Action research
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Teachers studying teaching and learning in their own classrooms

ACTION

EDUCATIONAL RESEARCH, USUALLY pursued by university scholars, is making its way into the daily life of classroom teachers. Teachers are taking advantage of their data-rich classrooms, where they already spend 160 to 180 days a year, by conducting what is known as action research or teacher research.

During this process, teachers engage in systematic inquiry to answer specific questions about student learning, instructional strategies, social dynamics, or an array of other classroom-centered issues. The results of this research inform others of important findings obtained from actual classrooms and therefore help bridge the notorious gap between theory and practice.

In science education, action research is seen as a way to broaden existing research and promote the exchange of knowledge between university researchers and teachers. Recently, the National Science Teachers Association Board of Directors made recommendations for action research in science education (Kyle et al., 1991) that included:

- Creating an investigative society;
- Engaging teachers as action researchers;
- Conducting research close to the classroom; and
- Pursuing collaborative research between individuals in universities and schools.

Action research can be divided into two types (Feldman, 1996). The first involves teachers reflecting on their teaching and student learning. Data are collected throughout the school year from student work samples, anecdotal notes, and teacher reflections. The second type of action research is a problem-solving process in which teachers focus on a problem and ask questions about it. A plan is developed to collect more information about the problem, draw conclusions, and potentially solve the problem.

BY ANNE MARSHALL COX AND DOROTHY VALCARCEL CRAIG

RESEARCH IN THE CLASSROOM

Given the importance of action research, we present herein ways to begin action research using the problem-solving process described by Feldman and a step-by-step organizer adapted from *How to Conduct Collaborative Action Research,* by Richard Sagor (1992), to help teachers conduct classroom investigations. The steps are pre-

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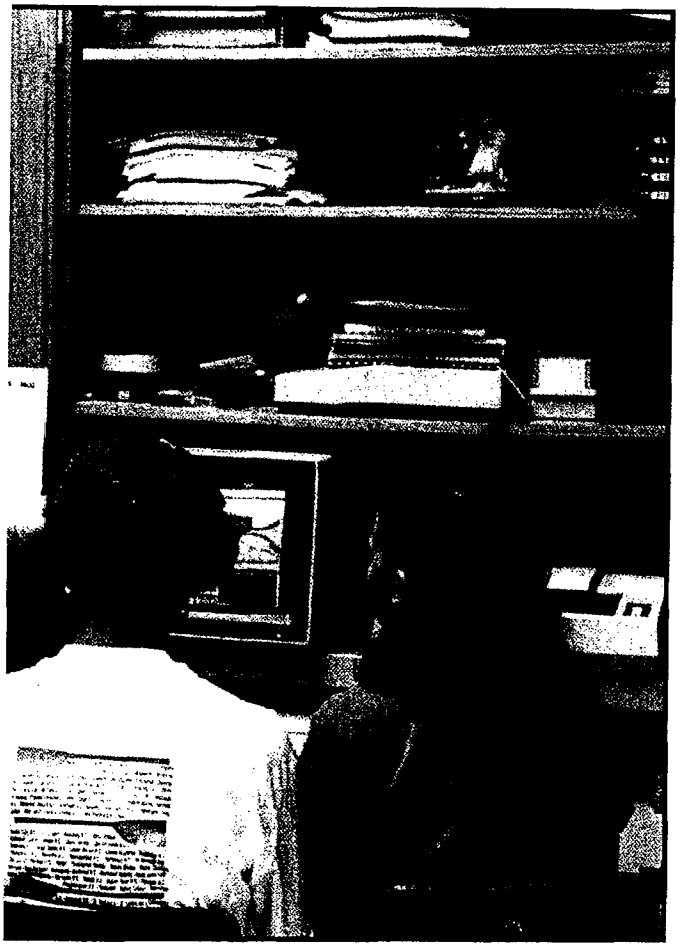
RESEARCH

sented in sequential order, yet teachers may occasionally need to cycle back and forth between different steps. This often happens during data collection and data analysis. For example, the teacher may want to collect only a small bit of data and analyze it before collecting additional data.

Teachers who feel uneasy about conducting research alone should seek support within their school from a fellow teacher or an administrator. These individuals can lend moral support or participate in the entire research process. If teachers have difficulty locating interested individuals in their school, they should contact a local university. Many professors and education graduate students are interested in helping teachers conduct classroom research.



Step 1—Getting Started. The teacher should become familiar with action research studies published in educational journals. These studies serve as excellent examples of action research. Books containing examples of action research and even reactions from teachers who participated in the process are also excellent resources (see Resources, page 52).

Step 2—Problem Formulation. The teacher identifies important classroom-centered problems and issues by stating questions about them: "What differences are observed in student motivation and achievement when activities lead students outside the formal classroom environment?" or "Will informal field trips to zoos and parks improve student achievement and attitudes about science?"

The most important thing to remember during this step is to make questions specific. The teacher should also make sure an answer is attainable. One way to find a focusing question or questions is to record what is happening in the classroom in a journal. The teacher uses the journal to describe problems encountered and possible interventions. This may take a few months, but it will help organize thoughts and focus the investigation.

Step 3—Data Planning and Collection. After formulating the questions to answer, the teacher determines what population of students to involve in the study. Will the study include only one ninth-grade class or all ninth-grade classes? Will one class be manipulated in some way while another class serves as a control group?

Next, the teacher determines what data are needed and decides what type of data to collect. For example, if the teacher is investigating whether trips to informal environments will improve science attitude, he or she may want to:

FIGURE 1.

Data analysis matrix.

Student	Interview Notes	Previous Tests/Class Work	New Tests/Class Work
Steven D.	Feels much more comfortable with the hands-on activities. Says: "Science is much more interesting."	76, 70, 77, 80/C, C, D, C	88, 91, 93, 86/A, B, B, B

- Conduct interviews before and after the trip with students and parents about informal learning experiences (qualitative data collection),
- Provide questionnaires before and after the trip (probably quantitative, unless open-ended questions are included), and
- Examine student portfolios (qualitative) and course grades (quantitative).

Varied types of data collection will enrich the research results. If the teacher only includes questionnaires when inquiring about student attitude and achievement from learning in informal environments, important information that could have been obtained from interviews, portfolios, and grading is lost. If possible, the teacher should use three different data sources.

Step 4—Stating Conclusions/Sharing Results. After gathering and analyzing information, the teacher determines what was learned as a result of the inquiry. It is essential for teachers to share information obtained from their studies to inform other teachers who stand to benefit from the results. This is part of one's professional obligation as both a researcher and a teacher.

Step 5—Implementing Changes. This step is presented as the "final" step, yet there is nothing final about it. This step entails putting the results to work in the classroom, which can be accomplished on a small scale by changing instructional strategies or, on a larger scale, by using the results to contribute to a schoolwide improvement plan.

PLANNING RESEARCH: AN EXAMPLE

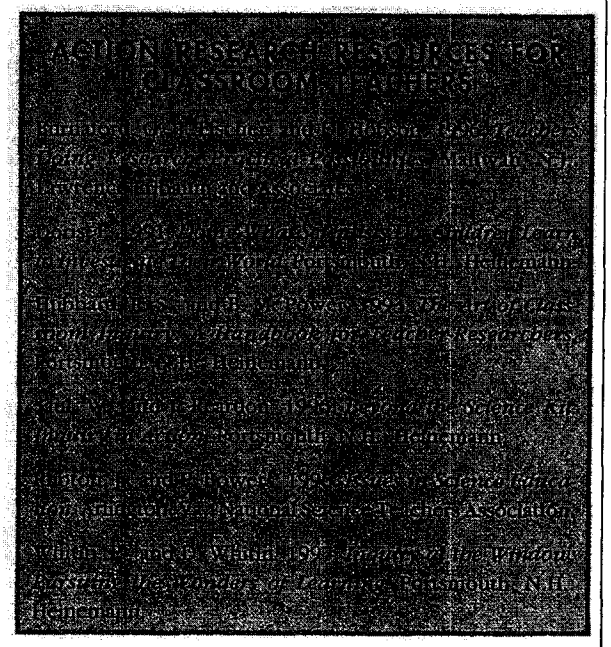
The following example shows how the process can be put into action.

Problem Formulation. During the first semester, students seem bored with traditional science labs. Many students are failing science and only partially completing labs during class. Several students inform the teacher that the labs are boring and regimented. The teacher has heard much about constructivism and decides that this problem can be solved by answering the following question: Will creating labs that are more open-ended increase student motivation and achievement?

Data Planning and Collection. The teacher decides that a time frame of three months is necessary to collect information and answer the question. The first month will be used to restructure labs, the second month to institute new open-ended labs and collect information, and the third month to analyze data. Data collection will include interviews from randomly selected students who are unmotivated and performing poorly and from students who are performing better. In addition, test results and work samples will be compared to previous scores and products. Interview and test data will be collected two times, but work samples will be collected each week.

Data Analysis. The teacher decides that analysis will begin as soon as he or she has a collection from each type of data. For example, after the first interview, the first test scores, and several weekly samples, the teacher will begin early analysis. All information is organized into a matrix showing the results of interviews, previous tests, previous class work, new tests, and new class work (Figure 1). The data are then compared as a whole. The teacher looks for patterns within the group of students selected.

Stating Conclusions/Sharing Information. The teacher finds that most students performed better using open-ended labs than using traditional labs taken directly from the textbook. Most students indicated that they enjoyed the labs more and were more excited about coming to class.



Because the information collected and analyzed showed that students greatly benefited from open-ended constructivist labs, this information should be shared with the faculty. Also, these outcomes could contribute to a presentation at a local or national science education conference.

Implementing Changes. The success of these labs has convinced the teacher that open-ended labs would be nicely integrated into the total science program. The teacher can still use many traditional labs that have proven to be effective. In addition, other teachers in the science department express an interest in changing some of their labs. The teachers decide to restructure at least three labs this year and then share them with one another. This would result in each teacher having nine new open-ended labs.

BRAINSTORMING AT DEPARTMENT MEETINGS

As teachers move into the action research process, they will find it helpful to engage in brainstorming and reflective interviewing, which can easily take place in team or department meetings. According to Sagor (1992), as teachers develop possible action research projects, reflective interviewing can help answer the following questions that may be helpful during the planning of research projects:

- Does the issue involve the teaching and learning process?
- Does the teacher have influence concerning the issue?
- Is the teacher both concerned and interested in the issue?

This brainstorming activity serves as an organizer for planning and ultimately leads to important questions that become the springboard for action research projects.

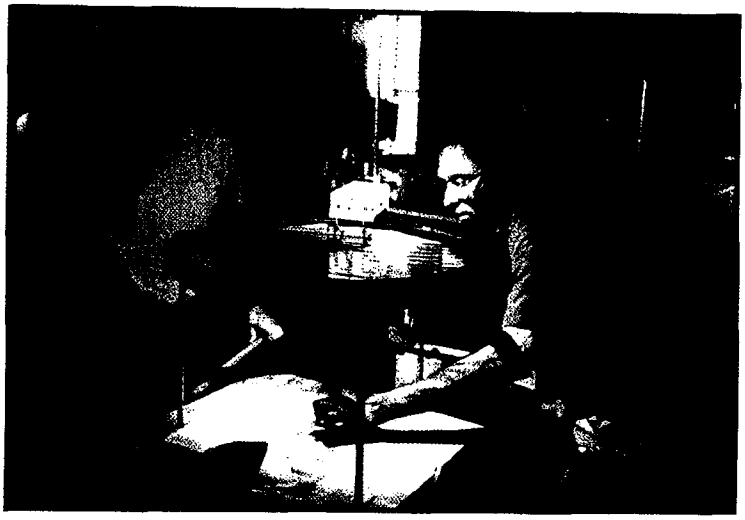
The following questions are examples of questions that developed as a result of brainstorming and reflective interviewing.

- What are some possible causes of lack of student participation in school science fairs?
- What strategies are most effective for improving student writing skills in content area subjects such as science?
- Why are female students less motivated during science labs? What are possible methods and/or activities that can be implemented to motivate these students?
- What are some possible solutions to address the lack of technology in our math and science classrooms? What are possible sources for funding—local business and industry? How can we effectively share computers with other teachers?

LOOKING AHEAD

As teachers, we must step up and take responsibility for informing others of important information found within our classrooms. This can be effectively done by systematically collecting and analyzing data, then presenting valuable information to the school or district, or in national journals.

Teaching as a closed-door endeavor must end as we enter the twenty-first century. Most teachers have important information to share. By sharing their findings, teachers become empowered as both learners and inquirers, and discrepancies between university research and actual practice may cease, improving science education for generations of students to come. ✧



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