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AUTHOR Cox, Anne Marshall; Olson, Joanne K.
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ABSTRACT

As educators seek to bridge the gap between research and practice, action research empowers teachers to inform others of the results found in their own schools. This paper describes a step-by-step approach to help teachers and administrators conduct classroom action research in their own schools. The five steps are as follows: (1) problem formulation; (2) data planning and collection; (3) data analysis; (4) sharing results; and (5) implementing changes. The paper also describes the background of action research in science education and discusses different types of action research. (PVD)

Empowering Teachers as Researchers

Anne Marshall Cox and Joanne K. Olson
Foshay Learning Center
3751 S. Harvard Blvd.
Los Angeles, CA 90018
(213) 735-0241
acox@scf.usc.edu jkolson@scf.usc.edu

According to Kemmis (1988), "Action research is a form of research carried out by practitioners into their own practices" (p. 42). Applied to the classroom, teachers engage in systematic inquiry to answer specific questions they have about student learning, teaching practices, and other related issues. Research, most often pursued by university scholars, is slowly making its way to practitioners who spend five days a week in a data rich environment. As educators seek to seize the gap between research and practice, action research empowers teachers to inform others of the results found in their own schools. In science education, action is endorsed as a way to broaden existing research and connect knowledge between university researchers and teachers. Recently, the National Science Association Board of Directors made recommendations for action research in science education:

1. Pursue collaborative research between individuals in university and schools
2. Engage teachers as action researchers
3. Conduct research close to the classroom
4. Create an investigative society within science education

Fosnot (1989) describes an empowered teacher as one who is reflective in making decisions and who learns by investigating the teaching and learning process. She describes an empowered learner as one who is an autonomous and inquisitive thinker. These descriptors are what all good teachers do daily; however, in action research, systematic inquiry is important for obtaining solid results in inquiry.

Haste, Watson, and Burke (1990) contend that inquiry is a way of life for teachers, and those teachers who make good decisions about curriculum are already involved in the research process.

Feldman (1996) discusses two different types of action research. The first involves teacher research which involves teachers reflecting on their teaching and student learning. Data is collected throughout the school year from student work samples, anecdotal notes, and teacher reflections. The second type is classroom action research and is described by Feldman as a problem solving process. It is classroom research which we will discuss here.

We organized a step by step approach to help teachers and administrators conduct classroom action research in their own schools. Even though five steps are presented in a particular order, some of these steps may require researchers to circle back and forth between different steps. This is usually happens during data collection and data analysis. The researchers want to collect a small bit of data, analyze, collect more data, analyze, and continue this process many times before determining results.

Step 1 - Problem Formulation. Researchers identify problems and issues by stating questions about what they want to know. For example, "Why are our students having difficulty completing homework and long-term assignments?" or "Will informal field trips affect attitude and achievement in science?" Make sure questions are specific and not too broad, and that an answer is attainable. An easy way to get started is to record what is happening in a journal. Are there specific lessons that excite students? Is there a science program that is not working as effectively as you once thought? Record personal reflections about what is happening in your classroom and specific problems that arise.

Step 2 - Data Planning and Collection. At this point the researcher will decide

which population of students will be involved. Will the study include only one class? Will the study include all classes? Will one class or several classes serve as control groups? In addition, determine what data are needed and decide whether you will collect data qualitatively or quantitatively or both. For example, if you are determining the affect of informal environments on attitude and achievement, you may want to engage in interviewing students and parents (qualitative data collection), provide a pre/post questionnaire (probably quantitative, unless it includes open ended questions), and also examine student portfolios (qualitative) and grades (quantitative). As a researcher, varied types of data collection add substantially to your results. If you were to only include questionnaires when inquiring about student attitude of informal environments, important information obtained from interviews, portfolios, and grading would be lost. If possible, we recommend you use at least three different data sources; however, this is not always possible.

Step 3 - Data Analysis. Determine how data will be analyzed before you begin data collection. It is important to examine and code data systematically. This may involve circling back through data when it is collected qualitatively and having someone check your statistics if your are measuring information quantitatively. Using the question from Step 1 (attitude and informal environments), you may decide to analyze the data three different times during the first semester, within one to two weeks after students engaged in informal learning. Whatever is decided, it should be completed systematically. Many researchers like creating a matrix to record various information collected. You may plan additional investigative steps if necessary.

Step 4 - Sharing Results. After information is gathered and analyzed, the most important part of the action research process is to determined what was learned as a

result of this inquiry. Once you have reflected upon the results, it is essential that you share information obtained from your study to inform teachers in your school and teachers in other schools. This is part of your professional obligation.

Step 5 - Implementing Changes. Planning for the next step of inquiry desired is the 'final' step; although, there is nothing final about this step! This step may include additional classes where results may eventually be compared, or a school improvement plan based on the results of your study. The importance of this step includes incorporating what was learned from systematic inquiry and making changes in actual practice.

Influencing Practice

In order for meaningful change to occur in the science classroom, teachers must step up and take the responsibility to inform others of important findings. This may include only informing teachers in your district or school, or in national journals. Teaching as a closed door endeavor must change as we enter the twenty-first century. When teachers are as empowered learners and inquirers, the discrepancies between university research and actual practice may come together for the improvement of science education for generations of students to come.

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Signature: Anne Marshall Cox Joanne K. Olson	Printed Name/Position/Title: Anne Marshall Cox Joanne K. Olson
Organization/Address: University of Southern California Waite Phillips Hall 1001A Los Angeles, CA 90089-0031	Telephone: (213) 740-9747 FAX: (213) 740-8666 E-Mail Address: acox@scf.usc.edu jkolson@scf.usc.edu Date: 1/24/97