teaching behavior?

Semi-structured interviews and classroom observations using high inference techniques were used to create four case studies. The cases are described through the words of the teachers, the words of their students, and the reflections and synthesis of the authors.

The teachers were involved in the collaboration in multiple ways. They agreed to implement teaching that conformed to the inquiry-oriented principles presented in the NSF workshops. They also selected a topic for instruction based on curriculum presented in the NSF workshops. They offered reflections and insights into their planning and thinking through interviews before and after direct observations of instruction. Further, they participated in selecting a sample of students to be interviewed about the nature of instruction within their own classrooms. The teachers also collaborated in the design of the interview protocols used with the sample of students.

Critical elements of the collaboration involved establishing a rapport for discussing instructional formats and student-teacher interactions. This required a deep level of teacher involvement because the NSF workshops left the specifics of classroom implementation of inquiry principles up to the teacher. Through 10 to 15 years of experience, these teachers had developed a variety of teaching skills supporting sophisticated perspectives on teaching. These teachers had specific concerns about the reasonableness of implementing certain inquiry-oriented teaching principles relative to time, pacing, and coverage. These were practical concerns they faced daily and this collaboration offered a venue for expressing that thinking. The success of this study depended upon the candid reflections of experienced teachers with respect to the implementation of reforms in science teaching in the middle grades.

As with the elementary teachers in the previous study, this project also dealt with teacher knowledge in science. Inquiry takes a broader understanding of a subject area than a more didactic instructional format. Teachers had to feel comfortable enough to express concerns they had about their own developing knowledge in some cases. While the study was focused on teacher planning and teacher practice, the quality of the collaboration allowed the open exploration of other features critical to inquiry-oriented instruction such as the level of teacher understanding of science content.

The teachers needed to feel that the authors were there to make their particular classroom better for learning science and not simply for generating an evaluation study. The transcripts of teacher interviews revealed a distinct level of collegiality between researchers and teachers through the mutual expression of insights about teaching practice and discussion of personal strengths and weaknesses.

The purpose of the fourth study was to analyze the practices of two skilled and experienced middle level teachers with respect to research-based criteria for instructional scaffolding in support of inquiry-oriented teaching (Flick, 1997). The research questions were:

1. What do skilled, experienced teachers do when scaffolding inquiry-oriented instruction?
2. In what ways do they align with research-based criteria for scaffolding and inquiry-oriented instruction?

An initial observation period lasting eight weeks preceded the selection of two experienced teachers from a field of eight. These initial observations were critical to the collaboration for they afforded an opportunity not only for me to determine that I could find the type of teaching I was interested in studying, but also for the teacher to understand the nature of the study and to assess their commitment to the collaboration.

Classroom observations extended across ten weeks in one semester and an analysis of six observations with video tape support. The lack of external funding meant fewer observations and more careful planning and collaboration between myself and the teachers. An extended interview session with each teacher was audio taped to document information gained from several informal discussions that took place before, during, and after instruction.

An extended description of each teacher's practice was written to characterize instruction based on observations. Each characterization offered an analysis of instructional practices that scaffold the elements of inquiry teaching (see Figure 1). Each teacher reviewed his own description and provided input for reaching an agreement on the characterization.

The study was guided by discussions that took place around each observation. The teachers provided an ongoing narrative on what was happening, how plans were implemented or scrapped during the observed lesson, and what was planned for future lessons. These discussions were critical for understanding how the teachers guided complex instruction across time. The teachers described plans for grouping students, designing tasks, and promoting specific kinds of student-teacher interactions for scaffolding inquiry-oriented instruction.

By using insights gained directly from the teacher reflecting on his practice, I was able to develop an understanding of how constraints of time, pacing, and converge played a role in guiding the unique instructional formats of each teacher. Even though both teachers described similar structures for guiding the pace and content of the class (e.g. rapid questioning sequences with frequent student response), they each displayed significantly different types of student-teacher interactions. The meaning and purpose of these interactions were made clearer by timely observations and discussions afforded by the collaborative arrangements of this project.

Discussion and Implications

In the collaborative research described in this paper teachers did not have paid release time specifically for research purposes and I was not funded for research. I maintained my regular responsibilities at the university. The small grant in the second study (Flick, 1996) supported release time for teacher planning and my consultation but no time for research. Collaboration was important for carrying out these small-scale studies. Collaboration meant that all parties saw involvement as beneficial to their current work. Studies that speculate long-term or esoteric results may be of questionable value to full-time teachers especially if procedures take time away from teaching (Tikunoff & Ward, 1983). Conversely, the teachers had to understand and appreciate the need to invest time in discourse and other procedures designed more for the investigation of teaching than to further immediate instructional goals.

All of the studies focused on the problem of how to design and implement inquiry-oriented instruction. However, in the collaboration, the research design and final outcomes were influenced by the teachers. The study involving the fourth grade teacher (Flick, 1995) began as a study of the role of writing in learning science and evolved into a study of how a teacher primarily trained in the language arts guides classroom discourse in science. The collaboration with 24 elementary teachers (Flick, 1996) initially focused on instructional design but the teachers added objectives for teacher understanding of subject matter and the role of the principal as an instructional leader. In general, the problems were broadly defined by myself as the researcher but were influenced in each case by the needs, intellectual input, and backgrounds of the teachers. The input not only enriched the research effort and established its ecological validity, but also provided results directly usable by the teacher. For example, the fourth grade teacher (Flick, 1995) was using the flat-earth debate two years after the study was completed.

The atmosphere surrounding teacher-researcher interactions in each study was one of mutual respect. I, as the researcher, respected the teacher as a skilled professional whose knowledge in the area of study was indispensable for the conduct and outcomes of the project. The teacher(s) in turn, respected my teaching background of 12 years and viewed my knowledge in the area of inquiry-oriented instruction to be an asset to their professional development. This type of teacher-research collaborative relationship opens opportunities to explore subtle points about complex instruction. These opportunities are not purposefully created in larger studies that are dominated by externally structured research designs.

Highly structured, externally imposed research designs are important for investigating inquiry-oriented instruction. Larger studies often have more funding that buys more time and allows greater control over the study environment putting the researcher properly in a lead position for guiding the study. Such studies provide valuable information on broad, generalizable results. Externally structured studies are necessary, for example, for investigating the relationship among specific psychological constructs and their effects on learning science (Cavallo, & Schafer, 1994). Externally structured studies also generate insights for complex, longitudinal interactions among demographic variables and student achievement (Germann, 1994). As such, larger studies provide critical, albeit static, images of instruction. The aggregate data is reduced to an essence or essential model of instruction.

The role of teacher-researcher collaboration in research on inquiry-based instruction is to create a panorama or even moving picture of inquiry teaching. What the initial research question(s) miss, the teacher provides by way of commentary and criticism based on the actions of current instruction and on years of experience. The collaboration provides a venue for reflecting on teaching experience often missing in the normal working routines of teachers. A collaborative relationship also allows the researcher to comment and criticize the work of teachers in a format that not only adds to a research knowledge base but also adds to teacher knowledge and therefore to the quality of immediate teaching environment.

Guidelines for small scale collaborative research:

1. The research team minimally includes a teacher and science educator.
2. The research problem(s) may come from either member of the team, but its final expression is considered significant by both.
3. Decisions regarding specific research questions and methods start with the science educator but ultimately are a consensus.
4. From the beginning the team attends to concerns of both knowledge production and application of that knowledge to teaching.
5. The research effort is flexible enough to be sensitive to complexities of the classroom.

Strategies for implementing small scale collaborative research

1. Become familiar with the work of the teacher through several days of direct observation of the classroom over several weeks.
2. Engage in extended discussions concerning their work in order to establish areas of common interest and commitment to the project.

3. Meet regularly during the intervention or observation period to share observations and interpretations.
4. Share both theoretical and practical points of view.
5. Modify or add to the study while maintaining a common core of questions and investigative procedures.
6. Use discussions to plan ahead to the next term or next year to extend the investigation or implementation.

References

American Association for the Advancement of Science. (1993) *Benchmarks for science literacy*. New York: Oxford University Press.

Anderson & Burns (1989). *Research in classrooms: The study of teachers, teaching, and instruction*. New York: Pergamon Press.

Black, P & Wiliam, D. (March 1998). Assessment and classroom learning. *Assessment in Education: Principles, Policy & Practice, 5*. 7-75.

Cavallo, A. M. L. & Schafer, L. E. (1994). Relationships between students' meaningful learning orientation and their understanding of genetics topics. *Journal for Research in Science Teaching, 31*, 393-418.

Germann, P. J. (1994). Testing a model of science process skills acquisition: An interaction with parent's education, preferred language, gender, science attitude, cognitive development, academic ability, and biology knowledge. *Journal for Research in Science Teaching*, *31*, 749-783.

Flick, L. B. (1999). Teaching Cognitive Strategies that Support Student Use of Inquiry in Learning Science. Paper presented at the National Association for Research in Science Teaching Annual Meeting. Boston, MA.

Flick, L. B. (1998). Cognitive Scaffolding that Fosters Inquiry in Middle Level Science, submitted for publication.

Flick, L. B. & Dickinson, V. L. (1997). *Teacher intentions, teaching practice, and student perceptions of inquiry-oriented teaching.* Manuscript submitted for publication.

Flick, L. B. (1996). Understanding Generative Learning Models of Instruction by Elementary Teachers Trained in a Linear Instructional Process. *Journal of Science Teacher Education, 7*, 95-122.

Flick, L. B. (1995). Navigating a Sea Of Ideas: Teacher and Students Negotiate a Course Toward Mutual Relevance. *Journal of Research in Science Teaching, 32*, 1065-1082.

National Council of Teachers of Mathematics. (1991). *Curriculum and Evaluation Standards.* Reston, VA: The Author.

National Research Council. (1996). *National science education standards.* Washington, D.C.: The Author.

Rowe, M. B. (1973). *Teaching science as continuous Inquiry.* New York: McGraw-Hill.

Shulman, L. S. (1989). Teaching alone, learning together: Needed agendas for the new reforms. In T. J. Sergiovanni & J. H. Moore (Ed.), *Schooling for tomorrow: Directing reforms to issues that count*, Boston, MA: Allyn and Bacon.

Tikunoff, W. J. & Ward, B. A. (1983). Collaborative research on teaching. *The Elementary School Journal, 83*, 453-468.

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