

The Institutionalization of Action Research: The California "100 Schools" Project

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Introduction

My purpose in writing this chapter is to come to a better understanding of an activity in which I have been involved for the past year and a half. During this time I have served as field coordinator and facilitator of action research as part of a national effort to reform the way in which science is taught in the USA. In the first part of this chapter I will lay out some information about the origins of my involvement in this enterprise. I will then present two interwoven narratives: one of my part in the project as field coordinator and facilitator, and one of my interaction with teachers engaged in action research. The final section of the chapter will consist of an analysis of my role as facilitator relying both on my experience and on my and others understandings of the nature of action research. The tone of the first two sections will differ from that of the last. The first two will be in the form of narratives -- my story of becoming a part of the reform effort, and then a story of my interaction with three teachers involved in action research in their schools. In the final section of the chapter I will use a more traditional academic style to analyze the conception of action research that evolved, and my role in the project.

My coming to the 100 Schools Project

In order to frame this process of my coming to a better understanding of my role as a facilitator of action research I will present a self-study of my own development as a facilitator and convener of action research, and as a teacher-educator and researcher of teachers and teaching. I ended a 17 year career as a school teacher in 1989 when I began a doctoral program in curriculum and teacher education at Stanford University. When I began those studies my interest lay in trying to find out what it was that caused so many people to avoid the study of physics, a subject which I had taught for most of those 17 years. Early on it became clear to me that most others saw this problem in terms of how people learn, and that if researchers could decipher those learning processes, new curricula and pedagogy could be devised that would better match the learner to the discipline. I saw the problem differently, that if teachers could figure out better ways to teach in a way that transformed the discipline, then more students would become interested in studying physics. My thinking in this way was due in part to my own experience as a teacher. I taught what I called physics in many ways to different students, emphasizing those areas that I thought were of particular relevance and omitting those that other teachers saw as a unalterable part of the liturgy of physics instruction.

It was with this frame of reference that I began my studies at Stanford and found my advisor, Mike Atkin, involved in coming to a better understanding of action research. I had never heard the term before, and the first paper that he suggested that I read (Elliott, 1987) helped little to further my understanding of what he and others meant by it. Over the next year and a half I read and wrote a great deal about action research. I assisted in classes for novice science teachers where Atkin's version of action research was practiced, and I sat in on meetings with elementary school teachers and a high school science department going through an accreditation review.

It was at that time that I learned that I had the opportunity to serve as a facilitator for teachers engaged in action research as part of a major reform effort in science education, Scope, Sequence, and Coordination (SS&C). I had first become aware of this enterprise when Bill Aldridge, executive

director of the National Science Teachers Association (NSTA) and originator of the reform, spoke about it at a meeting of the American Association of Physics Teachers (AAPT) in June of 1989.

Aldridge described it as an attempt to make a major overhaul of the way in which science is taught in order to extend scientific literacy to all students. The mechanism for this reform is the replacement of the current US model of teaching each science in turn, typically biology, chemistry, and then physics (the "layer cake model"), with a sequential and coordinated model more similar to the way in which science is taught in other countries. That is, each of four subjects, physics, chemistry, biology, and the earth and space sciences would be taught each year with a high level of coordination among the topics in each of the subjects, and then in successive years the same concepts would be revisited at higher levels of abstraction (Aldridge, 1991).

My initial reaction to this proposal as a high school teacher of physics was "Here we go again!" I was aware of Project 2061 that the American Association for the Advancement of Science (AAAS) had recently begun as its attempt to change science instruction. I had also received training in and taught several of the National Science Foundation science curricula of the 1960s and 1970s that were languishing dusty on storeroom shelves. To say the least my reaction was one of skepticism and resistance. Skepticism due to past experience with reforms and resistance because of my knowledge of my privileged position as "physics teacher."¹ It is important for me to lay out my initial feelings re this reform effort because to some extent they have not left me, and because they parallel the feelings of some teachers.

In January of 1991, at another meeting of AAPT, I had a conversation with Fred Goldberg of San Diego State University who had just begun to direct the action research component of SS&C in California. It was clear that it was to both our benefits for me to come aboard that project to serve as the field coordinator. And so I agreed to join the 100 Schools Project and become the facilitator of teacher action research that was designed to help to implement a reform in science education to which I was at most lukewarm to.

The '100 Schools' Project -- The California SS&C Project

California is among five sites in the USA involved in this reform. The others are Iowa, North Carolina, Puerto Rico, and Texas. The California reform is structured significantly differently from that in the other states. First, it is being coordinated through the State Department of Education, while the other sites each are coordinated through the efforts of university faculty. Second, California is the only site at which the high school years are the center of the effort -- the others have begun their work at the middle school level. And while all the sites can claim to have teachers collaborating in the reform effort to some extent, it is only in California where they are taking the lead. Each of the more than 100 secondary schools involved in SS&C in California is serving as a development site, and initiating and implementing its own incarnation of sequential and coordinated science.

The State Department of Education coordinates this effort through the Math/Science Education Unit, and the principal investigator is Tom Sachse, manager of the unit. It is through his office that information and funds are disseminated to all the sites. In addition, the Math/Science unit coordinates five state-wide components: Pre-service teacher education, in-service teacher education, documentation, evaluation, and action research. The directors of the pre-service component are attempting to coordinate a change in the way new science teachers are educated at the California State Universities (CSU). The in-service component serves to provide support for teachers currently practicing in the 100 Schools. The documentation and evaluation components serve to keep track of

what is happening throughout the state, to help with formative evaluation, and eventually to produce a summative evaluation of the reform effort.

The Action Research Component

The inclusion of action research as the fifth state-wide component of the 100 Schools Project is another feature that makes it unique in the national SS&C effort. It was included in the original proposal to the National Science Foundation (NSF) to serve several functions. As stated in that proposal, they are:

€[to review] the curricula and instructional materials of the ten model schools² with an eye towards the quality of the conceptual relationships in the science topics being addressed. ...

€[to review] the degree to which the developmental sequencing agrees with what is known about the intellectual development of students at a particular age and their ability to understand concepts deeply. ...

€[to] determine how students integrate scientific ideas they have learned and apply them in new and more abstract settings (CSDE, 1989, 11).

In addition, the proposal writers saw the action research component as a way to create a "feedback mechanism within and beyond the ten schools" that is "essential during the initial stages of the project because it allows all participants in all schools to benefit from all the successes and to avoid many of the failures that we encounter during the process (CSDE, 1989, 12)."

The director of the action research component, as was specified in the proposal, is Fred Goldberg. Goldberg has been educated as a physicist and currently does research in physics learning, a field in which he is quite well known. His expertise fits nicely with the stated goals of the action research component: Assessment and evaluation of the curricular materials, as they are developed, and of the science learning that occurs in relation to currently held theories of conceptual understanding.

An overview of my first year

I became a part of the CA SS&C project during the winter of 1990. By that time the project had expanded to over 100 high schools and an additional 100 or so feeder middle schools and junior high schools. Ten of the high schools were designated hub schools to serve as coordination and communication centers for the other high schools and feeder schools in their geographic areas. Several of the schools had already begun the implementation of coordinated or integrated science courses in 9th grade and were developing courses for the 10th and 11th grades. The in-service component had developed a questionnaire to assess teachers' needs, and the pre-service directors had begun to contact the faculty of natural sciences and science education within the CSU system. And Horizon Research and Far West Regional Education Laboratories had begun to document the implementation of SS&C in California.

At that point, the action research component was beginning to gear up. The first task was to begin to disseminate information about action research to the teachers in the schools involved in the reform effort. Goldberg and I developed a packet of information about action research and a proposal form, and sent them out to the hub coordinators. I began to attend hub meetings to talk with teachers about action research, answer their questions, and to solicit proposals. Only one proposal was

submitted by the original April 26, 1991 due date. The decision was made to extend the deadline to June 7, 1991.

Goldberg, Cheryl Mason, a faculty member in science education at San Diego State University, and myself met on June 12, 1991 to review the proposals. By that date 18 proposals had been received, a 19th was received by fax early that afternoon, and we solicited a 20th from a new hub coordinator. Seventeen were from teachers at high schools, two were from teachers at 7-12 schools including one continuation school, and one from a middle school science teacher. The schools were distributed throughout the state, ranging from as far north as Trinity County and as far south as San Diego. Most were clustered in the two major metropolitan areas -- Los Angeles and San Francisco.

By the end of the day we had accepted all but two of the proposals. One was rejected outright, and we decided to ask another teacher to resubmit her proposal. We decided that even for those which did not need to be resubmitted, the newly designated action research fellows would need to better formulate the nature of the problems on which they would be working. During that summer I contacted all of the action research fellows in order to give them feedback about their proposals.

Two Narratives

Three of the action research fellows with whom I worked were Bill Miller³, Robert Doyle, and Penny Young. My focus on these three teachers was not random. In some way their inclusion (and the exclusion of others) might suggest that all of the action research fellows have had significant difficulties with their projects. That is not the case. But my interactions with these teachers provide an opportunity to see the effects of my actions as facilitator.

The first teacher, Miller, has withdrawn from the action research component. This should not be seen as a reflection of his abilities or commitment as a teacher, school leader, and researcher. He continues to be a dynamic leader within his school and in the statewide effort. His withdrawal from the project will serve as a way to understand how to better coordinate the demands of action research with teachers' work and lives. The second, Doyle, is a relatively young and inexperienced teacher who has attempted to bring together the efforts of teachers at several sites in order to develop better programs at all the schools in his hub, and to improve the efficiency of the instructional design process. His frustrations serve to model the problems of communication throughout the action research component. And finally, Young's situation served to remind me of how the reform process in general, and the action research process in particular, are tied to the contexts of individual schools, school districts, and communities.

Bill Miller

Bill Miller had retired from the armed forces before beginning a second career as a science teacher. He teaches in an urban school, which is designated as an alternative academic high school. Although there are no entrance requirements, students are expected to be committed to preparing for post-secondary education. In addition to this focus on academics, the school has a strict dress code for both students and teachers⁴. Miller is the site coordinator for the SS&C project in his school and one of the feeder middle schools.

In his proposal Miller wrote the following in response to the item, "Describe what problem or problems you would be interested in addressing as an action research project."

Of the many fascinating problems that I see ahead for our implementation of the SSC [SS&C] beyond the 9th grade, I believe that the curriculum of the 10th grade ISC [Integrated Science

Curriculum] poses both the greatest challenge and the most opportunity for assessment. I would want to address planning the 10th grade curriculum as my Action Research Project.

To the next item, "Describe your initial ideas about how you would go about solving that problem." he wrote:

I would use my grant money [\$500] to gather the [combined departments of the high school and middle school] together for as long as the money lasts and let all of us determine how we want the curriculum to expand on the past year's learning. We would have to determine how much we want to expect our 10th graders to learn and how much we would pass into the 11th grade. I would assist each teacher in implementing and I would schedule meetings to give us a feel for how we are doing with this new methodology. As my one authoritarian act as the project director, I would require the use of journals by the teachers involved to assist in the evaluation.

Miller's proposal shares features with many of the others. It focuses on a problem that he and his department already have -- the development of a curriculum for the next year's implementation of SS&C. In the current school year, teachers were engaged in teaching the 9th grade program. What Miller has focused on is the development of the program for the next year's 10th grade, the current year's 9th grade. He foresaw the problem of needing to plan a totally new curriculum while engaged in teaching a new curriculum. Therefore he decided to try to use the process of action research to help the department engage in the curriculum development process.

Robert Doyle

Robert Doyle is in his fifth full year of teaching. Before he decided to teach, he was enrolled in a Ph.D. program in biology at a University of California (UC) campus. He has had a fair amount of experience as a biology researcher, both undergraduate and graduate. But as he told me,

Teaching is what I really like to do. I wasn't happy as a research scientist. I wanted to get back into the classroom, that's what I really enjoy ... this was research for the sake of getting a publication. I would rather be doing something that I got some personal gain from ... (interview 10/17/91).

He recently went through a credentialing program at a CSU campus. In that program he student taught, and he then taught remedial mathematics and mathematics to low-ability tracked students for two years. Last year was his first full year of teaching science. In addition to his teaching, and his responsibilities as a father in a young family, Doyle is currently writing a masters thesis in biology.

He teaches at a crowded high school in a rapidly growing suburb in southern California. As with just about all communities in that region, the population is highly diverse racially, ethnically, and socio-economically. There are large numbers of new immigrants, and a large Hispanic community which had its origins in the region's agricultural roots. A new high school will open next year in order to relieve the crowding and Doyle will join that faculty.

Doyle is excited about being part of the 100 Schools Project. The science department at his school had already decided to be a part of it by the time he joined the faculty, and as he taught his first full year of science he became intrigued by the nature of the reform:

it's an alignment of what I think should be done in a science class and my impression of how science should be taught, with a more thematic, more hands on, more conceptual approach. So I expressed interest in it [SS&C] and began going to the hub meetings and then offered to teach the Natural Science II, which is our second year (interview, 10/17/91).

Later that year I attended one of the hub meetings and made a presentation about the possibilities of doing action research. Doyle became interested in becoming part of the component. His interest in action research was aroused because he felt that "... anything that would help [him] evaluate what is happening in the classroom has an appeal ..." and that he could "... interact with other people ... [he was] curious to see what works well ... [and he sought] a forum to share ideas ... (interview, 10/17/91)." In addition, he saw action research as a way of

... improving my teaching in the classroom, improving the type of course that the students are receiving, the type of instruction, [and] making it more interesting and relevant to them (interview, 10/17/91).

He submitted a proposal for action research with the following statement of purpose:

Those responsible for the development of an integrated science program are faced with an unusual problem: To develop an instructional program which satisfies the stated expectations of the California State Framework and the University of California, and yet acknowledges the fundamental need of science students. We must produce scientifically literate individuals.

Compounding this problem is the lack of available resource materials for teaching an integrated science curriculum. The U.K. has produced some valuable materials as a result of a national curriculum reform, but none of these satisfactorily meets the needs of our courses⁵. It is necessary, therefore, to develop a set of instructional materials for the Natural Sciences courses which meets the needs of universities, society, and students.

In his proposal he suggested the following way to go about meeting the goals in his problem statement:

As a hub school, it is our intention to facilitate the development of a set of instructional materials which satisfies the criteria listed above. Since the intentions of the SSC program are subject to individual interpretation, these materials must provide a high degree of flexibility with regard to the different programs being implemented in different high schools. It is our intention, therefore, to develop a series of self-contained instructional packets for use in any integrated science program. These materials must be wholly self-contained, with provisions for verbal instruction, reading and writing in the subject, and manipulative materials. Additionally, each instructional packet must clearly state objectives in terms of how each meets requirements of the University of California and the State Framework.

Doyle's proposal focused on curriculum development, or as Sachse refers to it, instructional design⁶. He is not only concerned with meeting the goals of SS&C which he finds very desirable, but also the constraints of the California Science Framework (1989) and the entrance requirements for the University of California system. He is also concerned with the transportability of the instructional

packets from site to site so that teachers from the 10 or so schools in the hub can profit from the task that he has undertaken.

Penny Young

Penny Young teaches in the largest school district in the State. The room in which she has taught for the past 15 years is a temporary classroom moved to the site from another school. The view through the doors is of the parking lot where teenagers dressed in black and white clump together in groups of three or four. Young asked me whether I had noticed the color scheme, which I had. She told me that they were Raiders colors -- the colors of the Los Angeles Raiders football team and the colors of the largest gang in the area. The presence of the gangs has a significant effect on the school. In particular, on the day that I visited, Young's class was recovering from a horrid event. A student who had been enrolled in the class, but never attended, had been shot and killed just two days earlier on the periphery of the school grounds.

In addition to her duties as a teacher -- teaching four classes with three different preparations -- Young is the science department chair, site coordinator and co-hub coordinator for the 100 Schools Project, teaches the methods course in science teaching at one of the UC campuses, and is on the district textbook selection committee. Even so, she decided to participate in the action research component.

In her proposal for an action research project, she wrote

How does one assess for conceptual learning? Are we really designing our assessments to test what we have taught? Should a pretest be given? Is it right to compare students in these classes with ones in Biology and Chemistry? If not, is their work of equal quality and value? Is "hands on activities based learning" really more meaningful to the students? Is it cost effective?

Of the proposals that we received, Young's was the only one that suggested the importance of normative issues. She is concerned about the meaning of a comparison between "life science" students and biology students -- a difference that is as much ethnic and racial as it is academic. She is also concerned about the value of the work, that is, she is quite aware of the worth given to accomplishment in traditional science courses. She worries whether success in SS&C classes will be seen by others as having the same societal value.

The summer

Soon after the proposals were accepted, I telephoned the action research fellows to discuss their proposals. I asked them to reformulate their problem statements and to send a copy to me. Miller's reply was a more detailed statement of the problem and an additional page-and-a-half of methodology.

His new statement read:

[The] High School's science faculty planned a fully Integrated Science Curriculum (ISC) for the 9th grade (ISC-9) and implemented this curriculum in September 1990. The science faculty had intended to continue planning for the 10th grade during the school year so that there would be continuity for the students and fulfillment of the goal of a 9-11 grade ISC by 1993. Funding was not available to continue the level of planning necessary for this radical change in curriculum, however, and there will not be a 10th grade ISC (ISC-10) for the coming school year 1991-

1992. What can be done to construct an ISC-10 curriculum for school year 1992-1993 with no funding for extensive planning?

I then responded to him by mail with the following suggestions:

It is clear that you have done some careful thinking about how you might use action research to design instructional materials for the SSC program ... Your problem statement is specific and your action plan looks nearly complete. You will, of course, need to focus more on specific details. Although you have stated that you will meet regularly with the 10th grade teachers, you have not said how the information that you will collect about what is happening in the program will be used to change what is happening. In other words, the structure of your feedback mechanism is not clear to me.

As with Miller, I followed up with a telephone conversation with Doyle suggesting ways in which he could reformulate his proposal, but I did not receive anything from him before the end of the summer.

My exchange with Young was more complex. After I spoke with her, I received her reformulated action plan and a letter. Her new problem statement reiterated, and gave in greater detail, her concerns about assessment re her primarily minority students. For example, she noted that "if the materials [are] presented in a written manner either on a test or a project, over 50% of the class are not able to express the correct concepts or ideas." But "When quizzed orally in class, many of the same students can answer the questions correctly." She wondered about the reasons for this inconsistency. She asked if the students are tested in groups, would they rely on one student and the others then be "leaches?" She noted that for many of her students, English is not their first language. She asked whether questions should be asked orally, and whether she should prepare a glossary of science terms in their first languages. She has found that "Writing skills in the majority of students is lacking. The students do not know how to organize their ideas and present them in an understandable manner." She the asked whether more time should be spent in teaching writing skills?

In addition to reflecting on the skills of the students and how she might change her teaching in order to facilitate their learning, she questioned her own teaching.

Am I asking the right questions? Are my questions too vague? Do they relate to the concept? Are they only easy because I wrote the questions and I know what I want? Am I really covering the material that I am testing for?

I responded to her reformulated plan in this way:

You have put together an impressive list of concerns in your reformulated action research problem. The challenges that they suggest can be daunting. It seems that you are focusing on how you might use group work and writing to help your students arrive at a better understanding of science concepts, and then to use assessment devices that actually test whether they have. The way to proceed with this is to develop a long term and a short term action plan. As a larger goal, you might want to have your students do more writing in science classes. The short term action plan could focus on what you could do to accomplish this in the first few months of the school year. You could include a way to assess this, and then develop a new action plan for the

next period of time based on how the first action plan worked. You could do the same for groupwork.

But before I sent Young these comments, I attempted to address the issues that she raised in her letter. In it she wrote:

My only concern is that I am taking on more than I can do well. From our conversation I gather that I have to present a paper, write an abstract including a five page paper and keep a journal besides finding solutions to problems stated in my project.

Please remember that I am a full time teacher, science department chair, and SSC co-director for [my] hub among other things. I will also be team teaching for the first time one period of Integrated Science. I really don't know if I can do all that you ask.

In part, I answered with

Do not be concerned at this time about the amount of work that the action research project will entail. This is a very new project and it is important for us to figure out the best way to do it. The point of the project is to improve what you are doing and to share that with others.

Please stick with the project so that we can benefit from your experience of having so many responsibilities and trying to do an AR project.

Fortunately, Young did not receive this condescending note until much later because I had an inaccurate summer address for her.

The academic year

Soon after, during the weekend of September 6, 1991, an Action Research Conference was held as a training workshop for the action research fellows. Some time was set aside for them to discuss their projects with each other, and to receive reactions and critique from the other action research fellows and the component staff. From the evaluations it appeared that, in general, the action research fellows found the training sessions very useful, and the discussion session especially helpful. They left to go back to their schools filled with enthusiasm about action research and about their projects.

Miller

I next spoke to Miller on September 19, 1991. In a telephone conversation he told me that he was "up to his eyeballs in courses and kids," that he was keeping his research notebook⁷, he was talking with the SS&C teachers, and that he was "getting ideas about what was going on" in the school. During the next few weeks we had some contact by e-mail as we arranged my visit to his school where I would sit in a class or two and then for us to sit down together to have a long discussion about his project. The reasons I gave for this visit were threefold: for me to get some idea of the context within which he works; for him to report to me on his progress; and more importantly, for me to provide him any help through suggestions and critique. Several of the action research fellows voiced a fourth purpose -- that I was visiting them in order to "check up" on their work. Although I did not view my visits in this way, it is possible that my visits served as reminders that it was time to "get back to work."

When I arrived at his school I found that I would not be able to sit in on an SS&C class because of scheduling problems. I was able to observe one of Miller's traditional science classes⁸. We did have the opportunity to sit and talk about his project. I wrote the following in my notebook after the visit:

10/10 - Miller is concerned that he does not have enough time to do the AR research project that he proposed. They [Miller and the other science teachers] are finding it very time consuming to write the curriculum for the 10th grade which they are implementing as soon as they write it.

He has a lot of projects going on. Besides his teaching, being site coordinator, and writing curriculum, he has been working on [statewide] assessment ...

He feels that there is a great lack of resources [to allow for the teachers to expand past the ordinary demands of the school].

He would like to be a 1/2 time teacher, use the afternoon to build next year's curriculum. Instead he's teaching 5 classes and has 2 different preparations. There is a conflict with physical resources. They need more equipment and supplies because all the classes are doing the same thing at the same time.

[The high school science department has] drawn apart from their middle school which they worked with last year.

Miller had begun to find his participation in the project as an action research fellow as untenable. Shortly after our meeting, he sent a letter to Goldberg withdrawing from the project and returning the honorarium check which he had received.

Doyle

I spoke with Doyle twice on the telephone before visiting him at his school. He said that he was keeping his research notebook and that he would make a presentation at the next hub meeting in order to encourage interest in his project. On October 13th, he told me that very few people had attended the hub meeting and that he was therefore not able to get the word out about his project to collect and evaluate instructional materials.

On October 17th I visited him at his school. I had the opportunity to see two SS&C classes and then to spend some time with the science department chair. Later on, when I had the opportunity to speak with Doyle, he told me that he was having difficulty setting up the curriculum exchange. There had been few people from other schools at the first hub meeting so he had not been able to get the word out. As a result, he decided to limit the scope of his project. He would focus on his primary objectives:

- developing his own thematic lessons,
- asking people to contribute their own lessons at hub meetings every six weeks, and
- establishing sharing sessions at the hub meetings.

In addition to the exchange of materials, he would have the teachers evaluate them in terms of UC requirements and how well they work with the students. In effect, his thinking through of his project

resulted in his decision to eliminate student evaluations of the curricular materials. I gave him two suggestions -- that he try to develop a core group of teachers working on this with him, and that he make sure to telephone people about coming to the meetings.

The next time I spoke with Doyle I found that he was still having difficulties setting up the exchange mechanism. Part of this was due to his lack of time to follow through in the way in which he would like to. He was nearing completion of his thesis for his master's degree in biology and found that a great deal of his time and energy was going into that task. As a result he was not getting the response that he had hoped for to the exchange idea. He had begun to think about a new focus for his project. Since the problem seemed to be in establishing contact with all of the teachers in the hub, he thought he should put his effort into the State computer network (CSUNet). Doyle's interest in doing this had arisen partly from his designation as the hub communications specialist, a position that was originated after the State project leadership found that the teachers in the project needed more help, and encouragement, to go on-line.

As we talked about his new plans, I wondered aloud with him as to why his original plan had not worked. As it turned out, he had not investigated that question. I suggested that he do so -- to find out why something as useful as an exchange network was difficult to establish. He said that he would try to get some information at their next hub meeting, either through interviews of individual teachers or through focus groups.

Young

I have had a great deal of contact with Young through the academic year because of her status as a hub coordinator. She has been to all of the statewide meetings and has also attended a national SS&C meeting. As a result, we have had several informal conversations about the larger project and her immediate concerns which relate to her teaching context.

In October, I began plans to visit Young at her school. In one of her first e-mail messages to me, she wrote

My SSC class is very discouraging. I am ashamed to have anyone visit. Give me another week or two maybe I'll see it in a more positive mood (e-mail, 10/21/91).

I responded (again by e-mail)

My job is to help you get un-discouraged. I seem to be pretty good at that. I will not be able to get to your school until sometime in December. How late is too "late"? I know that you go off session for a while. Let me know your schedule. I will call you soon.

Not too late turned out to be December 11, 1991, just before the beginning of a long time period when school was not to be in session⁹. I arrived at the school in the early afternoon in time to observe one class, spend some time with Young in the afternoon, and then attend a hub meeting which began in the late afternoon and went through dinner.

During our conversation, Young and I were constantly being interrupted by students and other teachers as she attempted to attend to her many responsibilities¹⁰. Her concerns went back and forth between the problems that teachers were having in her district and the problem associated with teaching in the inner city. For example, when we were discussing how she could organize groupwork in order to encourage participation by as many students as possible, she asked

What do you do with the kids who are there half the time? The attendance rate is never the same. So what do you do with kids who are half absent, half there? That's the biggest problem. Let's say your project runs for three days, I might have one kid there two days, and one kid who's never there, one day, or another three days, or half a period, or "I forgot it at home," period (interview, 12/11/91).

Her concern for the teachers came out in statements that reflected both demands on teachers and new structural changes in the schools. At one point she said, "I know we're not going to keep the same program because we've had all these changes." These changes included a 4 1/2% pay reduction, the elimination of preparation periods and substitute teachers, and a district policy that had resulted in the mid-year transfer away from the site of a bilingual earth science teacher who was an integral part of the SS&C program.

She told me of her view of the situation for the teachers: "The teachers here are really devastated, the teachers themselves (interview, 12/11/91)." Towards the end of our long conversation, she went on to talk about her co-hub coordinator:

Teachers are getting so run down, she [the co-hub coordinator] said that she is so tired, she's teaching 200 students a day, she's trying to go to all these meetings ... these teachers, the good ones, are going to be physically beat to death. Yesterday I went to a meeting, I didn't get home to 9:00 last night. I have this [hub] meeting today, tomorrow I have to be at the Board at 8[AM] to work on all these textbooks. I still have lesson plans for tomorrow, I can't talk to you anymore (interview, 12/11/91).

But before she dismissed me, she asked, "Am I doing anything?" I replied with a comment about how teachers are involved on the grassroots level in this reform. Her response was "But they don't let us do anything." When I asked her to elaborate, she modified her statement, "They let you do things but there's no money, let's put it that way (interview, 12/11/91)."

Doyle and Young continued to work on their action research projects as they went along doing all the rest that is in their lives. At this time they have each submitted an action research report that will be part of a collection of the other 13 remaining action research fellows to be published and disseminated throughout California. Doyle completed his report while finishing up his masters thesis, and Young was writing hers as Los Angeles was in the turmoil of racial riots.

Reflections

In the next section of the paper I will try to come to a understanding of what has transpired during this past year as I served as a facilitator of this action research. Before I do so I must begin with an important caution -- although I have discussed my facilitation with peers and supervisors, I have not solicited direct feedback about my role from the teachers themselves. This was due in part to oversight, and in part to the structure of the action research component itself.

Action Research

My conception of action research has shifted and evolved as I have worked with teachers involved in a variety of action research projects. I began by using an operational definition based more on the results of action research rather than what it is. I saw it as a process which results in the action researchers becoming better at what they do, and gaining a better understanding of the contexts within

which they work. So when school teachers are engaged in action research on their own practice, their practice improves and they will have a better understanding of their educational situations.

My understanding of what action research is has derived from this operational definition. First, because the primary goal of this research is not the generation of new knowledge, whether local or more universal, but the improvement of practice, it is a self-developmental process. This does not differ significantly from the way in which John Elliott has written about action research. He sees its primary purpose as an improvement of practice and not the production of knowledge. Action research does this by

... developing the practitioner's capacity for documentation and judgment in particular, complex, human situations. It unifies inquiry, the improvement of performance and the development of persons in their professional roles (Elliott, 1991, 52).

A second aspect of action research arises from its self-developmental nature. Teachers seek to develop their practice because they want to provide a better educational experience for their students. Therefore, action research is an ethical process which is deeply rooted in the moral aspects of teaching (Elliott, 1991). The moral nature of the process is reflected in teachers' choices of projects to undertake -- projects that improve their practice or their situations in order to better the educational situations for their students or peers. By amalgamating the processes of inquiry, improvement of practice and professional development within this moral framework, action research serves to integrate "...teaching and teacher development, curriculum development and evaluation, research and philosophical reflection, into a unified conception of reflective educational practice (Elliott, 1991, 54)."

Conceptions of research

My accord with this definition for action research has resulted in a discrepancy between how I see action research and that way it has been defined as part of the CA SS&C Project. Sachse and Crellin Pauling, the principal investigators of the project, wrote action research into their proposal, to be "jointly created by university faculty and secondary school teachers" in order "to learn more about the curricular and instructional implications of SSC (CSDE, 1989)." They saw this statewide component as consisting of "a host of coherent and coordinated, locally designed action research studies that will get results directly into the hands of classroom teachers (CSDE, 1989, p.4)." And that "The action research will contribute an ongoing feedback loop to all schools in the SSC reform in a way that teachers from other departments can utilize information about what works and why (CSDE, 1989, p. 15)."

I have called their vision of action research institutionalized action research. I am using institutionalized in the sense that an organizational institution has been created and given legitimate status in order to promote a cause -- in this case the implementation of SS&C in California. This differs from the forms of action research described by Elliott and myself in which teachers engage in the process in order to improve their teaching, and to gain a better understanding of their educational situations. That is, institutionalized action research does not focus on the development of the participants but on the development of the program. In the 100 Schools Action Research component, there is a purpose which supersedes the immediate goal of improvement of practice and the more long term goal of generating knowledge -- to implement SS&C and/or to evaluate that implementation.

It is possible for action research to be associated with a larger project and be self-developmental, as in the Environment and School Initiatives Project, established in 1986 by the Center for Educational Research and Innovation (CERI) of the Organization for Economic Cooperation and

Development (OECD). As of 1990, this project, which encourages teachers and students to act to investigate and change environmental conditions, is going on in 21 countries. The action research arises from concerns that teachers have while engaged in developing or encouraging environmental projects -- it is not seen as a mechanism to help implement the projects in the participating schools (CERI, 1991). Its primary purpose is, again, teacher development.

But to Sachse and Pauling, the action research component had as its primary function the research agendas of university researchers and policy makers -- the implementation of the SS&C reform through the generation of knowledge about science learning and by careful program assessment. Given these agendas, Sachse and Pauling's conception of action research was of teachers working with university researchers to explore the ways in which science is learned and to assess the implementation of the reform¹¹. The teachers' roles would be to assist the university researchers in their inquiry in order to get a closer look at schools and to return the findings to the teachers in a more timely manner. That is, the teachers part in the research process would be to increase its efficiency.

When I became a part of the action research component, I brought a different conception of action research; one that envisions teachers' research as an activity that is distinct from that of university researchers. In it, the teachers would set their own research agendas that focused on their development as teachers, curriculum developers and designers, and as educational leaders in the reform effort. The primary goal would be self-development -- getting better at, and coming to a better understanding of what they do. Other teachers would benefit from their work through being informed about these new understandings, rather than receiving information about what works and why.

There was also a discrepancy between my conception of action research and that of the teachers¹². It appears as if knowledge of two research perspectives contributed to the ways in which the teachers thought about action research. The first, scientific research, is more familiar to people involved in academia. The second, evaluation research, is more familiar to policy makers and implementors. These teachers, all of whom are science teachers, have received at least some training in scientific research methods. Although most have not had the opportunity to do formal research in the sciences, they have been initiated into a culture that values the "scientific method." The second perspective, that of evaluation research, is ubiquitous in the public school systems. With the growth of state and federally mandated and funded programs, school districts have been required to keep detailed records of the enactment and efficacy of these programs. The focus of the first perspective is on "What do we know?" while that of the second is "What can we show?"

For at least several of these teachers, action research was a way to demonstrate that their SS&C-type programs were more effective than traditional science courses. And, for these science teachers, the way to do that was through some quantitative comparison. They were aware that they could not do an experimental study, but several teachers did attempt through the year to do quantitative quasi-experimental studies to evaluate their work. And, almost all were stymied by the lack of appropriate data from the traditional classes¹³.

In the most ambitious project of this sort, a teacher used two different pre- and post-tests; a comparison of attendance and grade data; and student, parent, and teacher interviews to evaluate the program at his school. While he was able to demonstrate that the program was meeting its goals, he was disappointed that he was not able to show that the students were learning more science and were more motivated to study science than those in traditional classes. What he was seeking was some evidence that what he has done has had a positive effect on students -- that students are learning what is asked of them "better" than they would have in traditional classes. This "need to know (Feldman, 1992)," and their training in the sciences were important factors in shaping their projects.

On the other hand, my goal was for them to look carefully at their own work -- their actions -- and to "get smarter" about their practice through that look. But for many of these teachers, and others for whom I have acted as an action research facilitator, this "need to know" has kept their lenses focused on their students.

The timetable

The institutionalization of the action research shows up in several other ways. The first is the requirement that it fit within the larger project's timetable. The 100 Schools Project had received initial funding for three years. In order to reach as many teachers and schools as possible, it was decided that there would be three sets of action research fellows¹⁴, each of whom would complete his or her proposed project within one academic year. The decision to limit each action research fellows work time in this way was due in part to the organizational constraints of the larger project. That is, because the action research component is part of a larger project with definite funding and evaluation cycles, there has been a timetable within which the action research had to fit. It is also possible that this decision was made because of the power of the tradition of the academic year, and the assumption made by the component staff that the teachers' projects should fit within that unit. Whether the decision was due to the institutionalization of this action research or whether it was due to the insipid influence of tradition on the staff, or some combination of the two, the teachers found themselves with a timetable that required them to submit proposals for action research before they had a clear understanding of the nature of action research or significant experience with attempting to implement SS&C which would lead to projects that could arise out of their experiences.

This worked against my goal of the action research being self-developmental. In order for the teachers to have had identified projects or goals that focus on improving their practice, it was important for them to have had some experience in order to determine what it is that is problematic about their practice. But this is not needed with institutionalized action research because it is expected to be solely instrumental. It is possible to develop goals to be reached, or to identify problems that can be solved without a corresponding improvement or new understanding of the practice. In fact, it appears that by restricting the action research timetable in this way, it nearly insured that the research goals and problem statements would be phrased in instrumental rather than self-developmental terms.

It is also clear from my experience that the converse is not true -- experience with the project did not ensure self-developmental goals. Some of the action research fellows had at least one year of experience in their schools and hubs with the implementation of SS&C but their proposals were written in the same instrumental manner as the others. Clearly, engaging in some practice does not necessarily lead to being self-critical of that practice.

How then, can teachers be encouraged to turn the lens of action research on their own practice? First, it might be necessary to begin by identifying teachers who are interested in doing action research, and then to support them as they decide whether they have time and other resources with which to engage in the process. At that point I would be able to help them to identify their individual starting points for their research projects. To some extent that is what I did in my communications with the action research fellows. However, I did not make it clear to them that the focus of their projects need not be set until later in the academic year. Rather, the requirement that they include a project statement in their proposals sent the opposite message.

What this suggests is that the action research process begin first with the selection of the action research fellows independent of their possible research projects, then some time when they would look critically at their own practice in order to identify starting points (Altrichter, Posch, and Somekh,

undated) for their research, and finally an assessment of whether they have the resources to attempt that project. If my interactions with the action research fellows had proceeded in this way it is possible that some problems might have been avoided. For example, Miller might not have gotten to that third step. He had early on expressed an interest in the action research process, but an attempt to sort out his commitments and priorities might have led him to decide not to proceed further. Another action research fellow, who has stayed with the project but has only been minimally involved, might have decided that he did not have the resources available to continue. For Doyle, who has had many personal and professional commitments but is not as burdened as the others, this process could have given him the time to work another half year with the implementation in his school and hub to find a more appropriate starting point. In fact, that is what he has done while having first articulated a different project. It had become clear to him that one of the biggest problems that he and his colleagues have had is one of communications. Once he had identified this, he began to seek ways to improve communications, and to understand the forces that act against facile communications, whether in person, telephone, or electronic mail.

Young's situation was more complex. For while the others have been working within the moral framework of education, she was the only action research fellow who had clearly articulated her ethical stance. Her original proposal arose from the dilemma of assessing non-traditional students in non-traditional ways, and she is immersed in a situation which is filled with discrepancies and dilemmas that are institutional in nature. In order for her to successfully meet her goal, she needed to tackle institutional problems such as the lack of time and resources for teachers, and the societal problems that result in large numbers of youths turning off to the school systems. In situations like this the problems that I face in my role as an action research facilitator also grow. This has led me to recognize the importance of a critical dialogue between the action research fellow and the facilitator in order to sort through the multitude of issues to identify those that the teacher has the resources with which to be effectual.

Isolation

The action research fellows in the 100 Schools Project have found themselves isolated from other action researchers and from me, their critical friend (Sagor, 1991)." This isolation has been due in part to the institutionalized nature of the action research, and can be traced directly to the expansion of the CA SS&C Project to over 100 schools. In the original proposal, there were to be 2-3 action research fellows at each site. With the expansion of the number of sites without a proportional increase in the budget for action research, the action research fellows are scattered throughout the State¹⁵. As a result, they have been for the most part independent actors.

Two major problems have arisen from this. The first is that the isolation has resulted in the action research fellows feeling that problems that they are having such as lack of time and other resources are unique to each of them. The second is that they have not been able to get the critical feedback that they need to move ahead on their projects. They are missing a critical friend, or friends, who views their activities in similar ways, can offer a sympathetic ear, and give critical feedback and advice when needed. In other words, what appears to be missing is a community of action researchers.

Although the group as a whole had not met since the Action Research Conference in September of 1991, there have been two opportunities that I have created for subgroups to meet and discuss their situations. The first was a meeting of the northern California group at Stanford in early November, and the second was at a regional of the NSTA in Reno, NV. The make-up of this second group was determined by other reasons for travel to that meeting. A third opportunity occurred in early February. Again the make-up of the group that met was dependent on individual resources available for travel to

attend a statewide meeting of the CA SS&C Project. A second complicating factor was that several of the action research fellows are now recognized as leaders in other areas within the reform effort and facilitated other meetings that were scheduled concurrently with the action research meeting.

It is clear that it is important for the action research component to have built into it some mechanism for regional or local meetings of action research fellows on a regular basis through the academic year. The action research fellows have found it useful when this has occurred; it appears that in my role as field coordinator and facilitator I must find ways to encourage more regular meetings.

Contradictions of control

The institutionalized nature of action research within the 100 Schools Project leads to another consideration. Elliott (1991) has warned that "... there are signs that action research has become hijacked in the service of technical rationality (p. 52)." The result can be, as he suggests, a re-emergence of "...hierarchicalized, specialist functions to control and regulate primary practice (Elliott, 1991, 55)." This possibility is indicative of the contradictions that can exist between action research as a humanistic, personal process, and the goals of large institutions.

The goals of the CA 100 Schools Project cause even larger contradictions. When seen as a government initiative, the project appears to be another top-down reform effort relying on center-periphery information transfers and control. However, the project is structured so that much of the curriculum development, including long term planning of courses over several years (coalitions of 6-8th grade feeder schools with 9-12th grade high schools are not uncommon) and day-to-day micro-planning, is done by classroom teachers¹⁶. In addition, the type of teaching encouraged by the reform and the CA science framework is thematic, hands-on, and student-centered. This sort of teaching requires the teacher to have a fair amount of autonomy. These contradictions are visible in Young's comments. She is aware of the contradiction between the autonomy provided to her by the State in her multiple roles of hub coordinator, site coordinator, and classroom teacher, while at the same time quite aware of the restrictions placed on her ability to act by the constraints of under-funding for both her project activities and her teaching. Although not as apparent, this same problem was related to Miller's withdrawal from the action research project.

As field coordinator and facilitator, I must be aware of these contradictions. There is a tension that arises between the more micro goals of individual action researchers and the instrumental goals of the project directors. Therefore, while starting points are being identified and research methods are being chosen, the requirements of the larger project must be kept in mind. Questions such as

€How does this action research project help to implement SS&C in CA?

€How will a report of this project help teachers and others in CA to implement SS&C?

must be asked when starting points are identified. The danger comes if these questions and concerns become the only criteria as to whether an action research project is acceptable.

As field coordinator and facilitator for the statewide project, my actions need to reflect both the goal of successfully implementing SS&C and that of aiding the action research fellows in their professional development while not interfering (too) negatively with their work as teachers and their private lives. I have found myself possibly sliding too far in one direction at least twice. The first was when I responded to Young's concern of too much work. And the second was when I urged Miller to write up a report of how he was involved in too many projects to engage successfully in action research!

Conclusion

I have now ended my first year of involvement with the CA SS&C action research component. This paper has served as a vehicle for reflection for me as I do second-order action research on the process of coordinating and facilitating the actions of others.

As a result of this reflection, I plan to modify the way I act in this role. In this paper I have identified some of the ways in which I will do so. First, I will try to encourage more meetings of groups of action research fellows. This might happen through special gatherings, or at hub meetings, or at other meeting of the CA SS&C Project. Second, I will try to remain aware of the contradictions of control that I have identified above, and help the action research fellows to be cognizant of them. The third modification concerns the way in which the new action research fellows are selected. As I go to hub meetings around the State, I will talk with teachers about both the advantages of action research and the need to make an assessment of resources before making a commitment to a project. And, I will also try to make it clear that although the component staff would like the teachers to have some idea of the type of problems that they would like to be involved in and ways in which they could begin to address those problems, their focus can change as their experience with SS&C in their settings causes them to be aware of specific dilemmas and discrepancies that can serve as starting points for action research.

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¹As the physics teacher I taught the most academically motivated students in the school. And because most administrators, like many others, have never studied physics, I felt free of any possible criticism of my pedagogy.

²The proposal was to fund ten schools to serve as models for implementation by other high schools in California. The high quality of the proposals submitted by science departments to be part of the project prompted the decision to do away with the idea of model schools and instead include over 100 schools in the reform effort.

³The teachers asked me to identify them by pseudonyms. I will use pseudonyms but refer to them by their surnames following the convention used to refer to academic authors.

⁴During my visit to the school, I noticed a sign notifying the students that they would be suspended if they wore shorts to school. I also noticed that all the male teachers wore ties and the women teachers were in skirts or dresses.

⁵ He is referring to curricular materials distributed by Salters Publishing which is being "Americanized" by a team associated with the CA SS&C project.

⁶Sachse prefers the latter term because it suggests that the teachers are engaged in figuring out the best ways to teach in the style of SS&C. The former suggests that they are writing new curricula, an activity that they do not have the time or other resources to do.

⁷The action research component's staff had decided that it would be useful for the action research fellows to keep reflective journals of their experiences doing action research. I had met resistance from other science teachers when I had discussed with them the idea of journal keeping. I realized that while reflective journal keeping seemed to be out of the culture of science, keeping a research or laboratory notebook was deeply embedded within the syntactic structure (Schwab, 1964) of the disciplines. Therefore we decided to encourage the action research fellows to keep research notebooks in which they keep track of their actions and their thoughts re their actions or the results of those actions.

⁸In retrospect, that was probably a mistake. There was no need for me to see him teaching that class, and it might have led him to see me in more of an evaluative role.

⁹Young's school is now a "year-round" school. As part of this new schedule, school ended on December 20, 1991 and did not resume until February 14, 1992.

¹⁰This was not a unique occurrence. During many of my school visits teachers needed to attend to several things simultaneously. For example, one teacher was hosting the holiday party for a peer counseling group as we talked in an adjourning room.

¹¹Action research was put into the NSF proposal after a brainstorming session between Sachse and Frank Collea, the project coordinator for the southern hubs. Collea told me that he suggested action research because of the experience he had directing a large research project in which teachers served as research assistants to collect data about other teachers (personal communication, 2/11/92).

¹²To try to come to an understanding of another person's conception can be thought of in some ways as an act of mind reading. To attempt to develop a composite image through reflection on conversation and observation approaches folly. My claim is not that I am providing the reader with an accurate image of what these teachers have been thinking, or that I am giving them "voice." What I am attempting is to identify some ways of thinking about research that I believe affected the ways in which the teachers engaged in their projects and the ways in which I interacted with them.

¹³The one exception was a teacher in a district that used standardizes exams for all science classes. She was able to develop an exam that pieced together questions from the traditional courses to match the SS&C curriculum. Preliminary analysis of the exam scores indicates that the SS&C students scored higher than the traditional students on selected items in biology.

¹⁴Because of the way in which the funds were released, there will only be two years of the action research cycle.

¹⁵Scattered might be too strong a term. Most are clustered in the two large metropolitan areas -- Los Angeles and the San Francisco Bay area. But it must be remembered that the LA metropolitan area is

quite large and congested. Without traffic, the distance spans a driving time of more than two hours. In addition there are teachers considerably north of San Francisco and south of Los Angeles.

¹⁶Another example of this contradiction in action is the State policy for textbook adoptions. California is a textbook adoption state for grades K-8. In the current round of adoptions, the State has asked textbook publishers to put forward texts that will reflect the coordinated/integrated science aspects of the SS&C reform. While the availability of these texts will remove the burden of curriculum development or instructional design from the teachers, it will also restrict their ability to shape programs to meet the needs of their educational situations.