

CHEMISTRY TEACHERS RESEARCH THEIR OWN WORK: TWO CASE STUDIES

RACHEL MAMLOK-NAAMAN, OSHRIT NAVON,
MIRIAM CARMELI, AVI HOFSTEIN

The Weizmann Institute Of Science, Israel

ABSTRACT

Ten high-school chemistry teachers and two staff members from the Science Teaching Department of the Weizmann Institute of Science who served as coordinators participated in a one-year professional development program aimed at enhancing the teaching and learning of chemistry using Action Research methodology. In Action Research, teachers research their own practice of teaching. The program involved monthly meetings throughout the year at the Science Teaching Department. Here we present two case studies which will serve as examples of the program. In the first study, teachers investigated their students' misconceptions about the electrical conductivity of metals and ionic materials. The second study focused on the behavior of non-science-oriented students and their attitudes toward chemistry studies. The program included an evaluation of the process that teachers underwent while doing their classroom research; the evaluation was done by the workshop coordinators. Based on the findings of these two studies, we may conclude that involving teachers in an intensive workshop dealing with various aspects of teaching and with investigating their own work, provides teachers with tools for systematically diagnosing students' learning difficulties and the ability to change their instruction accordingly. Moreover, the workshop experience supported an environment of collegiality and enabled teachers to collaborate with professional researchers and other teachers.

1. THEORETICAL BACKGROUND

Action Research is an inquiry in which teachers research their own work and their students' learning in the classroom (Feldman & Minstrel, 2000). According to Feldman (1996), the primary goal of Action Research is not to generate new knowledge, but rather to improve and change classroom practices. The process of Action Research can be described as a cycle of planning, implementation, observation, and reflection. Implementing changes and improving classroom practices is an iterative process (Kemmis & McTaggart, 1988; O'Hanlon, 1996; Zuber-Skerritt, 1996). Each cycle of Action Research is repeated, and all cycles together form a spiral. Lewis and Munn (1987) indicated three main reasons for conducting teacher-based research: (1) to try to determine what is actually going on, (2) to monitor and thereby formatively influence the direction of new developments, and (3) to evaluate what is already taking place.

Loucks-Horsley, Hewson, Love, & Stiles (1998) wrote that

Action research has evolved in the education community into an ongoing process of systematic study in which teachers examine their own teaching and students' learning through descriptive reporting, purposeful conversation, collegial sharing and critical reflection for the purpose of improving classroom practice. (p. 95)

The use of Action Research as a strategy for professional development is based on the following assumptions (Loucks-Horsley et al., 1998, p. 97):

- Teachers are intelligent, inquiring individuals with important expertise and experiences that are central to the improvement of education practice.
- By contributing to or formulating their own questions and by collecting data to answer these questions, teachers grow professionally.
- Teachers are motivated to use more effective practices when they are continuously investigating the results of their actions in the classroom.

For Action Research to be an effective means of helping teachers to reflect on their practice, we must provide them with opportunities to engage in life-long professional development (Hofstein, 2001). These opportunities will provide them with an environment of support, collegiality, and a chance to collaborate with professional researchers and other teachers who teach the same or related subjects, in a milieu that encourages teachers' reflection on their classroom practice and on the results of their research efforts.

According to Holly (1991), collaboration is now seen as a major form of professional development. Indeed, this collaborative inquiry should be conducted by professionals acting as reflective practitioners (Schon, 1983). When teachers reflect critically on their experiences, they scrutinize them and improve their ability to teach and understand their students' learning difficulties (Obaya, 2003). Van Zee (1998) discussed the meaning of the term "teacher researcher", the rationale for preparing teachers to do research as they learn to do it, and suggested ways to educate teachers as researchers.

Typically, teachers who are inexperienced in Action Research need support and training regarding its methodology, procedures, and activities. This includes designing tools, collecting data, analyzing and interpreting the results, and finally, applying the findings in the science classroom. Engaging in professional development provides teachers with an opportunity to share the results of their classroom research and related pedagogical activities with fellow teachers who will later provide them with feedback and other ideas.

Having a long and varied history, Action Research was first introduced by Kurt Lewin in the 1940s. However, only in the last 10 years have we discovered the potential that this strategy has in our effort to bring about changes in the science classroom. In recent years, Action Research has been widely used as a tool for the professional development of teachers in all stages of their career, including their pre-