

2018

Developing Pre-Service Teacher Professional Capabilities through Action Research

Shannon Kennedy-Clark

University of Notre Dame Australia, shannon.kennedy-clark@nd.edu.au

Katrina Eddles-Hirsch

University of Notre Dame, Sydney, katrina.eddles-hirsch@nd.edu.au

Tryon Francis

University of Notre Dame, Sydney, tryon.francis@nd.edu.au

Grace Cummins

University of Notre Dame, Sydney

Luke Ferantino

University of Notre Dame, Sydney

Matthew Tichelaar

University of Notre Dame, Sydney

See next page for additional authors

Follow this and additional works at: <https://ro.ecu.edu.au/ajte>



Part of the [Educational Methods Commons](#), and the [Secondary Education Commons](#)

Recommended Citation

Kennedy-Clark, S., Eddles-Hirsch, K., Francis, T., Cummins, G., Ferantino, L., Tichelaar, M., & Ruz, L. (2018). Developing Pre-Service Teacher Professional Capabilities through Action Research. *Australian Journal of Teacher Education*, 43(9).

<http://dx.doi.org/10.14221/ajte.2018v43n9.3>

This Journal Article is posted at Research Online.

<https://ro.ecu.edu.au/ajte/vol43/iss9/3>

Developing Pre-Service Teacher Professional Capabilities through Action Research

Authors

Shannon Kennedy-Clark, Katrina Eddles-Hirsch, Tryon Francis, Grace Cummins, Luke Ferantino, Matthew Tichelaar, and Lloyd Ruz

Developing Pre-Service Teacher Professional Capabilities through Action Research

Shannon Kennedy-Clark
Katrina Eddles-Hirsch
Tryon Francis
Grace Cummins
Luke Ferantino
Matthew Tichelaar
Lloyd Ruz
University of Notre Dame, Sydney

Abstract: There is a growing interest in pre-service teacher education programs on how to maximise the learning benefits of professional experience. This study attempts to discover how action research can be used as a vehicle to bridge the divide between theory and practice and to support pre-service teachers in the development of authentic professional knowledge. In this paper, we share the experiences of four pre-service teachers who undertook an action research study whilst on a ten-week professional experience placement in an Australian High School. The findings of the study indicate that pre-service teachers see the benefit of being able to conduct an authentic study not only in terms of developing research skills, but also in order to reflect upon their strengths and areas of development in their own teaching. We argue that with a growing attentiveness to raising accountability across the sector, this approach prepares pre-service teachers for the Teacher Performance Assessment and the classroom.

Introduction

Creating learning experiences for pre-service teachers that translates both into meaningful and practical teaching skills is highly regarded as being a fundamental component of professional experience in pre-service teacher education. The constraints of the higher education system, such as access to resources coupled with rigid assessment systems, makes it difficult to provide pre-service teachers with the opportunity to develop and conduct their own research studies while they are in the classroom (Mitton-Kukner, Munroe & Graham (2015). Assessments are often undertaken in coursework subjects in the format of an essay or extended response, and the focus is on the theoretical aspects of teaching. As such, even practical assessments, such as micro-teaching or units of work, are created outside of the classroom and are not linked to real students or classes. Elbow (1993) further noted that we, as educators in institutions of higher learning, often focus on student grades or “summing up one’s judgment of a performance or person into a single holistic number or score” (p. 187). From this standpoint, the research that suggests that there is somewhat of a disconnect between the theories taught in university education programs and the opportunity to put these theories into practice through authentic assessment (Kosnik & Beck, 2000; Smith & Sela, 2000; Volk, 2010). Here we argue that action research conducted whilst on professional experience provides an opportunity for students to engage in an authentic assessment that

links theory to their developing classroom practice. It has been put forward in the literature that there are multiple benefits of doing action research in teacher education and that action research may provide an opportunity to bridge this gap between theory and practice (Kosnik & Beck, 2000; Montecinos, Ceardi & Fernández, 2014; Smith & Sela, 2000). However, despite the benefits, the factors that contribute to pre-service teachers' learning and teaching decisions in the classroom are difficult to identify because of the complex environment in which pre-service teachers on professional experience operate.

This study, attempts to discover how action research can be used as a vehicle to bridge the divide between theory and practice, and to support pre-service teachers in their development of professional knowledge and reflective practice. The study focuses on action research in an undergraduate pre-service teacher education degree for secondary school teachers at a metropolitan university in New South Wales. This study puts forward the voices of four pre-service teachers as co-authors. The article focuses on the connection between theory and practice gained through the eyes of the pre-service teachers who co-authored this paper. In this paper, the pre-service teachers share their unique experiences of an action research assessment in the inclusive classroom through the case studies presented. In this context, the pre-service teachers conducted action research studies during their professional experience that considered an area of their own teaching. This was done in order to provide pre-service teachers with an opportunity to reflect critically upon their teaching. The pre-service teachers were invited to participate in the development of their individual cases and to contribute to the writing of a journal article so that they could develop an authentic understanding of the research process. Underpinning this study is a view that as academics we should be sharing our own reflective practices with students, as this is an integral part of a teacher's professional identity. The research questions that underpinned this study were:

1. How does action research as an assessment support pre-service teachers' ability to think critically about their professional practice?
2. How does reflection on action research provide opportunities for authentic professional development?
3. What can teacher-educators learn from the experiences of the pre-service teachers in a way that supports their professional development?

Background

Professional Standards and Professional Practice

There is consensus in the literature on the central role of professional experience in teacher education, and it has been argued that professional experience can be the most powerful component of a teacher education program (Ingvarson, Reid, Buckley, Kleinhenz, Masters & Rowley, 2014). Extant research emphasises the importance of creating a balance between the time devoted to university-based learning and on-the-job learning via professional experience (Deed, Cox & Prain, 2011). Deed et al. (2011) further clarify that there needs to be a meaningful integration of the two experiences in order to improve learning and professional outcomes for graduating teachers. An essential component of pre-service teacher training, therefore, is the connection of theoretical learning with practice via assessment. In pre-service teacher education, professional experience centres on workplace professional learning where pre-service teachers can gain an understanding of the everyday reality of Australian schools and can gain experience in the classroom as teachers. Professional experience gives pre-service teachers the opportunity to dovetail ideas and theories from theory-based courses with their own experience of observing and teaching in classrooms, particularly, in relation to their teaching areas. Another benefit of professional

experience is that pre-service teachers can begin to develop a professional knowledge and understanding of teaching, and to gather evidence to demonstrate that they have achieved the Focus Areas of the Graduate Standards of the Australian Professional Standards for Teachers, Australian Institute for Teaching and School Leadership (AITSL, 2011).

The achievement of the graduate level of the Australian Professional Standards for Teachers forms the basis of teacher education degrees as mandated by the Australian Institute for Teaching and School Leadership (AITSL). In this context, graduate teachers must be able to validate that they can determine a range of competencies at the end of their degree (AITSL, 2011; 2017). AITSL (2011) posits that there are three different categories of the Standards that teachers can use the standards to progress through their careers:

1. The first are *program standards* for national accreditation of pre-service teacher education programs;
2. The second are *mandatory standards* used for attaining, renewing and maintaining provisional and full registration; and
3. The third category are *voluntary standards* against which teachers choose to be assessed when they apply for promotion to ‘highly accomplished’ and ‘lead’ levels.

While standards themselves are not an unusual occurrence in professional degrees and qualifications, it is the presentation of the standards that may raise concerns. The standards raised here are often presented as a checklist of competencies that are seen to suffice as indicators of effective teaching (Ditchburn, 2015). It has been put forward that the professional identity of teachers is not a reflection of policy or standards, but is a response to being part of a community of professionals and experiencing the emotional and organic aspects of classroom and school environments (Bloomfield, 2006; Lave & Wegner, 1991). It has also been argued that standards, in any form, “should only be used as prompts for reflective professionals to deliberate about their own knowledge and skills in relation to the context and conditions in which they operate” (Bourke et al., 2012, p. 28). As evaluation of student learning is a major component of teaching responsibilities, it is worthwhile to gain a better understanding of pre-service teachers' attitudes, beliefs, behaviours, and environmental pressures as related to classroom practice (Campbell & Evans, 2000). Thus, it is translating these standards into meaningful learning experiences that governs the approach taken in this reflective case study. How this relates to this research study is that the Australian Teaching Standards encourage teachers to reflect on their teaching and take part in small, independent research projects. The inclusion of an action research project into professional experience may enable pre-service teachers to achieve the related standards.

AITSL (2017) is in the process of introducing a Teacher Performance Assessment (TPA) that is a final capstone assessment to be conducted by pre-service teachers on their final internship. While the final articulation of this task is not yet clear, it is evident that it will take the form of an inquiry or action research study during a pre-service teacher's final teaching internship. This will require that the pre-service teacher has mastery of their pedagogical and content knowledge, as well as a level of data literacy sufficient to understand and make use of data to inform classroom decisions. The need to undertake inquiry that positions the teacher as an action researcher so that they are able to reflect on practice and make independent curriculum data-driven decisions has been outlined in the research as an important focus in a teacher's role (Cochran-Smith & Lytle, 2009; Fecho & Allen, 2003). Data collection and teacher reflection on data use are also seen as critical in meeting the learning needs of a diverse student population, and a number of studies have shown that data-driven decision-making can lead to an increase in student achievement (Lai, McNaughton, Timperley, & Hsiao, 2009; Campbell & Levin, 2009; Mandinach & Gummer, 2013; Schildkamp & Poortman, 2015). While pre-service teachers are taught the importance of reflective practice they are rarely provided with the opportunity to put these skills into

practice in the classroom or to develop the methodological approaches to conduct a classroom-based inquiry. Hence, while there is an expectation that graduand pre-service teachers will have the necessary research skills to carry out independent research projects and to make data-driven decisions in the classroom, there is often no time allocated in their degree programs to develop these requisite graduate skills.

Action Research

Action research can be understood in myriad ways, and this necessitates an explanation of the approach used in this study. The approach taken in this study is that action research is a systematic investigation into one's own practice with the aim of improving teaching and learning through professional development (Ulvik & Reise, 2015). Day (2007) highlights the importance for individuals in investigating one's own practice in stating that professional development is an inner process, and it cannot be reduced to a checklist of behaviours. It is argued that in order for action research to be successful in pre-service teacher education, the project must be grounded in the student-teachers' own pedagogical content area and own questions (Ulvik & Riese, 2015). That is, each action research project should be unique investigation into one's own classroom.

Action Research, in general, falls within a qualitative research paradigm. The methodology and methods used to conduct the research are varied. There is a long history in the literature on action research that extends for over seventy years, and from this literature four key features are inherent in an action research study. These are: 1) *participation and collaboration*; 2) a *constant and iterative cycle of self-reflection*, which includes planning, acting, observing, and reflecting; 3) *knowledge generation*; and 4) *practice transformation* (Cordeiro, Baldini Soares & Rittenmeyer, 2016). There is an extensive body of research that describes collaboration and participation in action research studies (Kemmis & McTaggart, 2000). There is such a range of types and modes of collaboration presented in the research, and there is no one best way to arrange a study. However, it also clarified that despite the variety of modes of study, iterative cycles of research design are a key part of an action research project. This characteristic of action research encourages researchers to continuously reflect upon and evaluate data in order to define and redefine research approaches. The aim of these cycles is to make the study more precise in addressing the research question; hence, moving from general to specific (Kemmis & McTaggart, 2000; Cordeiro, et al. 2016). There is consistency in the literature on action research that its processes should generate knowledge and transform practice (Reason & Bradbury, 2008). Two key tenets of an action research approach, therefore, are the construction of practical outcomes to localised problems and the development of new forms of understanding (Kemmis & McTaggart, 2000; Reason & Bradbury, 2008). There is an alignment between building theoretical knowledge and action. Overall, even from the beginnings of the formulation of an understanding of action research as advanced by Lewin (1946), action on practice was central in his approach. It was Lewin's (1946) focus that building knowledge without practical outcomes was insufficient, he argued that 'Research that produces nothing but books will not suffice' (p. 35). From this position, understandings that are generated by action research are derived from action and are for action.

Reflective practice is an essential element of pre-service teacher education. In order to further explore the potential learning of pre-service teachers, this study was concerned with uncovering pre-service teachers experience on their own learning and teaching through action research. This study considers how the process of and reflection of student-led action research in teacher education can contribute to the professional learning of the teacher

educators undertaking the assessment (Auld, Ridgway & Williams, 2013). There is an extensive body of literature on assessment in pre-service teacher education (Auld et al., 2013; Bowen, 2013; Bryant, Akinleye & Durrant, 2013; Fletcher, Meyer, Anderson, Johnston, & Rees, 2012; McDonough, 2006; Medland, 2014; Nolen & Putten, 2007). In this study, we were focusing on reflections based on an action research assessment. Reflection in relation to teaching and research can support pre-service teachers to better understand their own learning and teaching and to develop a knowledge of these practices (Loughran, 2004). Similarly, Harrison and Yaffe (2009) put forward that reflective practice is a process of learning that occurs through observation and engaging in discussion of practice so that questions about tacit beliefs and pedagogical practices could be examined. Professional practice places direct emphasis on embedded experiences in educational settings for pre-service teachers. These experiences depend on strong, continuously evolving university-school partnerships. Professional experience can better prepare pre-service teachers for their teaching career and can provide students with opportunities to integrate theory with practice (Chang et al., 2016). Our focus, therefore, was to provide the pre-service teachers with the space to examine their own classroom, identify an issue or challenge, plan a study, reflect and evaluate on the design, and to put forward a discussion of their experiences.

Action Research Project

The case studies presented here are the reflections of four pre-service teachers that were collected after they completed an action research project whilst on a ten-week professional experience at a metropolitan high school in New South Wales. The study presented here is part of an ongoing consideration of how best to integrate data literacy and action research into professional experience in order to make explicit the links between theory, practice, and assessment.

The pre-service teacher cohort was given, as part of their assessment requirements for the third-year professional experience, the opportunity to undertake an action research project whilst on their ten-week professional experience. The pre-service teachers were provided with online support through the University's Learning Management System (LMS) for their selection and articulation of a project. This was the pilot course in undertaking the assessment through online platforms. In previous years, different face-to-face models were adopted including: Saturday sessions and evening sessions during the ten-week professional experience. However, the pre-service teachers indicated in unit/course evaluations that attending these sessions placed an additional burden on them during an already intensive ten-week period. The materials were housed online on the LMS (Blackboard). In accordance with university policy, the students were directed to check their University email on a weekly basis so that they could be up-dated with resources and feedback during their professional experience. The action research model that students were given was set up in clear stages (Figure 1). The scaffolded support followed these steps. The model was discussed with the cohort so that they could see how their action research followed a clear pathway from the development of a research question to the submission of their journal article.

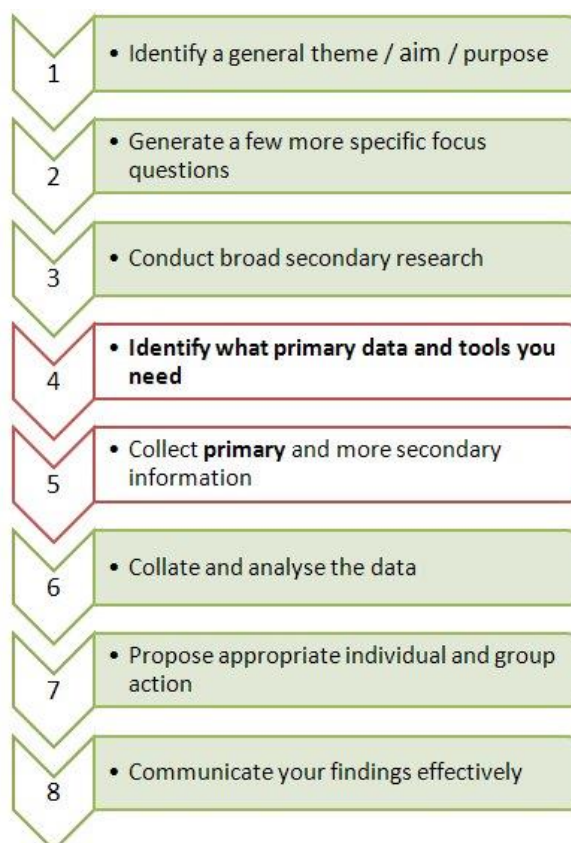


Figure 1: Action Research model for Professional Experience

In order to assist pre-service teachers in identifying the target area for their research, they were provided with a table (Table 1) to complete no later than ten days into their professional experience. The aim of the table was to provide students with an objective lens with which to view their teaching context. That is, rather than personalising the potential research areas as deficiencies in themselves or their teaching, the pre-service teacher had to articulate three areas to identify strategies where they could use relevant theories or challenge their current assumptions about learning and teaching.

The pre-service teachers were guided through the formalising of a research area and a research question. The research design had to support the collection and analysis of student learning data, such as pre and post-tests. Hence, students had to be able to identify and collect data as well as being able to make sense of their findings. They were then asked to submit their research questions for feedback either via email to the course coordinator/lecturer or on the University's LMS. This process enabled the lecturer to make recommendations for improvement or clarification of the research question and the research design. The pre-service teachers were encouraged to meet with their instructor through a variety of mediums to discuss the merits and challenges of conducting their projects. These one-to-one and/or online meetings gave them the opportunity to reflect and reconsider their research designs. The cohort was also provided with a template that mirrored an academic journal. The rationale for having students submit an academic paper rather than an essay was to develop an understanding of how educational research was both conducted and presented. As the pre-service teachers were nearing completion of their Bachelor of Education degree it seemed timely to present the cohort with an opportunity to consider higher degree by research pathways, employment and post-graduate coursework options.

Area 1:	Area 2:	Area 3:
Definition/Description:	Definition/Description:	Definition/Description:
Main problems:	Main problems:	Main problems:
What do you need to know:	What do you need to know:	What do you need to know:

Table 1: Identification of possible action research areas

Research Design

This study involved putting forward the reflections of four pre-service teachers involved in a secondary education program in a New South Wales metropolitan university. Each of the reflections is presented in its entirety. A case-study approach was adopted for the research as it provided the most appropriate grounds within which to examine the pre-service teachers' experiences of their own action research. There are a myriad of definitions of case study research, and those by Yin (1984; 2014) and Stake (1995) are often referred to in the literature. A case-study research approach, as defined by Yin (1984), "investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used" (p. 23). Stake (1995) focuses more on the phenomena "the study of the particularity and complexity of a single case, coming to understand its activity within important circumstances" (p. XI). The central aim of case study research is to conduct an in-depth analysis of an issue in order to understand or explain a decision or set of decisions by the participant or participants. That is why they were taken, how they were implemented, and with what result (Schramm, 1971; Merriam, 2009). In this context, the aim of this study was to understand the pre-service teachers' own experiences of conducting an action research study while they were undertaking professional experience. Hence, the study aims to see how an action research study is experience through the lens of a pre-service teacher rather than a researcher.

The entire cohort enrolled in Professional Experience was invited to participate in the study. Of the forty pre-service teachers enrolled in the course, four students indicated that they would like to be involved in the analysis of their case studies. Action research was selected as the research strategy for the pre-service teachers to use as teacher educators often assume that pre-service teachers will understand a great deal from simply reading the recommended literature (Carroll, 1997). Carroll (1997) further adds that a corollary benefit of giving pre-service teachers the opportunity apply the literature in the classroom is that it makes it authentic and gives the theoretical side of the degree program credibility.

Professional Experience Context

The study was conducted within the third-year professional experience course. The pre-service teachers were required to participate in a ten-week high school based professional experience. The professional experience requirements for this degree are rigorous totalling 155 days conducted over four school-situated professional experiences over the course of four years. In first-year, students complete a one week observation. In second-year, third-year, and fourth-year, students complete a ten-week professional experience. This is the second of three ten-week professional experience courses that the students must successfully complete in order to satisfactorily complete their degree program. The third-year professional experience was selected for the study for two reasons: There is a high attrition rate during the

second-year practicum. The reasons for the attrition were related to work-life balance, course mismatch, change of career goals and financial reasons. These reasons were cited on withdrawal and are consistent with other Australian universities (Penn-Edwards & Donnison, 2014; The Victoria Institute, 2013). Secondly, the fourth-year practicum has a full teaching load and is, therefore, too onerous in terms of work load to place additional study related requirements on students with an action research project.

The rationale for the course was to assist aspiring secondary teachers to cater for children with diverse abilities and disabilities in the mainstream classroom. A major focus of the professional experience course was on developing an understanding of the special academic, physical, behavioural and communication differences that exist in modern student-centred classrooms. Strategies for the adaptation of the learning environment, the curriculum and teaching style were examined and the nature of the policy of inclusion and social justice issues relating to special needs, are explored. The current situation in NSW schools, both primary and secondary, and the structures (such as collaborative planning teams) within them to cater for children with special needs were also raised in the course.

Case Studies

The reflections presented are those of the pre-service teachers that co-authored the paper. Their individual contributions form the basis of the case-studies on action research during professional experience. Their contributions are invaluable for the researchers as they present the authentic reflections of pre-service teachers on how they perceived their own learning experiences during professional experience. Thus, rather than presenting views of researchers along with our own biases of how we think our undergraduates should think and respond to our teaching, these pre-service teachers share their own views. That is, the case studies have not been manipulated or altered beyond addressing typographical errors. It is reiterated here that all marks in the course were completed and moderated prior to the undergraduate students contributing their stories so that there was no perceived coercion in participating in this paper. Moreover, as these are the reflections of the pre-service teachers and co-authors, the analysis of their cases was for broad trends that arose from their individual research studies rather than to make judgement on their experiences. The goal was to gain an understanding of how we, as the instructors, could improve the action research assessment in order to better support the pre-service teachers.

Reflection 1

Teaching areas: History and English.

According to Edwards and Burns (2016), action research is “taking a self-reflective, critical and systematic approach to exploring your own teaching contexts” (p. 208). By extension, action research is observing the effectiveness of teaching and learning strategies and actively researching and testing how these strategies could be adjusted to suit learning needs. Essentially, action research is differentiation in a more focussed form for long term adjustment and improvement of teaching practices. Such a process of research and experimentation is difficult to understand and undertake in the stressful environment of professional teaching experience. However, the significance of undertaking an action research project becomes evident during reflection after the fact.

The action research project that I completed throughout my third year professional experience is titled “Communication and Classroom Activities for Teaching Students with Social Anxiety Disorder” and focusses on developing a method of communicating with socially anxious students in order to ensure that they are benefiting from learning in the classroom. The project began through the observation of students in specific classes and the recognition that there were students who were disadvantaged due to an apparent social anxiety. Social Anxiety Disorder is a mental health issue that is not recognised or understood widely in society and because there were students in each of the classes, that were being taught during the action research process, that seemed to have blatant social anxiety issues I was drawn to this area of research because it is a distinct issue that needs to be recognised by teachers in order to nurture an inclusive classroom environment. The research was carried out throughout the term as different types of activities and methods of communication were tested in the classroom. Also, reading articles about Social Anxiety Disorder throughout the term helped to inform strategies that could be useful. Data was difficult to collect in a formal way because students who suffered from the condition would be distressed if their actions were being obviously analysed, so the results turned into basic written observations. Throughout the term I was testing different strategies but it became more about my personal teaching method for the benefit of myself and my students rather than simply because I knew I had to complete a write up after the term had finished.

All effective teachers are, or definitely should be, carrying out action research in every teaching instance, whether consciously or not. The action research project was a way of ensuring that all pre-service teachers would actively think about the research that needed to be done in order to carry out effective classes.

Ditchburn (2015) highlights the role of the supervising teacher as an “assessor, rather than as a collaborator” (p.94). However, this is completely dependent on each individual mentor and I found that my supervisor became part of the research and reflection process. Through creating a routine of checking in with my mentor, researching, teaching and then reflecting with my mentor again, a process was developed that allowed effective teaching and improvement in classroom practice. Therefore, both the pre-service teacher and the mentoring teacher had a role as teacher and researcher in the context of my professional experience.

The whole action research project was a gradual process that developed due to the testing of different kinds of learning activities and methods of communication over a period of 10 weeks. Therefore, it was possible to assess the effectiveness of the action research project through taking note of the response of students with Social Anxiety Disorder to the different activities and methods. The overriding challenge of doing action research while in the classroom is having to try and focus on researching in one particular area, for the purpose of a project, while paying deep attention to all other areas in the classroom that really need an equal amount of research and reflection. For example, attempting to observe the actions and reactions of the socially anxious students meant that other issues with behaviour or learning needs of different types of students could receive less attention. However, the greatest benefit of action research is that it encourages the development of essential differentiation skills. It has been suggested by Tomlinson and Masuhara (Edwards & Burns, 2016, p.106) that “teachers need to be able to reflect upon their own practice

and identify principles and systematic procedures for materials adaptation.” Therefore, an action research project is one way of ensuring that pre-service teachers use reflection to improve their materials and teaching methods for future practicums and in our teaching careers.

The action research affected my teaching because it meant that I was actively testing solutions to an issue that was occurring in my classroom. Also, action research encouraged deep thinking about how certain types of students need to be taught and the importance of actively reflecting on the individual human beings that will be in each class I teach throughout my career. Action research assessments are undoubtedly a good thing. However, in my personal case I found the concept daunting in the beginning and until I figured out what action research was, and how the project was meant to progress, I was confused and frustrated. In order to improve assignments like this for other students, a thorough planning process should occur in an on campus day so that students set out on their practicum and are able to begin their project confidently while dealing with the general stress of professional experience. Action research is the perfect assignment to complete while on practicum if those taking part are set up adequately.

Reflection 2

Teaching areas: Drama and English

Action research is actively experimenting and working towards a goal which can be reflected and evaluated on to find common themes and strategies that can be implemented in the future. My action research project ended up being about student behaviour and its influence on the way students learn. I selected this particular area because I felt that the way students behaved directly affected their own learning and those around them, therefore, I wanted to find a way to as a teacher manage those behaviours into a positive situation. I honestly did not plan for this action research project. It came about naturally the way the research occurred. I wanted to work on my own behaviour management skills but also to find different ways to teach students. I like to think outside of the box and not be a “typical teacher”.

The role of teacher and researcher are one and the same when it comes to action research if you think about it. The problem becomes when you see students as test subjects and not allow the human element to take effect. I felt that naturally my teacher role was dominant in the action research and that the researcher was an afterthought. If I did something, I would often reflect on what had happened well after the fact. I think no matter what, the teacher needs to be the dominant feature; however, it can be understood that to allow the researcher to find data it will in-turn provide valuable information for the teacher to possibly further extend students. I measured the impact of the action research based off physical cues. If students were more focused, or understanding content more productively then I would consider the research a success. I also took it upon myself to have discussions with students regarding their learning. I found that asking students what they want cannot be bad, and often I found some insightful information which allowed me to plan and adjust behaviour strategies. The challenges of doing action research as a teacher in a classroom is that you need to plan well ahead of time in order for the research to be properly

conducted. Other challenges include the struggle for time during the class and also the attention aspect, for example, when the research pertains to only a certain student or group of students. As a pre-service teacher, another struggle is coordinating with the supervising teacher. The benefits of doing an action research as a teacher in the classroom are that you can understand how your students learn, you can find out what can be applied for different students in future lessons and years. The action research didn't affect my teaching directly in the moment. This is because I did not reflect in regards to the research. I often reflected but didn't relate the reflection to my research. However, after completing the research and reflecting further (giving time in between), I have understood and can see how the research has effected the way I view situations. I know that my future teaching strategies will be impacted by this research. As a pre-service teacher I am undecided on doing an action research assessment during practicum. My thoughts whilst on practicum were that I didn't have time to do the action research and that I shouldn't have to do it now. However, after these initial thoughts I would say to myself, "well this is what it would be like in the real world teaching," and "well to be a better teacher you would need to improve and study whilst teaching once you finish university." So I see both the good and bad sides of the assessment during practicum. I think the problem with action research can come when you become too involved in the research in the moment. I believe that the research becomes more alive and dynamic when there is distance and time between the research and the reflection. Emotions can play a part in your reflection if you reflect in the moment of researching, whilst once the data is collected and time has significantly passed, I believe that the emotions can be subdued in the reflection.

Reflection 3

Teaching areas: History and Religious Education

Action research formed a fundamental part of my practicum experience, with its successful implementation owing to the smaller, more relevant style of research on my teaching ability – as well as students' learning abilities (McDonough, 2006). My action research project was to determine what effect, if any, emotion has on the learning process. This was achieved by structuring activities along an axis depending on how likely they were to elicit an emotional response; activities following the traditional 'chalk and talk' style would be at the lower end, whereas activities where, for instance, students heard from guest speakers with lived experiences on a topic would be placed at the higher end of the emotive scale. There are several reasons behind choosing to do my research action piece on this topic. Specifically, I was interested in conducting this project due to it being a relatively unexplored topic amongst researchers. I believe further research on this topic may benefit future teachers, providing a scope to understand the various ways through which essential educational material can be conveyed to students, allowing their learning to be memorable and effective.

The planning process for this research project was not too dissimilar from simply planning lessons regularly. Since most teachers will aim to have a range of lesson ideas throughout the term, conducting research for the project was merely a matter of ensuring different activities of the same emotive range were

spread about the term to eliminate as much effect from outside influences as possible – such as students not enjoying an activity simply because it was during NAPLAN week rather than because of the activity itself.

The results of the action research were measured via a non-graded test in week 10, featuring questions from every week of the term. The tests were then graded and collated to determine which questions were most commonly correct, and which were most often wrong. This determined that activities eliciting a strong emotive reaction – such as meeting and listening to stories of holocaust survivors, or the ‘blue eyes/brown eyes’ activity (Stewart et al., 2003) – stayed with students throughout the whole term; whilst the activities with little to no emotional response were forgotten by week 10. Interestingly, there was very little correlation between the week the activity was held and memory, suggesting students are not more likely to remember topics from earlier or later in the term. Being both a teacher and a researcher has difficulties, obviously owing to the fact that confirmation bias can occur. Similarly issues such as, “informed consent, participant autonomy, and [coercion]” have been discussed as possible foils for action research (Nolen & Putten, 2007, p. 406). I was very careful to ensure that I did not teach the topics with high emotive content with more attention than other topics – to ensure that this did not influence student memory. I acknowledge that, obviously, this is not a fool proof measure, and thus I would recommend that further research on this study should be conducted by a separate teacher and researcher - with the teacher left ‘in the dark’ about the methodology and outcome of the study.

On a personal level, it must be noted that the benefit of seeing the results immediately was hugely influential on my teaching and will ensure that I spend even more time planning highly emotive lessons in my future career. It also allowed me to reflect critically on my own teaching ability and seek further improvements (Ditchburn, 2015).

From my own experience, I believe that conducting, or at least participating in, action research projects during practicum is a good idea. I believe this would be especially beneficial during the penultimate practicum; allowing for changes and adjustments to be made to one’s teaching style prior to commencing their final practical teaching experience (Carroll, 1997). The added research component is also beneficial for students wishing to undertake further study after their degree and this task allows students the opportunity to complete a research based task to ascertain their skill levels in such an area and begin thinking about the relevant area of study.

Reflection 4

Teaching areas: English and Religion

Action research is research done with the intention of addressing real-life situations. For teachers, this means responding to issues in the classroom by adapting teaching to reflect research into best practice.

My action research area was literacy. In particular, I looked at developing a resource for SMART goal setting in literacy. This resource helped students set individualised learning goals with the teachers in order to address a number of key literacy outcomes. The reason for this study was my exposure to low literacy at various levels on my professional experience. I encountered a range of

students in my classes from those who could write sophisticated responses to those who struggled to complete complex sentences. I wanted to find a way of engaging students in their learning by setting achievable goals to improve all areas of literacy.

Teachers have to strike a difficult balance between theory and practice. To be too theoretical is to ignore the uniqueness of each student and the practice of teaching, however good practice should be informed by quality research. There is a difficulty in navigating the vast amount of research available. To this end, meta-analyses undertaken by practicing teachers would be incredibly beneficial in order to engage with the breadth of research and findings available. There is also a difficulty in finding relevant research and balancing research requirements with the time commitment required in and outside of the classroom.

There were a number of challenges in conducting action research. However, I was able to create a resource as a result of my research, which I can implement in a classroom down the road. There are a number of difficulties to overcome in order to effectively conduct action research on a practicum; such as, getting to know the students, the limited timeframe which both teacher and students are aware of, the willingness of your prac supervisor to enable research implementation. The most pertinent challenge is the time commitment and the difficulty in finding relevant research. The benefits are that some of the research which has been done is able to inform better teaching practice. In a way, the use of research also provides input from professionals who are further along in the field. The research summarises best practice and theory from a number of teaching professionals which is helpful for beginning teachers especially.

It was difficult to assess the impact of my action research as I completed the action research journal after my practicum. The resource I created was practical and I believe it will be helpful in literacy goal setting in the future. I did complete the action research in order to fulfil the requirements of the assessment, rather than to improve my teaching per se. The difficulty of finding relevant research mean to my area of inquiry was quite niche and did not address the main issues I face in the classroom.

I believe action research can be beneficial but I would make the following changes:

- a) Begin the process with a self-assessment survey to allow preservice teachers to identify their strengths and weaknesses and how they could most benefit from making changes to their teaching practice based on research.*
- b) Give more guidance around what research is available in a number of broad areas which may be relevant. For example, I could find no relevant research on addressing varying literacy outcomes in the secondary classroom - if it's out there I couldn't find it. For other areas such as behaviour management, differentiation, etc. it would be helpful to know what research is out there.*
- c) Where possible, bringing the supervisor into the process could be beneficial as well.*
- d) Obviously having a session where we can address issues/questions around action research would be beneficial, I would say it is imperative given the unique nature of the undertaking (we have not previously been exposed to this kind of activity).*

- e) *The Saturday commitment, however, is difficult considering we already have a ten week unpaid internship to contend with. Could we possibly have the first two days of term at uni (one for the session we had and a second for action research) before going to our prac school? The first week is observation anyway and this would give us time to embed action research in our prac experience.*
- f) *Could the process of action research be less formal? (for example, “Find evidence for one change you could make to your teaching practice based on research”) and use informal but perhaps more practical examples such as TED talks and the research behind them?*

I think the theory behind action research is great - it should be where the rubber hits the road in terms of research and teaching practice. In reality, the demands of the practicum and the difficulty in accessing quality research makes it a difficult task which, might not be worth the effort.

Discussion of Case Studies

What comes out of these case studies is an insight into how pre-service teachers feel and respond to conducting action research in an actual teaching context. Reflective teaching has clearly been an integral part of the teaching process to the pre-service teachers that participated in the study. Feedback from the cohort has allowed the instructors to reflect on the types of adjustments that need to be made to make this experience even more effective for the students enrolled in this course in future years. One of the key themes to arise from the pre-service teachers reflections is that they were working on their own professional development *in situ*. That is, they were addressing areas of concern in their own teaching in order to be better teachers. This confirms the findings of Kemmis (2010) who sustains that through action research, teachers may become stewards of their own professional development. In this sense, action research produces self-knowledge, and it can be regarded as one way to make the tacit knowledge gained through experiences visible. When viewed through this lens, action research is both a developmental process and an integral part of classroom teaching (Kemmis, 2010; Ulvik & Riese, 2015). This framing of action research is consistent within the discussions on action research as a methodology. The study considered a body of research that recommends integrating action research into pre-service teacher education (Ulvik & Riese, 2015). Researchers consistently put forward the claim that a key aspect of action research is that it is underpinned by a continual cycle of self-reflection, see for example Israel, Schulz, Parker, Becker, Allen, & Guzman (2003), Kemmis (2008) and Kemmis and McTaggart (2000). What came out of the pre-service teachers' experiences that is consistent with the literature is that the research cycle is not linear, but a fluid, iterative, open, complex, and responsive process that leads to a deepened awareness of practice and theory (Cordeiro, et al. 2016).

The benefits of the study for the research team were twofold, while the pre-service teachers develop as teachers through their action research, the teacher-educators had the opportunity to develop their teaching and approach to action research through what can be referred to as action research upon action research (Smith & Sela, 2005). The importance of reflection in teaching and teacher education is not new, and numerous authors have contributed their views on reflection, values, self-efficacy, and outcomes of reflective practice (Bloomfield, 2006; Bourke, Ryan, & Lidstone, 2012; Ditchburn, 2015; Phelps, 2010; Zeldin & Pajares, 2000). Kosnik and Beck (2000) in their research on action research found that it was difficult to assess the impact of doing action research in teacher education

separately from the effects from other aspects of the professional experience. That is, they found it difficult to clearly understand the impact, if any, of the action research process. They conclude, however, that action research is a valuable approach because pre-service teachers had to identify a problem in their own classroom and solve it their own way, which gave them an ownership of the research task. This can help pre-service teachers to develop a more reflective and questioning approach to teaching (Kosnik & Beck, 2000). Thus, there is little argument in whether or not reflection is of value, but rather there is discussion on how best to place and design reflective opportunities that result in a better understanding of the individual as a teacher (Bloomfield, 2006).

It should be noted here that despite the opportunities afforded to pre-service teachers in undertaking action research in the classroom that action research in teacher education is described in the literature as being a complex and challenging process that needs guidance and facilitation (Winter, 1998). Dobber, Akkerman, Verloop, and Vermunt (2012) in their research found that many students struggle to conduct action research and that their elaboration and decision-making on the basis of their research may be weak. What was found in this study was consistent with research that pre-service teachers need support in the action research process. Moreover, the approach that is presented to them plays a crucial role in their understanding of the value of the project (Kosnik & Beck, 2000). As Cochran-Smith and Lytle (2009) determined, the research study needs to be framed in the context of the *what* and *why*. A common concern voiced by the pre-service teachers in our study was the feeling of being overwhelmed at the start of this process, even though they were able to see the benefits of the action research task by the conclusion. It is easy to understand this situation, if we consider that the students enrolled in this course have no research experience and are novice teachers. Moreover, many have outside commitments, such as family and work, which add to their time pressures. Whilst the online component was designed to accommodate students who, in the past, have expressed feeling pressured due to a lack of time and a hesitancy to travel to university during professional experience, it is evident that it is necessary to incorporate elements of face-to-face at the start of the research project in order to provide just in time feedback and guidance.

The literature suggests some conditions that need to be in place for pre-service teachers to achieve a level of success in their studies. For example, there needs to be strategies in place to mitigate the time pressures, such as the time pressure to develop a question and move into the study in a relatively short period of time as both of these factors can put pressure on pre-service teachers, and this was consistent with our findings (Kosnik & Beck, 2000; Ulvik & Riese, 2015). In order to address this finding, we will move the action research component of the professional experience to an intensive block before the professional experience as this may provide more time for the pre-service teachers to understand the theoretical and practical aspects of undertaking a research study. It was also evident from the reflections that the pre-service teachers needed explicit instruction in how to collect data, and it is evident that we need greater emphasis on data literacy. Data literacy for teachers includes three skill sets with these being: 1) *problem-focused skills*, such as knowing how to frame questions, identify problems and to make informed decisions; 2) *data-focused skills*, which include knowing how to access, generate and interpret data; and 3) *process-focused skills*, which include knowing how to engage in collaborative inquiry and to evaluate cause and effect (Mandinach & Gummer, 2013). We should also note here that we placed an emphasis on using evidence-based adjustments to classroom teaching during the action research. In the case of the reflections (see reflection 2 for example), we advocated that any change in practice must be grounded in evidence and literature. In future iterations, we will focus on making this more explicit to the pre-service teachers.

A further concern that was raised by the pre-service teachers was the lack of understanding of how to source current references. This problem can be addressed through offering research skills workshops and by demonstrating how to use the databases. In the current iteration of the action research study, we included a course on data literacy and the development of a valid research design. It was evident from the analysis of the journal articles submitted by the students in this cohort that data literacy is an area that needs explicit instruction. In light of the introduction of the TPA, we also acknowledge that pre-service teachers will benefit from the addition of data literacy in their degree programs. As outlined in this paper, we have attempted to gain an understanding of the pre-service teachers' experiences of action research; however, we realise that further steps could have been taken. As the instructors of these methods courses in teacher education, we intend to move forward by:

- Providing explicit instruction in collecting and analysing learning data that provides low stakes opportunities to make learning and teaching decisions prior to professional experience (Mandinach & Gummer, 2013);
- Providing opportunities for pre-service teachers to articulate research problems from earlier professional experience so that they can unpack their classroom experience. This supports Ulvik and Riese's (2015) claim that the project must be grounded in the student-teachers' own work and own questions
- Providing explicit instruction in how to write aspects of their research study, such as the literature review (Carroll, 1997; Dobber, et al., 2012).
- Providing two in-service campus days during professional experience in order to provide just-in-time feedback on the action research projects. This supports Winter's (1998) claim that students need both ongoing and timely support in conducting their action research.

By building on the student successes of this study, and addressing the weaknesses, we aim to develop future educators that are not only well-versed in education models and theory, but also have the skills to put what they have learnt into practice through a research model that encourages self-monitoring and reflection.

Conclusions

The wide variation in school and classroom contexts that the pre-service teachers encounter on their professional experiences means that it is difficult to articulate a one-size-fits-all approach to the action research assessment, and even to put forward consistent expectations about the kinds of research that pre-service teachers should undertake in the workplace. Conducting action research while on professional experience means that the pre-service teachers must have the capacity and confidence to articulate a research project, identify and gather appropriate data, analyse the data to make informed learning and teaching decisions and then present their findings to demonstrate the effectiveness of their interventions and approaches. In this sense, action research projects are a multifaceted assessment that requires that the student can manage both their teaching load and their research projects concomitantly. With the introduction of the TPA into Australian education degree programs during the final internship, there is a definite need to develop and address pre-service teachers' action research skills and the development of their data literacy during their degrees. There is a need, therefore, to develop a connection between university-based teaching of research skills and students' professional experiences.

References

- AITSL. (2017). Australian teaching performance assessment. Retrieved 15 September 2017 from <https://www.aitsl.edu.au/deliver-ite-programs/learn-about-ite-accreditation-reform/improving-ite-assessment/australian-teaching-performance-assessment>
- AITSL. (2011). *Australian Professional Standards for Teachers*. Carlton South, Australia: Education Services Australia.
- Auld, G., Ridgway, A., & Williams, J. (2013). Digital Oral Feedback on Written Assignments as Professional Learning for Teacher Educators: A collaborative self-study. *Studying Teacher Education*, 9(1), 31-44. <https://doi.org/10.1080/17425964.2013.771575>
- Bloomfield, D. (2006). *A New Discourse for Teacher Professionalism: Ramsay, Standards and Accountability*. Paper presented at the Australian Association for Research in Education (AARE), Adelaide.
- Bourke, T., Ryan, M. E., & Lidstone, J. (2012). Reclaiming professionalism for geography education: defending our own territory. *Teaching and Teacher Education*, 28(7), 990-998. <https://doi.org/10.1016/j.tate.2012.05.005>
- Bowen, W. G. (2013). *Higher Education in the Digital Age*. Princeton University Press.
- Bryant, P., Akinleye, A., & Durrant, A. (2013). Educating the early career arts professional using a hybrid model of work based learning. *Higher Education, Skills and Work-Based Learning*, 3(1), 17-29. <https://doi.org/10.1108/20423891311294957>
- Campbell, C., & Evans, J. A. (2000). Investigation of Preservice Teachers' Classroom Assessment Practices during Student Teaching. *The Journal of Educational Research*, 93(6), 350-355. <https://doi.org/10.1080/00220670009598729>
- Campbell, C., & Levin, B. (2009). Using data to support educational improvement. *Educational Assessment, Evaluation and Accountability*, 21(1), 47-65. <https://doi.org/10.1007/s11092-008-9063-x>
- Carroll, K. L. (1997). Action Research and Preservice Teachers. *Art Education*, 50(5), 6-13. <https://doi.org/10.2307/3193657>
- Chang, A., Rak Neugebauer, S., Ellis, A., Ensminger, D., Ryan, A. M., & Kennedy, A. (2016). Teacher Educator Identity in a Culture of Iterative Teacher Education Program Design: A Collaborative Self-Study. *Studying Teacher Education*, 12(2), 152-169. <https://doi.org/10.1080/17425964.2016.1192030>
- Cochran-Smith, M., & Lytle, S. L. (2009). *Inquiry as stance: Practitioner research for the next generation*. New York, NY: Teachers College Press.
- Cordeiro, L., Baldini Soares, C., & Rittenmeyer, L. (2016). Unscrambling method and methodology in action research traditions: theoretical conceptualization of praxis and emancipation. *Qualitative Research*, 17(4), 395-407. DOI: <https://doi-org.ipacez.nd.edu.au/10.1177/1468794116674771>
- Day, C. (2007). Committed for life? Variations in teachers' work, lives and effectiveness. *Journal of Educational Change*, 9(3), 243-260. <https://doi.org/10.1007/s10833-007-9054-6>
- Deed, C., Cox, P., & Prain, V. (2011). Enablers and constraints in achieving integration in a teacher preparation program. *Australian Journal of Teacher Education*, 36(8), 81-92. <https://doi.org/10.14221/ajte.2011v36n8.3>
- Ditchburn, G. M. (2015). Remembering reflection in pre-service teachers' professional experience [online]. *Australian Journal of Teacher Education (Online)*, 40(2), 94-111.

- Dobber, M., Akkerman, S., Verloop, N., & Vermunt, D. (2012). Student teachers' collaborative research: small scale research projects during teacher education. *Teaching and teacher education*, 28(4), 609–617, <https://doi.org/10.1016/j.tate.2012.01.009>
- Edwards, E., & Burns, A. (2016). Action research to support teachers' classroom materials development. *Innovation in Language Learning and Teaching*, 10(2), 106-120. <https://doi.org/10.1080/17501229.2015.1090995>
- Elbow, P. (1993). Ranking, evaluating and liking: Sorting out three forms of judgment. *College English*, 55(2), 187–206. <https://doi.org/10.2307/378503>
- Fecho, B., & Allen, J. (2003). Teacher inquiry into literacy, social justice, and power. In J. Flood, D. Lapp, J. Squire, & J. Jensen (Eds.), *Handbook of research on teaching the English language arts (2nd ed., pp. 232–246)*. Mahwah, NJ: Lawrence Erlbaum.
- Fletcher, R., Meyer, L., Anderson, H., Johnston, P., & Rees, M. (2012). Faculty and Students Conceptions of Assessment in Higher Education. *Higher Education*, 64(1), 119-133. <https://doi.org/10.1007/s10734-011-9484-1>
- Harrison, J., & Yaffe, E. (2009). Teacher educators and reflective practice. In A. Swennen & M. van der Klink (Eds.), *Becoming a teacher educator* (pp. 145 - 162). Dordrecht, The Netherlands: Springer. https://doi.org/10.1007/978-1-4020-8874-2_11
- Ingvarson, L., Reid, K., Buckley, S., Kleinhenz, E., Masters, G., & Rowley, G. (2014). *Best Practice Teacher Education Programs and Australia's Own Programs*. Canberra: Department of Education.
- Israel, B.A., Schulz, A.J., Parker, E.A., Becker, A.B., Allen, A.J., & Guzman, R. (2003). Critical issues in developing and following CBPR principles. In M. Minkler & N. Wallerstein (Eds), *Community-Based Participatory Research: From Process to Outcomes (second edition)*. San Francisco: Jossey-Bass, 47–66.
- Kemmis, S. (2010). What is to be done? The place of action research. *Educational Action Research*, 18 (4), 417–427. <https://doi.org/10.1080/09650792.2010.524745>
- Kemmis, S. (2008). Critical theory and participatory action research. In P. Reason & H. Bradbury (Eds) *The SAGE Handbook of Action Research: Participative Inquiry and Practice (third edition)*. London: Sage. <https://doi.org/10.4135/9781848607934.n14>
- Kemmis, S. & McTaggart, R. (2000). Participatory action research. In N.K. Denzin & Y.S. Lincoln (Eds) *The SAGE Handbook of Qualitative Research (second edition)*. Thousand Oaks, CA: Sage, 567–606.
- Kosnik, C. & Beck, C. (2000). The action research process as a means of helping student teachers understand and fulfil the complex role of the teacher. *Educational action research*, 8 (1), 115–136, <https://doi.org/10.1080/09650790000200107>
- Lai, M. K., McNaughton, S., Timperley, H., & Hsiao, S. (2009). Sustaining continued acceleration in reading comprehension achievement following an intervention. *Educational Assessment, Evaluation and Accountability*, 21(1), 81–100. <https://doi.org/10.1007/s11092-009-9071-5>
- Lave, J., & Wenger, E. (1991). *Situated Learning. Legitimate Peripheral Participation*. Cambridge: Cambridge University Press. <https://doi.org/10.1017/CBO9780511815355>
- Lewin, K. (1946). Action research and minority problems. *Journal of Social Issues*, 2(4) 34–46. <https://doi.org/10.1111/j.1540-4560.1946.tb02295.x>
- Loughran, J. (2004). A history and context of self-study of teaching and teacher education practices. In M. L. H. J. J. Loughran, V. K. LaBoskey, & T. Russell (Ed.), *International handbook of self-study of teaching and teacher education practices* (pp. 7-40). Dordrecht, The Netherlands: Kluwer. https://doi.org/10.1007/978-1-4020-6545-3_1

- Mandinach, E.B., & Gummer, E.S. (2013). Defining Data literacy: A report on convening experts. *Journal of Educational Research and Policy Studies*, 13(2), 6-28.
- McDonough, K. (2006). Action Research and the Professional Development of Graduate Teaching Assistants. *The Modern Language Journal*, 90(1), 33-47.
<https://doi.org/10.1111/j.1540-4781.2006.00383.x>
- Medland, E. (2014). Assessment in higher education: drivers, barriers and directions for change in the UK. *Assessment & Evaluation in Higher Education*, 1-16.
<https://doi.org/10.1080/02602938.2014.982072>
- Merriam, S.B. (2009). *Qualitative research: A guide to design and implementation (2nd ed.)*. San Francisco, CA: Jossey-Bass.
- Mitton-Kukner, J., Munroe, E., & Graham, D. (2015). The challenge of differing perspectives surrounding grades in the assessment education of pre-service teachers. *The Canadian Journal of Higher Education*, 45(4), 322-342.
- Montecinos, C., Ceardi, A., & Fernández, B.M. (2014). Using Action Research to Foster Preservice Teachers' Reflection on Themselves as Learners: Examining Beliefs and Changing Practices. *International Teacher Education: Promising Pedagogies (Part A)*, 427-445.
- Nolen, A. L., & Putten, J. V. (2007). Action Research in Education: Addressing Gaps in Ethical Principles and Practices. *Educational Researcher*, 36(7), 401-407.
<https://doi.org/10.3102/0013189X07309629>
- Penn-Edwards, S., & Donnison, S. (2014). A fourth generation approach to transition in the first year in higher education: First year in higher education community of practice (FYHECoP). *The International Journal of the First Year in Higher Education*, 5(1), 31-41. <https://doi.org/10.5204/intjfyhe.v5i1.190>
- Phelps, C. M. (2010). Factors that pre-service elementary teachers perceive as affecting their motivational profiles in mathematics. *Educational Studies in Mathematics*, 75(3), 293-309. <https://doi.org/10.1007/s10649-010-9257-2>
- Reason, P. & Bradbury, H. (2008). Introduction. In P. Reason & H. Bradbury (Eds), *The SAGE Handbook of Action Research: Participative Inquiry and Practice (third edition)*. London: Sage. <https://doi.org/10.4135/9781848607934>
- Schildkamp, K., & Poortman, C. (2015). Factors Influencing the Functioning of Data Teams. *Teachers College Record*, 117, 1-42.
- Schramm, W. (1971). *Notes on Case Studies of Instructional Media Studies*. US Department of Health, Education and Welfare. Retrieved 15 September 2017 from <http://files.eric.ed.gov/fulltext/ED092145.pdf>
- Smith, K. & Sela, O.(2005). Action research as a bridge between pre-service teacher education and in-service professional development. *The European Journal of Teacher education*, 28 (3), 293–310. <https://doi.org/10.1080/02619760500269418>
- Stake, R.E. (1995). *The art of case study research*. Thousand Oaks, CA: Sage.
- Stewart, T., Laduke, J., Bracht, C., Sweet, B., & Gamarel, K. (2003). Do the “Eyes” Have It? A Program Evaluation of Jane Elliott’s “Blue-Eyes/Brown-Eyes” Diversity Training Exercise. *Journal of Applied Social Psychology*, 33(9), 1898-1921.
<https://doi.org/10.1111/j.1559-1816.2003.tb02086.x>
- The Victoria Institute. (2013). *Victoria University Student Attrition Report: Comprehensive Analysis and Recommendations*. Retrieved from Melbourne, Australia:
- Wallace, C. (2013). Promoting Shifts in Preservice Science Teachers' Thinking through Teaching and Action Research in Informal Science Settings. *Journal of Science Teacher Education*, 24 (5), p.811-832. <https://doi.org/10.1007/s10972-013-9337-0>

- Winter, R. (1998). Finding a voice – thinking with others: a conception of action research. *Educational action research*, 6 (1), 53–68. <https://doi.org/10.1080/09650799800200052>
- Ulvik, M. & Riese, R. (2015). Action research in pre-service teacher education – a never-ending story promoting professional development. *Professional Development in Education*, 42 (3), 441-457, <https://doi.org/10.1080/19415257.2014.1003089>
- Volk, K. (2010). Action research as a sustainable endeavor for teachers: Does initial training lead to further action? *Action Research*, 8(3), 315-332.
- Yin, R.K. (2014). *Case Study Research Design and Methods (5th ed.)*. Thousand Oaks, CA: Sage.
- Yin, R. K. (1984). *Case Study Research: Design and Methods*. Newbury Park, CA: Sage.
- Zeldin, A. L., & Pajares, F. (2000). Against the Odds: Self-Efficacy Beliefs of Women in Mathematical, Scientific, and Technological Careers. *American Educational Research Journal*, 37(1), 215-246. <https://doi.org/10.2307/1163477>