Action Research in Teacher Education: Preparing Pre-service Teachers to be Adaptive Experts

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In an increasingly diverse and rapidly changing world, it is no longer sufficient for teachers to be “routine experts” (Hotano & Oura, 2003) able to master established curriculum and pedagogy with efficiency. In a report commissioned by the National Academy of Education, an expert panel argued that teacher education programs need to focus on the development of “adaptive expertise” (Hotano & Oura, 2003). In order to adapt to changing social and professional circumstances, adaptive experts continuously add to their knowledge: “knowledge of learners and their development in social context”; “knowledge of subject matter and curriculum goals”; and “knowledge of teaching” (Bransford, Darling-Hammond & LePage, 2005, p. 11).

To become adaptive experts, pre-service teachers need opportunities to draw on their knowledge, skills and dispositions in authentic classroom situations (Bullough & Gitlin, 1995). They need to make informed pedagogical decisions, reflect on those decisions, and make adaptations (Schon, 1983). They need to feel a sense of moral agency within collaborative professional communities (Bransford, Darling-Hammond & LePage, 2005). These are large demands requiring powerful strategies and thoughtful approaches.

In our personal experiences as classroom teachers and as teacher-educators, practitioner research and reflective practice have been

essential to our ongoing professional renewal. Like many other teachers, we have employed action research as a means of developing our responsive expertise (Cochran-Smith & Lytle, 1999; Zeichner & Noffke, 2001). Action research is generally defined as a form of educational research in which practitioners engage in systematic, intentional inquiry into practice for the purpose of understanding and improvement (Cochran-Smith & Lytle, 1990; Kemmis & McTaggart, 1988; Sagor, 1992). Simply stated, action research looks for answers to the question, “How do I improve my work?” (Whitehead, 1989). The inquiry process involves gathering base-line data, formulating a question, developing and implementing an action plan, collecting and analyzing new data, and making claims to knowledge based on conclusions drawn from evidence (McNiff, 2002). Reflection is an inherent part of the process. Significantly, improvement is broadly directed to enhancing learning for students (Laidlaw, 1992).

In this article, we hearken back to a previous action research project we undertook, in which we introduced our pre-service teachers to action research (S & K, 2004a; S & K, 2004b; K & S, 2004a; S & K, 2005). Our purpose was to professionally empower these soon-to-be teachers by enhancing their concept of what it means to be a teacher. Reflection and inquiry, inherent in action research, were our tools.

Now, we re-examine this project, exploring the following question: Did our two-tiered action research project, directed to professionally empowering pre-service teachers, simultaneously contribute to developing their adaptive expertise? In considering this question, we focus on an action research project written by Leslie, one of our participants.

Encouraging Equitable, Willing Participation while Teaching Math

An Abridged Version of Leslie's Pre-service Action Research Report

Question:

How can I encourage equitable and willing participation from students, regardless of gender, ethnic origin or ability, when taking whole-class approaches to mathematics?

Baseline Data:

My baseline data was based on observation. I worked daily with students in two sections of grade 7 mathematics, both of which consisted of evenly distributed males and females, whites, Asians and Indian/Arabic. However, while 7A formed a vocal and dynamic class with willing and equitable student participation, 7B had a large contingent of quiet, non-participatory females and lower ability, less confident males.

Action Plan and Implementation:

- Eliminate unintentional favoritism: I paid close attention to the distribution of opportunities to participate. I made a conscious effort to choose evenly from different genders, races and areas of the classroom, keeping track of who had or had not spoken.
- Stress learning over performance and offer intangible rewards for participation: I em-

phasized concept and goal over rote procedure, expressed appreciation for all contributions, and made time for “stupid” questions. I also nodded, smiled and made strong eye contact when listening to student responses.

- Increase wait time: I rephrased questions and comments or paused longer after speaking, rather than responding to the first person to raise a hand. This gave more hesitant and more reflective students greater opportunities to participate.
- Provide positive critical feedback: Rather than say, “good try”, when an answer was incorrect, I inquired neutrally after alternatives, gave hints and suggestions, asked probing questions and encouraged students to restate or correct original positions.
- Provide more “low risk” opportunities for participation: I allowed students to consult before answering and to anonymously call out answers. I incorporated simple, straightforward questions into my lectures and encouraged group consultation when taking up homework, thus shifting credit and blame to the group rather than the person.

Results:

Section 7A exhibited increased overall participation, but maintained the same participation pattern. Students asked more questions of a deeper nature, and volunteered more answers. Section 7B displayed both greater and more even participation. More students put up their hands more often to ask questions or contribute insights of a deeper theoretical nature. Participation remained somewhat skewed, but competent males no longer dominated the class discussion. Female students and students of lower ability and

with less confidence contributed more frequently and adequately.

Rationale for Our Initial Project

Leslie’s report is one of thirty-two generated in our teacher education class. Our intention was to address the gap between educational theory and classroom practice identified by the Holmes Group (1986); since the publication of that landmark report, the reform of teacher education has been a priority for many university-based teacher educators. However, making connections between theory and practice has proved elusive, as teacher educators have come to realize the complexity of the skill sets teachers require to reflect critically on their skills in order to address the needs of students in classrooms (Darling-Hammond & McLaughlin, 1995).

J. was committed to addressing this gap in the general methodology course. He already employed a range of reflective practices: personal narratives; reflections on critical incidents; case studies; and critical analysis (K, 2005a, K, 2005b). While he had considered introducing action research as a way of promoting inquiry into practice, he had been reluctant to add to a syllabus already packed with content and assignments. However, when D. became his teaching assistant in 2004, things changed. D. had been very active in action research during her teaching career. Together we devised a two-tiered action research project in which pre-service teachers conducted classroom action research, while we conducted action research on our implementation of this project at the university level (S & K, 2004a, K & S, 2005).

Action Research Plan

Our observations, base-line data gathered over the years, indicated

that most pre-service teachers think of themselves as routine experts, at best. At worst, the general milieu of teaching can make teachers feel they lack the expertise and the right to be experts of any kind (S, 2006). Thus, we designed our question as follows: Given the requirements and limitations of our pre-service teacher education program, is it possible to introduce action research to students in a way that will empower them professionally?

As we designed our plan for introducing action research to pre-service students, we adapted the three-phase process Bullough and Gitlin (1995) developed for use in pre-service teacher education (p. 181).

- Phase One: Identify and write up a concern or issue; collect baseline data. In light of the data, reconsider and reformulate the issue and write a question.
- Phase Two: Write and implement an action plan; gather and analyze data.
- Phase Three: Assess the plan in the light of the data analysis. Make recommendations for future study and practice.

In order to assess the effectiveness of incorporating this action research project into our teacher education course, we planned to collect and analyze data from a variety of sources: pre-service teachers’ proposals, project reports, and reflections, as well as our written feedback to students and our personal reflective journals.

Implementation

After we introduced the action research project, pre-service teachers began to formulate research questions based on their interests and their experiences during four to six observation days prior to the first practicum.

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Simultaneously, they researched literature pertinent to their topics.

Each project addressed a question of significance to the pre-service teacher who designed it, and related to the needs of the students with whom s/he was working. Our feedback focussed on helping them develop inquiry questions that were both meaningful and manageable. The examples below convey the nature of the topics explored:

- How can I best program for a student with exceptionality (Asperger Syndrome) who is in a gifted program, while maintaining a suitable learning environment for other students? (Teresa)
- Can the use of cooperative learning strategies in a grade 12 physics class stimulate higher-level investigations and discoveries by students, and elevate the excitement of learning? (Siow-Wang)
- Will reading about classroom management approaches and subsequently choosing and utilizing one method improve my classroom management skills? (Maureen)

Prior to the first practicum, pre-service teachers each formulated a plan of action. They then implemented their plans and collected data during their practicum placements. Upon returning to the faculty, they wrote final reports in which they analyzed data, assessed their plans, and made recommendations for further action or study. They concluded with reflections on their inquiry experiences. Each action research project was also presented in class.

Analysis

In our original study, we assessed the degree to which our action research project empowered pre-service teachers. In this

article, we look for evidence of a correlation between professional empowerment and adaptive expertise.

Once again, we focus on Leslie, but also reference the work of other students whose proposals we quoted.

Knowledge of Subject Matter and Curriculum Goals

Leslie and her colleagues entered the program with strong academic backgrounds in their teachable subjects. For example, Leslie had a B.Sc. in Mathematics. All took subject-specific curriculum courses as part of their pre-service programs.

In designing their lessons and units, pre-service teachers had to work within Ontario curriculum expectations. In Leslie's case, the action research question helped her see beyond specific knowledge and skills expectations in the Ontario curriculum. Indeed, Leslie's commitment to "learning over performance" made her more effective in addressing broader provincial goals such as promoting reasoning, reflection and communication in mathematics.

Students learn only when they are engaged. Siow-Wang, Ph.D., (Physics), observed that students seemed disengaged from the problem-solving exercises in their textbooks. As a result, she sought to engage Grade 12 Physics students in authentic problem-solving through a cooperative learning activity. While this was a time-consuming process, Siow-Wang was pleased that this project increased motivation and stimulated higher-level inquiry.

Action research empowered Leslie and Siow-Wang to move beyond routine ways of teaching their subjects. They functioned as novice adaptive experts when they extended the curriculum, thus addressing higher-order cur-

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riculum goals and obeying the moral imperative to help each student reach his or her potential as a learner.

Knowledge of Learners and Their Development in Social Context

Leslie and her colleagues had the opportunity to visit schools once a week prior to the first practicum. This experience, although brief, enabled them to readily identify action research problems that engaged them and addressed student needs. Studying educational resources also informed their action plans. The reading of education sources also informed their action plans. Leslie devoted considerable attention to the individual learning needs of students, particularly those not inclined to participate. Her commitment to gender equity in mathematics made her mindful of the gender and cultural diversity in her class and she factored these into her lesson planning. Engaging in action research prompted Leslie to explicitly adapt her teaching to the needs of individual learners within their social context.

Teresa, who worked with a gifted student with Asperger Syndrome, enhanced her "commitment to helping students develop their natural learning processes" and acquired strategies to enhance learning and social adaptation for at-risk students.

These field observation days and the ensuing projects helped pre-service teachers connect theory and practice (K, 2005) and relate practice to the needs of individual learners in their social context; thus, they addressed teachers' moral imperative. Pre-service teachers experienced agency when their modified teaching practice based on understanding of stu-

dents made a positive difference in students' engagement and learning. Once again, professional empowerment enhanced adaptive expertise.

Knowledge of Teaching

The invitation to become a teacher-researcher encouraged Leslie to see teaching as a complex process. She looked beyond routine delivery of mathematics curriculum.

Knowledge of teaching is critical to teaching curriculum in a manner that is responsive to the needs of learners in their social contexts. However, awareness of the multi-dimensionality of teaching can be overwhelming without scaffolding. Novices who lack skills and support are often overwhelmed in the face of complexity and change (Hammerness, Darling-Hammond, & Bransford, 2005). Teacher-educators and associate teachers supported Leslie's inquiry by helping her frame an appropriate question, plan strategies, observe student process, and reflect on learning. These strategies for negotiating complexity empowered Leslie professionally with understandings and skills that may help her develop expertise in adapting to the needs of diverse students in a changing world.

Conceptions of Teaching

As teacher educators, we were pleased with the conceptual impact that action research projects had on pre-service teachers' images of what it means to teach. For some pre-service teachers, it was a "watershed experience" (Clandinin, 1986) that caused them to view themselves as reflective teacher-researchers, with a sense of moral agency and the capacity to connect theory and practice. Choice of research question and knowledge of literature positioned them to make informed pedagogical decisions and draw on their own resources.

Leslie, reflected that this action research project taught her "to continuously and consciously observe, monitor, and reflect in order to improve my own practice." Equally important, the impact on her students validated these efforts. Leslie wrote, "I was surprised and gratified by how well my students responded to my efforts, leading to stronger lessons and, therefore, more learning."

Teresa credited this project with "making me more aware of underlying issues within the classroom, both social and academic". More significant, in our view, is her next sentence: "I think that the process of reflection and investigation that accompanies an action research project forces a teacher to examine alternative ways of teaching and learning—both of which are important in the process of life-long-learning". Teresa moved beyond simply designing and implementing lesson plans to researching and creating her own practice. She saw herself as an agent capable of transforming learning among students.

This sense of agency also emerged in Maureen's reflection: "I enjoyed this project tremendously. I would not have been as conscious of classroom management, nor as willing to experiment with different strategies, if I had not had the opportunity to choose this topic." By "working on the intersection of theory and practice", she was reminded "of the need to keep learning and of [her] ability to do so". These comments convey the joy many expressed upon discovering that researching their practice could make a difference in the lives and learning of students.

Implications

First, and perhaps most significantly, we find that empowering teachers professionally results in teachers becoming adaptive experts, more fully capable of serv-

ing the needs of their students. Our study supports the findings of Bransford, Derry, Berliner, and Hammerness (2005), stated in *Preparing Teachers for a Changing World*: "a major way to prepare teachers for innovation is to help them develop inquiry skills that support ways to look at student learning and adapt accordingly" (p. 77). In other words, when teachers engage in self-directed action research in schools, they develop adaptive expertise by improving practice, raising awareness, and deepening reflection. Empowering teachers' professional growth by developing the concept of *teacher as reflective researcher* is an important, forward-thinking concept that should be promoted as a vehicle for positive change in education.

Secondly, if teachers are to become adaptive experts, it is our belief that the conceptual foundations must be introduced in pre-service preparation when teachers form their adult image of what it means to be a teacher (Stevens 2006). Our pre-service teachers' final reports and reflections indicate that they are quite capable of selecting and carrying out projects beneficial to students. They enjoy choosing issues of significance to themselves, and derive satisfaction from the implementation and analysis of their projects. Engaging in authentic learning helped them critically examine their conceptual understandings of teaching and learning changes, and expand their practice in order to meet student needs (Bransford, Darling-Hammond & LePage, 2005).

Finally, we look to the future. The concept of teacher as researcher and adaptive expert must be supported by powerful links between teacher preparation and future professional development. This support is critical in the induction years, if novice teachers are to hold on to a progressive image of what it means to teach.

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A promising avenue for such linkages is the New Teacher Induction Program, which has become a priority in Ontario. Furthermore, if action research in teacher education is conducted in partnership with local school districts, it could lead to stronger professional development across teachers' careers through the development of collaborative professional communities. Jackie DeLong (2002), a superintendent in the Grand Erie District School Board, introduced teachers to action research as part of her commitment to "the development of a culture for improving learning [that] rests upon supporting the knowledge-creating capacity in each individual" (p.1). These experiences suggest that school districts can play a powerful role in the development of adaptive expertise among teachers (DeLong, 2001; DeLong & Black, 2002; DeLong, Black & Knill-Griesser, 2003).

We can envision a time in the not-to-distant future when inquiry and action research skills are introduced in teacher education programs, further developed during the induction years, and supported as a vehicle for professional growth throughout the careers of teachers who are adaptive experts, well positioned to meet the needs of their students.

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A Simple Plan for Action Research (Part A)

Raymond Chodzinski

During my tenure as a professor I often encouraged students to actively pursue thesis and

project work that made sense to them as classroom teachers and school counselors. I challenged them to look at research with an eye to actually making a difference. In doing so I always reflected on what a very special colleague of mine used to refer to as the 5 "W's" and an "H". Jake Rogers, a veteran teacher and an instructor for several years in the Pre Service Intermediate Senior Program at Brock began every new class with an introduction to the words Why, What Where, When, Who and How as a means to explain almost every lesson plan he taught. In his words "if there ain't no plan or purpose or action, their ain't no use. Outcomes and student success meant everything to Jake and he taught his students that every lesson a teacher planned and taught should be directed with change and success in mind. I applied this model to the action research methodologies I taught in my statistics courses and research and change and innovation courses. It would be simple here to quote the likes of Michael Fullan and others who have championed the process of change in schooling in Ontario, or Friere's approach to Participatory Action Research which influenced social change throughout the world, but this article is intended to provide a brief and simple outline of what a teacher should do if s/he decides to pursue a research activity either in a school setting or as an assignment for a graduate or pre-service professor with the intent of transformational change within a school setting. In my model I include the word "Will".

The plan is quite straightforward.

Identify a problem and ask yourself why do I want to do this? Reflect on what actually prompted you to even think of it as a problem requiring attention. Then ask how I address the problem even if I want to pursue it. Is the problem going to be beneficial and will it fit into the overall

scheme of the school ebb and flow and school board policies and procedures? Will I be able to manage the parameters as I have defined them and can the problem be stated clearly in the form of a research question? Most important is can you explain the problem and your plan to whom ever will need to approve the project. Once you have established a research question then you must ask how do I collect information, data and what types of data do I collect? Will I need permission? Do you need help? When can you implement the plan and what are the stages? Of course you must always keep in mind why you are doing this in the first place and who or what will benefit from this added stress to your already taxed and often overburdened day. Once you have decided that yes you must do this then consider who will you report your results to and more important who will care? Ask what can be learned from the data once it is analyzed and how will it affect the problem as you originally perceived it to be. Ask yourself what changes might be gleaned and how can they be implemented? Involve your colleagues in the project and try to get as many supporters as you can on board. There are usually five stages to any research project. Simply put they are Problem Identification, Plan of Action, Data Collection, Analysis of Data, Implications and Recommendations.

Armed with a half decent understanding of basic descriptive statistics and qualitative research methods you should be able to pursue and complete an action research project based on an assessed need. Your findings whatever they might be will help you to grow professionally and most important confirm that you are making a difference.

We must be the change we wish to see in the world

M.K. Gandhi