

Supporting Technology Integration through Action Research

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Billions of dollars have been spent to bring computer technology into K–16 classrooms. Since 1999, Congress has devoted over \$275 million to the Preparing Tomorrow's Teachers to Use Technology program. States and local districts have spent tax dollars to wire schools for Internet access and to conduct summer computer technology academies for teachers. Parents and concerned citizens have even donated time to wire classrooms and train teachers to use computer technology in "Net Day" events. Although these efforts have had great success, they have not yet brought about the reform that educators had hoped would transform our classrooms. Many teachers are not yet using computer technology in their daily teaching. According to staff in the U. S. Department of Education (1999), only 20 percent of the 2.5 million teachers currently working in our public schools feel comfortable using computer technology in their classrooms.

Why are our teachers still hesitant to use technology for teaching and learning? One reason for the lag in implementation is that teachers are not yet convinced that computer technology can significantly enhance learning. When teachers believe in a method, they go to great lengths to implement it. Almost everyone can tell a story of a dedicated teacher who created the most sensational lesson from materials that he or she obtained by saving soup labels or cash register receipts, or a story of a teacher who spends hundreds of dollars every year on classroom supplies. The point is that teachers will stop at nothing if they believe in the cause. However, many teachers do not yet believe in the benefits of computer technology in the classroom. The workshops that have been the primary source of professional development in the area of computer technology have failed to help teachers understand the compelling benefits of

integrating it into classroom lessons. A survey of technology workshops listed on the Internet reveals a list of skills-based, one-shot sessions that help teachers learn how to make a Web page, create an electronic concept map, or make a multimedia presentation. But besides knowing how to use computer technology, teachers need to understand how they can use it to develop student understandings and to support constructivism, cooperative learning, and problem-based learning. Professional development for computer technology needs to be ongoing, tied to student learning, focused on individual and organizational goals, driven by a long-term plan, and planned collaboratively by those who will participate in it (Bellanca 1995; Bradley 1996; U.S. Dept of Education 1996). The thesis of this essay is that action research can be an effective professional development strategy to show teachers how to use computer technology in their classrooms and to convince them that the benefits outweigh the additional demands for time and resources.

There is more than sufficient evidence to demonstrate the effectiveness of technology to improve student achievement. Kulik's studies (1994) showed that use of certain computer based instruction programs raised student achievement at least 1.4 years in 10 months of use. Similarly, Wenglinski (1998) found that higher order uses of computers led to increased student achievement in mathematics for both fourth and eighth grade students. Sivin-Kachala's review of research (1998) revealed that use of computer technology led to improved achievement by students in every content area, including special education. Nevertheless, for the most part, teachers apparently remain unconvinced. Perhaps classroom teachers feel too far removed from the research for it to be convincing. Few class-

room teachers read research journals or feel connected with the findings reported there. Practitioners tend to find traditional educational research less useful than narrative accounts from schools and classrooms that provide them with vicarious experiences (Anderson, Herr, and Nihlen 1994).

The research on educational change indicates that change is more likely to occur when participants feel ownership of a problem and feel connected to the solution (Anderson, Herr, and Nihlen 1994). It follows, then, that teachers are more likely to change and use computer technology if they are involved in discovering and testing how it can improve student achievement. Action research can engage teachers in examining the effectiveness of teaching with technology and convince them to want to reform their teaching.

What Is Action Research?

In *Reclaiming the Classroom*, Boomer stated that action research is a “deliberate, group or personally owned and conducted, solution oriented investigation” (1987, 8). Anderson, Herr, and Nihlen defined it as “insider research done by practitioners using their own site as the focus of their study.” They continued to say that it “is oriented to some action or cycle of actions that practitioners wish to take to address a particular situation” (1994, 2). Action research is problem focused, context specific, and future oriented and aims at improvement and involvement (Hart and Bond 1995). The components of action research are reflection, inquiry, and action (Patterson and Shannon 1993). The term “action research” can be used synonymously with “practitioner research;” “site-based research;” or “participatory action research.” Because its purpose is to improve instruction, the litmus test of good action research is that it improves the quality of the transactions between teachers and their students (Cousin 2000).

Advantages of Action Research

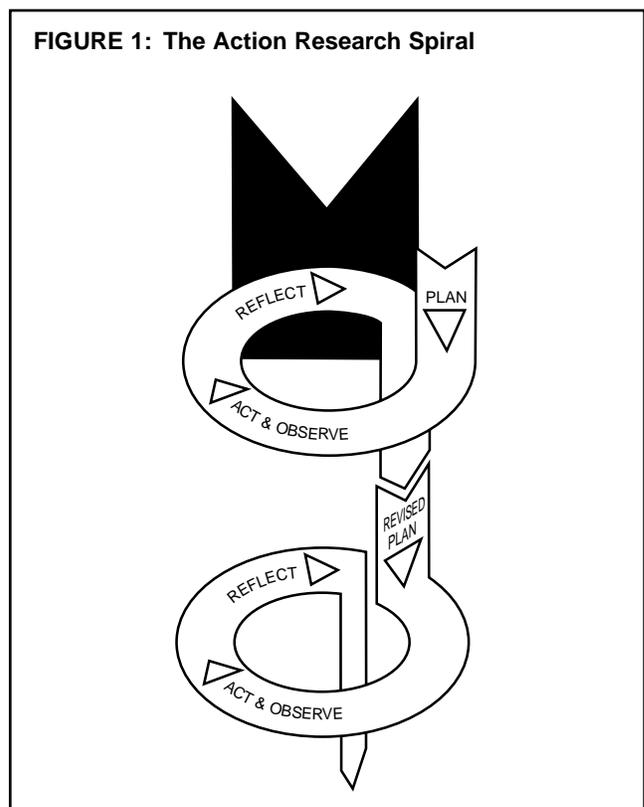
There are several reasons why teachers should participate in action research. The first reason is that it facilitates improvement via change in the classroom. According to Dick (2000), “when change is a desired outcome, and it is more easily achieved if people are committed to the change, some participative form of action research is often indicated” (¶16). Action based on new knowledge is the goal of action research (Patterson and Shannon 1993). In action research, participation is a requirement; it generates greater commitment and increases the likelihood of action. A second reason that teachers should participate in action research is that it is focused on improving student achievement (Anderson and Burns 1989). Action research can pinpoint effective uses of technology to improve student achievement. Finally, teachers learn

more from professional development experiences when they use action research (Dick 2000). Direct teacher involvement with research will increase the likelihood that the teacher will use the research results. It gives teachers the power to make decisions and allows them to take responsibility for their own professional growth (Thorson 1999).

Research Cycle

Action research is a cycle of continuous movement. Through reflection on both theory and practice, connections are made, and each influences the other (Hancock 1993). The teacher-researcher makes a plan, implements an action, observes, and reflects. Based on this reflection, a new plan is created and the cycle begins anew. Often the research question that guides the action research emerges after several cycles. Kemmis (MacIsaac 2000) represents the cycle with the graphic in figure 1.

One implication of the diagram is that action research in computer technology will take time. Teachers will need to begin by interacting with their peers. Study groups, demonstration lessons, professional journals, and peer coaching can provide teachers with ideas for best practices. Close observation of a technology rich lesson and student work will yield behaviors, actions, and outcomes. Reflection on these data can begin to provide ideas for research questions and action research.



Elements of Action Research

Research Question

Framing the research question is perhaps the most difficult part of action research. Questions for teacher-researchers arise from their classrooms. (Hubbard and Power 1993). According to Odell (1987), the research question comes from a sense of conflict or uncertainty. *Unlike traditional hypothesis-based research, the research question emerges as action research progresses.* Although the initial question and answers are likely to be fuzzy, the cyclic procedures will allow the researcher to refine both the question and the methods (Dick 2000). There are numerous research questions that teachers can use to investigate the use of technology to improve student achievement:

1. How can all members of a group be actively engaged when small groups share a single computer?
2. What strategies are effective for guiding students when they are reading Web pages so that they process the information they are reading?
3. How can multimedia be used as an assessment tool?
4. How can computer technology increase student motivation?
5. How does participation in an online collaborative project affect motivation?
6. How can students use computers in the content area if their computer skills are weak?
7. How are student attitudes, behaviors, and knowledge influenced when a particular strategy or use of software is implemented?
8. How are students, teachers, and parents affected when Web pages and e-mail are used to facilitate communication between home and school?
9. How can spreadsheets be used to develop an understanding of graphing?
10. How can using a word processor encourage revision of student work?
11. What are the effects of using PowerPoint to support student presentations?
12. What are the effects of having students work in small groups versus working individually on the computer?
13. What are the effects of a particular professional development strategy for helping faculty learn to integrate technology?
14. How can the school's network be used more effectively to improve student achievement?
15. How can a discussion board increase faculty use of technology?
16. How will putting information on a classroom Web site affect student achievement, attitudes, or behavior?
17. How will using PowerPoint to deliver instruction affect student achievement, attitudes, and behavior?
18. How can the Internet be used to improve reading skills?
19. How can word processing be used to increase writing skills?
20. How can the use of databases improve students' understanding of core knowledge?
21. What are the effects on student achievement of using simulation software?
22. What are the effects of using computer-based instrumentation in the science classroom?
23. What are the effects of using a template to facilitate student use of a particular software program?

Methods

In addition to framing a research question, the teacher-researcher must develop a research plan that includes the purpose, the subjects, and the innovation. According to Anderson and Burns (1989), the action researcher needs a clear statement of purpose that includes a description of the participants, a description of the events, and the relationship between the participants and the events. After creating the plan of action, the teacher researcher must determine how to collect the data. The method will determine how the evidence is to be gathered and how meaning is to be derived from it. It should include the following:

- What the sources of evidence will be
- How the evidence will be collected
- How meaning will be derived by connecting to frameworks
- How evidence will be interpreted relative to the research question (Anderson and Burns 1989, 98)

Because action research is often considered unstable research, the plan of action should carefully consider reliability. In addition, Isakson and Boody (1993) explained that the methodology should address the Lincoln and Guba standards:

- Credibility—multiple data sources to support claims for internal credibility
- Transferability—a description of the context, participants, and activities is included to speak to external credibility
- Dependability—conclusions that logically connect to the findings are shared with colleagues to ensure accuracy
- Confirmability—evidence from field notes is provided to support interpretations

Data Sources

Within the classroom, a variety of methods exist for data collection. One of the most widely used is the reflective journal, which teacher researchers can use to develop research questions as well as to answer them. Ideas based on Stephens and Reimer (1993, 163)

Ideas for Reflective Journals

Reading

- Comments—relate to readings in technology, such as *Learning and Leading with Technology*.
- Connect—relate readings to classroom experience.

Teaching

- Tell—recount an event when technology was used in the classroom.
- Observe—record student behavior when using technology.
- Interpret—analyze a child or an activity.
- Hypothesize—raise possibilities. What would happen if you used technology in a particular activity?
- Instruct—reveal instructional decisions regarding grouping or methodology when using technology.

Planning

- Discuss—share lesson plans that integrate technology for lesson study.

Reflecting

- Analyze—examine the confidence you project as a technology user.
- Examine—analyze personal learning journey.
- Document—provide background information on classroom experiences.

Assessing

- Evaluate—examine the journals as a learning tool.
- Evaluate—assess students, the lesson, or the program.

regarding the use of reflective journals by teachers to examine the implementation of computer technology in the classroom appear in the sidebar.

Patterson and Shannon (1993) suggested that the teacher-researcher write daily in a reflective journal as a way to get started on action research. The teacher should write for at least a week and then begin looking for surprises and patterns. Journals facilitate thinking about teaching by providing a tool for making sense of what happens in the classroom (Isakson and Williams 1996).

Another tool for collecting data is videotape. Analysis of videotaped lessons will often raise more questions. The videotape can also be shared with students,

who may be asked to describe what they were thinking or why they behaved as they did.

Qualitative research strategies can provide other sources of data. A teacher-practitioner can interview students and other teachers, use survey questionnaires, and focus groups, or conduct classroom observations. Finally, examples of student work and comments from colleagues, parents, and teacher study groups can provide evidence bearing on research questions (Hancock 1993; Anderson, Herr, and Nihlen 1994; Fleming 2000).

Reflection

After collecting the data, the teacher-researcher must analyze them. Through reflection, teachers understand what they are currently doing; why they are doing it a certain way; whether it is what they want to do; and what they should do in the future (Patterson 1996). Reflection on the use of computer technology in the classroom can identify causes of successes and failures and provide ideas for revision. Was the lesson with technology more or less successful because of the method, the students, or the specific equipment? In the past, when a computer-based lesson did not yield the desired results in achievement, some teachers resolved not to use technology at all. Reflection based on carefully gathered data could identify specific weaknesses in the lesson and suggest areas for change. Reflection could also highlight specific strategies that were successful and encourage using them in other lessons.

Reporting

The success of action research as a tool to increase the use of computer technology in the classroom for teaching and learning depends on reporting the results. As stated earlier, practitioners tend to find traditional educational research less useful than narrative accounts from schools and classrooms that provide them with vicarious experiences (Anderson, Herr, and Nihlen 1994). Reporting the results of action research can provide those experiences. To increase credibility as well as creativity, teachers should involve their colleagues in all phases of their action research projects. Reporting can occur in various settings: in school teams, in faculty meetings, in professional development sessions, on electronic bulletin boards, or in regional conferences and professional journals.

Because it can provide a structure for reflective practice, action research provides an alternative approach to using workshops to encourage teachers to integrate computer technology into their teaching. If we encourage more practitioners to undertake such investigations, a growing body of research will show more clearly the benefits of using computer technology and increase teacher motivation to use it to increase student learning.

Key words: action research, teacher motivation, technology in the classroom, student achievement

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