THE HISTORIAN AND THE PHYSICIST: A CRITICAL REVIEW OF THE LITERATURES OF ACTION RESEARCH AND OF TEACHER PREPARATION

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ABSTRACT
This article is written by two new professors teaching at a faculty of education and follows on the completion of their first two years of teaching. They taught both core and elective courses offered in their faculty of education pre-service program. This article is a critical review of action research and teacher preparation literatures. It will address these two scholars’ experiences of teaching in the pre-service program. It will use these experiences to explore specific themes in the literatures. The themes are “necessity” in the pre-service curriculum; laptop and information technology (IT) best practices, and use of guest speakers. Lastly, the paper will conclude by speaking to the utility of a comparative literature review in encouraging trans-disciplinarity rather than “siloing” amongst new faculty in teacher education programs.

INTRODUCTION
Physics research through experimentation or computer simulation delves into the very essence of things to study how and why they are as they are. Physicists provide a verbal and/or mathematical explanation of their results and may hypothesize future outcomes and applications of their findings. Research in the field of history brings the past to life. Historians often emerge from dusty archives with gems of lives unsung and deep secrets unsullied by the light of day(Seixas, 2008). Reflective and reflexive teachers are involved professionals, and they constantly seek new ways to get their students involved while at the same time are continuously aware of advances in scholarly literature in their field(Laville, 2004). Students discover that the challenges of learning can be aesthetically enjoyable, provocative and interesting(Henderson, 1992). This paper is inclusive of these stake holders while examining the experiences of new faculty. The authors are respectively a historian and a physicist. The paper will explore the authors’ experiences in teaching pre-service teachers through a critical
review of the literatures of action research and teacher education. It will use these experiences as starting point to explore specific themes. The themes are “necessity” in the pre-service curriculum; laptop and information technology (IT) best practices, and use of guest speakers. This review article will also look for answers to the question; how should faculty frame reflections and analyses of their teaching? It will conclude by looking at the larger research project of ensuring trans-disciplinary awareness amongst faculty.

Thoughts on Reflective Teaching – The literatures of Action Research and of Pre-Service Teacher Education

The question of action research is a good one. When is research action research? Clearly, there is a plurality of opinion with regard to this and this is a field that is expanding. The principles of the field were enunciated by Kurt Lewin in the 1940s, although some would assert the field’s origin dates back to the nineteenth century. Later Stephen Kemmis, among others, articulated his cycle of planning, action, observation, and reflection and then to start again with revised planning (Kemmis & Carr, 1986; Masters, 2000). More recently, Somekh set out the principles of methodology in action research and it is perhaps important to enumerate these here (Somekh, 2006). “1. Action research integrates research and action. 2. Action Research is conducted by a collaborative partnership of participants and researchers. 3. Action research involves the development of knowledge and understanding of a unique kind. 4. Action research starts from a vision of social transformation and aspirations for greater social justice for all. 5. Action research involves a high level of reflexivity. 6. Action research involves exploratory engagement with a wide range of existing knowledge. 7. Action research engenders powerful learning for participants. 8. Action research locates the inquiry in an understanding of broader historical, political and ideological contexts” (Somekh, 2006).

Elsewhere, Bell points to the need for all to learn from anecdote (Bell, 1998). Freese speaks of the need to re-discover the stories of individuals and sort through the inconsistencies of their experiences (Freese, 2006). This is just the beginning!

The literature of action research can be critically examined alongside and juxtaposed with the literature of pre-service teacher education. One of the prime directions of this literature in recent times is to examine the practice of reflection. Reflection became a staple of North American teacher education programs from the 1980s onward as Adler notes (Adler, 1991). Indeed, the act of reflecting on experiences, readings or observations is now used at all educational levels, including the programs at the authors` university. This is well noted in the literature by Gil-Garcia. Elsewhere, notably Kane, et al and van den Berg ask good questions about teaching at the university level, as well as questions about meaning in practice (Gil-Garcia, 2002; Kane, Sandretto, & Heath, 2002; University, 2006; van den Berg, 2002). It is thought that through reflection, individuals will be able to critically analyze their experiences. Learning through the reflective process helps to overcome the difficulties experienced originally and assists in planning for the future (Bednar, 1992). It is also through the reflective process that individuals are able to ponder and then internalize lived or received information. For students, reflections are personal as they connect their lived reality with their previous experiences as Sweitzer and King note (Bednar, 1992; Jay, 1999; Stein, 2000; Sweitzer, 2003).
The connection between reflection and the pre-service classroom also becomes apparent when the literature of teacher education is more deeply probed, in particular when one looks at the work of James Henderson. One of the key tenets of Henderson’s approach is that students are active participants during the learning process (Henderson, 1992). Teaching styles that moved towards a more constructivist approach found greater receptivity with students. Three key characteristics of reflective teachers, described by Henderson bridge theory and practice (Henderson, 1992). The first key characteristic is the ethics of caring. Teachers who care for their students seek confirmation of students’ understanding and growth. The ethics of caring also provides for dialogue where connections were made between the students’ feelings and thoughts. Additionally, it gives opportunities for cooperative practice so that faculty can ‘kindle the fire rather than filling the vessel,’ thus acting as facilitators of learning, counselors and advisors for subject fields, rather than simply purveyors of knowledge (de Chastelain, 2006).

Henderson’s reflective teaching also uses a constructivist approach in the classroom (Henderson, 1992). This requires that students become active, sometimes both mentally and physically with the content, and allows for a greater extension of the learning process (Fosnot, 1989). This type of teaching strategy also requires that students pull from their past experiences as well as from their own personal purpose to respond to the need for critical analysis, reflection, and the projection of their needs as future teachers. This also corresponded with students active participation in becoming a life-long learners (Henderson, 1992). Additionally, this mirrors the transformation from pre-service teacher candidate to experienced teacher as is described in Miller (Miller, 1990).

Reflection in Henderson's teaching is also characterized by artistic problem solving (Henderson, 1992). As classroom teachers and as faculty members, educators encounter a host of problems which can usually be identified as 'bounded' or 'unbounded.' The difference between these two ideas is that those that are considered “bounded” are easy to solve with straightforward solutions. Those that are “unbounded” are much more complex and could be labeled differently by different educators (Henderson, 1992). In order to solve both bounded and unbounded problems, educators need to apply inquiring problem solving strategies. This approach has its own difficulties. As discussed by Dewey, and summarized by Grimmett, artistic problem solving has four main steps (Dewey, 1933; Grimmett, 1988). The first is to reflect on the problem. This is particularly important where one experiences a state of doubt, hesitation, perplexity or mental difficulty. Secondly, one must transform this problematic experience into a “clear, coherent, settled, harmonious experience.” Step three is to posit a tentative conclusion which is based on past experiences with problem solving. The fourth and final step is the assumption that knowing the past will assist with the initial problem (Dewey, 1933; Grimmett, 1988). What Grimmett suggests should work with most bounded problems. Yet it may falter when considering unbounded problems. One is left with uncertainty since the problem itself is often complex and encompassing a host of unknowns (Grimmett, 1988). One must take a risk or a stab in the dark.
This focus on reflection, and reflective teaching would not be complete without looking at the literature of professors’ reflection. This is growing (Alvesson & Skoldberg, 2009; Lynn McAlpine & Weston, 2000; L. McAlpine, Weston, Beauchamp, Wiseman, & Beauchamp, 1999). Reflexivity is also significant in that it enables the researchers’ disparate disciplinary origins (i.e. in this case history and physics) and ways of thinking. This also brings the discussion to some of the questions the authors wish to reflect on, sometimes in a divergent manner, in the context of the two literatures.

**BEST TEACHING PRACTICES**

**THE NECESSITY OF COURSE CONTENT**

One of the first questions to be reflected on regarding both literatures and salient for these scholars is the question of “necessity.” It pervades pre-service teacher education classrooms and can be looked at from both an action research and a teacher education perspective. “Why are we learning this?” is a common refrain when students see course content for the first time (Darling-hammond, 2000). Many student-teachers do not realize the degree to which course content has been selected and trimmed when they first see the syllabus. Among some pre-service candidates, the view is voiced by some that they are “subject specialists” and this has been debated in the literature of teacher education at all levels and across many jurisdictions (Beane, 1993; Boe, Shin, & Cook, 2007; Ingersoll, 1999; Partington, 1997; Zientek, 2007). For student-teachers, many project this to mean that they would simply be teaching in their own subject area within the education system in a middle school or junior high school. For some this is indeed where they will work, particularly if they are in a secondary school. For others, they will have to teach a variety of subjects in the Junior Grades, Grades 4 through 6. Necessity also became important when student-teachers approached the issue of Numeracy and Literacy education. The notion and challenge of teaching multiple subjects had not crossed their minds.

The issue of necessity is also addressed in action research literature as well. In Nigeria, in one case, the question becomes of prime importance in the effort to reach students across class boundaries (Umar, 2006). Sleeter also speaks to the issue of preparation in the pre-service program from an action research perspective. In her work, she points to use of action research case studies that examine course content around the issue of multi-cultural preparation of pre-service teachers in the United States. Some of these studies reveal that course content is effective helping pre-dominantly White students prepare for multi-racial classrooms, while in other cases it is profoundly counterproductive and reinforces racial stereotypes (Lawrence & Bunche, 1996; Sleeter, 2001). Sleeter’s work echoes the earlier seminal discussion by Zeichner and Core that takes up the problematization of social context of action research in schools of education. In their view, the “deep structures” of schools were not sufficiently examined in action research projects in the late 1980s and early 1990s (Gore & Zeichner, 1991).

The authors endeavored to address the question of necessity head-on by bringing in real-life examples in their discussions and lectures. This practice is echoed and affirmed in the teacher education literature (Darling-Hammond, 1990; Friesen & Williams, 1985; Kirby,
Darling-Hammond, & Hudson, 1989). As well, time was spent through discussion and illustration of the need and requirement of teachers to work on both Literacy and Numeracy skills of all students. This would be two-fold; first to improve the skills of the students and secondly to act as a positive role model to illustrate the importance of these skills in a non-language arts or non-mathematics course. Finally, time was also spent in the Education Foundations course illustrating why the past is critical, why it has brought us to where we are as an education system, and indeed a civilization today (AERA Panel on Research and Teacher Education, Marilyn Cochran-Smith, & Zeichner, 2005, pp. 52-53). Detailed questions such as the AERA Panel, et al, raised include; who should be educated? and what should be taught? It is clear that these questions have been argued over for a long time, but must be raised again with each subsequent generation, and particularly each generation of new teachers. It is key to learn about the African-American perspective because it is necessary to get beyond entrenched attitudes about race and multi-culturalism in the many Canadian and American classrooms (King, 1991).

**Laptops, PowerPoint Slides, and the Limitations of Action**

Information Technology (IT) in pre-service teacher education can be a mixed blessing and it also struck these scholars as an important theme. The quest for best practices in this area is still evolving. Here too, the literatures of action research and teacher education have responded to changes in the field. The authors’ faculty of education pre-service program is completely centered on the active use and incorporation of information technology. Central to the program is the use of the laptop computer. Programs that require all pre-service students to use laptops are the norm in many jurisdictions as noted by teacher education literature (Charlalambos & Glass, 2005; Mackinnon, Aylward, & Bellefontaine, 2006; University, 2006; Van’t Hooft & Swan, 2006). Both authors were very supportive of the program at their institution and sought ways to integrate and expand the use best practices in their classrooms.

Action Research literature has responded in a lively manner to the use of technology in pre-service programs and higher education more generally (Makohon, 2009; Redington Bennett & Cunningham, 2009; Yasmeen, 2008). Action researchers have been particularly interested in looking at the question of establishing collaborative communities of pre-service teachers as they encounter new technology (McNeil & Pierson, 2001). Davis looks at the impact of technological knowledge and challenges that students have using the laptop (S. Davis, 2002). Of particular significance were the efforts undertaken in New Zealand to establish ICT Professional Development Clusters in the late 1990s. Action researchers have also looked at pre-service contexts in New Zealand in addressing the question of ICT. One of the ongoing issues that scholars and instructors faced in the 2000-2010 period was the lack of student-teacher pedagogical content knowledge on which they could build their technical pedagogical knowledge (N. Davis & Morrow, 2010). New Zealand, as Davis and Morrow also note, has been the site for the broader establishment of the Collaborative Action Research Network (CARN) (N. Davis & Morrow, 2010). In his analysis of experimental controls for action research projects in higher education, Kember points to some of the challenges that researchers have in obtaining standardized results over multiple projects and he draws
action researchers notably to PowerPoint & web-based teaching versus other types (i.e. problem solving) (Kember, 2003).

The issue of ICT is also explored in many ways in teacher education literature. PowerPoint presentations as a teaching innovation is one in particular and it is well discussed (Annetta, Slykhuis, & Wiebe, 2007; Brown & Warschauer, 2006; Pope, Hare, & Howard, 2002; Wiebe, Slykhuis, & Annetta, 2007a). Students can be overwhelmed by huge waves of text; a glazed look comes over their faces prior to mentally shutting down. Many have asked, “Do we have to know this?” The first observation made by the authors is that having a limited number of slides is critical. The second observation and perhaps more importantly is to answer the question of relevance and necessity, “Why and how this slide is relevant to what is set out to be accomplished or learned?” Students respond positively when their learning is clearly linked to their future role as a teacher. The third observation deals with the idea of PowerPoint being interactive to stimulate the students. If the slide is going to be completely effective, it should in some way be interactive thus resulting in higher order thinking skills being used, and hopefully leading to some type of internal connection between the material and past experiences (Cyphert, 2004; Henderson, 1992; Olliges, Mahfood, & Tamashiro, 2005). This thereby allows the student to retain the information more easily. Having a connection to what the students are learning is clearly in the best interests of faculty.

The availability of PowerPoint slides online is also addressed by teacher education literature. The authors’ students felt that they should just be able to download the collection of class notes. One of the keys to addressing this issue and linkages to best practices is the notion of active learning. The question of whether the student actively engaged in the learning has been consistently noted (DuFrene & Lehman, 2004; Gareis, 2007; James, Burke, & Hutchins, 2006)? It is clear that downloading a PDF or PPT file takes much less mental energy than typing in or creating an original note. Supplemental questions have also be raised by James et al (James, et al., 2006). For example, does the student who is downloading a slide presentation actually look at the slides in as much detail as what was presented within the classroom setting? Also, is the student bothered to show up for class as Frey & Birnbaum ask (Frey & Birnbaum, 2002)? Will the student read ninety PowerPoint slides? Certainly the student has the choice of downloading the presentation at any time of day that he or she likes; this might or might not the most conducive for the student to learn the material(Frey & Birnbaum, 2002).

From a science and mathematics view point, PowerPoint was a great asset for in-class use and this is echoed in the literature. The class notes were posted to the faculty member’s website so that students could review the information. It was thought by the physicist that this would be the best path to take since so many of the J/I students were feeling uncomfortable with the topics covered in the science class (note on subject information in physics.). In terms of the other classes, namely physics and senior mathematics, some PowerPoints were used and those were also posted because of the reference material they contained. Students, again, found this to be very useful as a form of on-line resource. The combination of PowerPoints and multi-media resources were very effective in the science education classroom as noted by several scholars as well (Bencze, Hewitt, & Pedretti, 2001; Rowcliffe, 2003).
**Guest Speakers, Controversy and Specialization**

The topic of guest speakers is the final salient theme that the authors will investigate in the context of action research and teacher education literatures. As part of the courses offered by the authors, each attempted to introduce guest speakers in the classes to discuss specific, predetermined topics of interest with the student body. On the surface, this seemed to be an excellent idea, yet teachers, especially pre-service teachers were some of the most critical listeners when it comes to a guest speaker, especially if he or she was not dynamic. The less dynamic the speaker, the more likely that students would be dragged down. Student-teachers often became restless, negative and turned off to the subject at hand if the speaker was not engaging. This was particularly the case in a large scale presentation. Conversely, the more exciting or dynamic the speaker was, the more likely a presentation would continue past the preset time-limit.

These reflections are reconfirmed in the literature of teacher education (Cloud & Sweeney, 1988). Guest-speakers were also an excellent way to introduce specialized topics and marginalized perspectives as Kumashiro and Lance point out(Kumashiro, 2000; Lance, 1987). The literature of action research illustrates divided views on guest speakers. Some authors are critical of the use of guest speakers in professional development settings. All too often however, guest speakers take over a PD day and leave the teachers, who had hoped for inspiration, with less than what they came for. Kelleher argues for a more teacher centered approach that emphasizes peer-learning and growth through leadership in action research projects(Kelleher, 2003).

In action research scholarship as well, the question of guest speakers is addressed by Armstrong and Moore in their work on inclusive practices in the school classroom. Responses to questionnaires in their schools emphasized the need for guest speakers to take on topics that teachers have low comfort level with; in this case sexuality and homophobic bullying(Armstrong & Moore, 2004). The example of Armstrong and Moore is an excellent one. It also makes it clear that action research in a pre-service environment can help faculty members change their practice and provide for more stimulating takes on controversial issues in this way. Moustakim also speaks about the authority of the instructor in dealing with controversial issues in the undergraduate context(Moustakim, 2007)

**Reflecting on the Moment**

*Planning, Action, Observation and Reflection* is what Kemmis instructs the Action Researcher to engage in. In this section the authors engage in Kemmis’ fourth stage (i.e. reflection). Both authors felt that they had experienced a series of successes in their teaching and this forms the foundation of their self-reflections. Too many times the reflections of pre-service candidates reflection centred on what went wrong – things can go right! In the courses taught by the authors, success was most certainly having a lesson that was widely accessible. A variety of different teaching methods were introduced by both authors in order to ensure this. Students were happiest when they were engaged in the learning. Skits, readings, debates, experiments, peer-presentations, peer-tutoring, and many other exercises sparked their interest. These modeled best practices and related what they were learning to their future career(Butin, 2005). Students were engaged and excited. Another example of faculty
engaging in this type of reflection is provided by Zhu as he speaks to the challenges and opportunities of being a self-reflective faculty member at Northeast Normal University in China (Zhu, 2010).

It is clear, in all classes taught by the authors, the closer student-teachers were to “doing it”, i.e. activities that were directly linked to being a teacher, the more pleased the students were. In many cases, finding a happy medium between practice and theory remained a challenge. Tying necessity of theory to lived experiences of action was critical. Students very much enjoyed opportunities for “hands-on” activities. In terms of the laptop, students enjoyed activities that required them to make use of the software as well as classroom friendly websites. Consequently, student created PowerPoint slides, statistical exercises, web-searches, graphic calculator experiences and scientific software activities were well received. LaBoskey et al speak of organic incorporation of issues of race and diversity in their action research on pre-service teacher education reflecting the same need to have assignments and learning experiences such as guest speakers that connect closely with reality of the classroom (LaBoskey, Davies-Samway, & Garcia, 1998).

CONCLUSION

The journey of a critical reflection on the literature in one in which the authors sometimes dive into a new field of research and find out something new. Such has been the nature of this journey. This article has discussed some of the observations and reflections on teaching in a Bachelor of Education program offered at the authors’ university in the context of a critical review of the existing literature of action research and teacher education. The question of how should professors frame reflections and analyses of their teaching remains. Clearly, both literatures are central in framing our reflections here. The literature of teacher education provides a depth of knowledge across a wide range of fields which can be quickly accessed in support of practice. Action research literature, on the other hand, provides a way forward in which structure research projects which is fast and solutions-oriented; this is extremely important in pre-service teacher education. Educationalists of all fields need to be eclectic in their reading and trans-disciplinary in their reflection as is evident by this analysis. The more obscure and the more arcane the language of a particular field, the more it cuts itself off from new and sometimes very useful ideas. Openness and the ability to see things through several different sets of lenses is akin to the flexibility expected from pre-service teachers. The authors’ passage through the rigors of the first two years at a new institution was instructive, from not only a practical, but also a theoretical perspective. Looking back, more needs to be done to provide new faculty with opportunities for reflection on their teaching, to read widely, and to critically analyze literature in allied disciplines. Much work also needs to be done to encourage this trans-disciplinary and respectful context throughout faculties of education. Silos and isolation exist and they are not acceptable (Shields et al., 2003). Challenges will continue to emerge for new (and old) faculty but this hopefully this type of reflection and critical review will open the way for others regardless of their discipline. The context of faculty of education change and renewal also provides a powerful push in the direction of continuing this type of reflexive activity at the university level.
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