Examining Action Research and Teacher Inquiry Projects: How Do they Help Future and Current Teachers?

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Abstract: Both teacher candidates and in-service teachers can develop their skills as teachers and as teacher leaders by participating in action research and teacher inquiry projects. This article describes the experiences of five teacher candidates and two in-service teachers who conducted action research and teacher inquiry projects in elementary classroom settings and discusses how the process contributed to the development of teacher candidates and in-service teachers as teachers and as potential teacher leaders. Implications include a need for professional development school (PDS) and school-university partnerships to consider including action research and teacher inquiry as integral parts of the work between university-based faculty, teacher candidates, and school-based faculty.

KEYWORDS: *elementary education, action research, teacher inquiry, teacher candidates, professional development, professional development schools (PDS), mathematics, reading, social studies, gifted education*

NAPDS NINE ESSENTIALS ADDRESSED:
4. A shared commitment to innovative and reflective practice by all participants
5. Engagement in and public sharing of the results of deliberate investigations of practice by respective participants

Action research and teacher inquiry projects are systematic ways for teachers to bridge the chasm between research and practice by identifying a problem, designing a possible solution, implementing the solution; then collecting, analyzing, and interpreting data. (Putman & Rock, 2017). Action research extends the work of typical social science research by either researching a specific action or intervention or using data to prescribe and carry out future actions or interventions (Sagor, 2000). Similar to action research, teacher inquiry is another approach that has proven effective for supporting both in-service teachers and teacher candidates in implementing innovative strategies and conducting research to examine their effectiveness (Babione, 2015; Cochran-Smith & Lytle, 1999).

Action research and teacher inquiry projects have been advanced as an avenue to provide teachers with professional learning experiences (Smeets & Ponte, 2009). Action research and teacher inquiry can also support teacher leadership. Teacher leadership has been defined as a form of leadership where teachers take responsibility at various levels in educational organizations (Harris & Muijs, 2005). When teachers and teacher candidates collaborate with one another on research projects, teachers deepen their understanding of content and pedagogy and develop skills related to collaboration and leadership (Harris & Lambert, 2003; Harris & Muijs, 2005).

Multiple studies found that teacher candidates conducting action research led to growth in their leadership skills (Ginns, Heirdsfield, Atweh, & Watters, 2001; Kruft & Wood, 2018; Ulvik & Riese, 2016). A study in which teacher candidates completed action research projects with support from teachers and faculty members found that teacher candidates developed data analysis and research skills which carried over into their classroom (Kuter, 2013). Kruft and Wood (2018) found that teacher candidates and clinical educators both deepened their understanding of data analysis and developed more teacher agency by conducting inquiry around specific problems of practice. A different study found that teachers conducting teacher inquiry research can promote teacher leadership when the school has a culture of collaboration that supports teacher inquiry, and teachers have ownership and some level of autonomy within their own classrooms (Smeets & Ponte, 2009).

 In North Carolina, the state in which the work described in this article took place, there is a strong emphasis on developing teachers' leadership capacity. Teacher leadership is one of the five standards on the teacher evaluation instrument used to evaluate teachers every year (North Carolina Professional Teaching Standards [NCPTS], 2013). Moreover, teacher candidates who are seeking initial licensure also must be assessed on their leadership and collaborative skills (NCPTS, 2013).

While the literature documents promise and potential about how teacher candidates and teachers can benefit from participating in action research and/or teacher inquiry projects, there is a need to more closely examine these benefits. Specifically, more attention is needed to examine how action research and teacher inquiry experiences develop teachers and teacher candidates in their teaching and in their leadership skills.

Background and Research Setting

This article is a collaborative effort between Polly, a university-based professor who mentors action research and teacher inquiry projects, and seven others who were either teacher candidates or in-service teachers at the time they completed their projects through the University

of North Carolina at Charlotte. The purpose of the article is to describe their experiences conducting action research and teacher inquiry projects in an elementary classroom setting and how these projects influenced their development as both teachers and as teacher leaders. The first five vignettes involve undergraduate teacher candidates who completed honors research projects during their senior year. The last two vignettes involve in-service teachers who completed action research projects as their master's degree program capstone experience.

Introduction to Vignettes and Examples

In order to find commonalities across projects we used a common reporting framework for every study. For each project, we detail the researcher's personal interest in the topic, the context, the research questions, the study design, the research findings, and implications for practice. We close by describing how the process of conducting action research has contributed to the development of teacher candidates and in-service teachers as teachers and as potential teacher leaders. All of the vignettes were organized around the following questions: 1) What was your interest in pursuing your project? 2) What did you study and what did you find out? 3) How did classroom-based research prepare you to teach? 4) How did classroom-based research prepare you to be a teacher leader? Our goal is to provide multiple examples about how action research and teacher inquiry can provide fertile ground for the growth and development of both future and current teachers.

Action Research Projects by Teacher Candidates

The undergraduate teacher candidates completed these projects within the context of our partner school network where the university places a large number of teacher candidates for clinical practice experiences and full-time student teaching. Each candidate completed a three-semester experience where they learned about research design, conducted a synthesis of relevant literature, and designed a study; then carried out the study and wrote up the results as a research paper.

Assessing Elementary Boys' Interest in Texts within the Classroom Library

I (Burchard) had an interest in why teachers and researchers kept finding that elementary school boys did not like to read and wanted to see what texts they may be interested in. I completed a mixed methods study over two months where second-grade students completed an interest survey, read books based on their interests, and then shared with me during interviews about the books they selected to read and their reasons for choosing it. I found that the topic of the book was more of an influence than the perceived difficulty level of the book. I used parts of various interest surveys to design my instrument and developed the interview questions using the interest surveys and what the literature said about students' interests in text selection.

Completing a classroom-based research project boosted my confidence as an educator immensely and taught me how to write and communicate more effectively. It also taught me a lot about data. In my project, I had a lot of data points. I had to look at surveys, demographic data, times, observations, interviews, and the books themselves. Before this project, I had only worked

with somewhat limited data sets. This project included a few data points for a whole class and a lot of data on a few students. Analyzing and then drawing connections and conclusions from all of this information really prepared me for real classroom data analysis. I learned through the project and conversations with my faculty mentor that it's not just test scores and reading levels; a student who scored low on one test may have had a hard morning at home because they spent ten extra minutes unpacking than they normally do.

Now, I also observe student behavior in a whole new way. I did a lot of observations during my project where I pay close attention to not only what books the students picked, but also how they picked the books. During our literacy centers, I will often postpone my next small group to watch my students as they work and take note of their interests and behaviors. In terms of leadership, completing my research project has given me the confidence and experience to be an expert in something. I lean on that experience any time I speak up in a professional learning community (PLC) meeting, bring an idea to a coworker, or spearhead a grade-level project.

Examining How Teachers Personalize Learning in Mathematics

During clinical experiences, I (Castillo) was in classrooms using technology to provide personalized learning experiences. I wanted to take a closer look at teachers' and students' experiences in personalized learning mathematics classrooms that are differentiated based on data. For the study, I observed teachers, gave them an open-ended survey to respond to, and interviewed students about their experiences in their mathematics classrooms. I focused on kindergarten and first-grade classrooms because there has been pushback in education about young children spending too much time on devices.

I found that teachers' use of personalized learning and differentiated instruction varied greatly. During small groups and centers, students could choose which activities they wanted to do in some cases, while in other cases, students did the exact same activities as their classmates. Regardless, all students reported liking math time and the activities they were doing in class. Doing honors research gave me extra time in the classroom to observe different teachers and how they teach. It also allowed me to interview teachers and hear their perspectives on what they use in their classroom and what works. This information was further validated when I interviewed students to see their perspective.

The research project showed me more ways I can collect data from my students, such as asking students questions or giving them surveys about their interests and preferences. I can then use their responses and feelings to tailor my classroom and lessons to my students. As a teacher, I strive to make my lessons very personalized to my students. I like to implement a lot of student voice and choice in my classroom, and design hands-on lessons. I have used the responses from teachers and students about what materials and centers students enjoy most to help me select some of the materials I have for my own classroom. In terms of leadership, I now have knowledge on a topic I would not know as much about without having conducted the honors research project. By doing an in-depth study, I did a lot of reading on the topic and now know more about personalized learning than many others in my area. I am able to talk with my team about including more personalized learning in their lessons. I also try to share the information that I have learned with others, so they know more about the topic as well.

Examining How a Teacher Plans and Uses Think Alouds

I (Drake) was interested in seeing how teachers use research-based strategies in their literacy classrooms. One of the strategies I saw during clinicals was think alouds as a means of teacher modeling. For my project, I studied a sixth-grade social studies teacher and analyzed lesson plans, notes from classroom observations, and researcher journal notes. I found that the teacher successfully implemented think alouds to model comprehension and used questioning techniques to make the think aloud more interactive and engaging for students. Further, the teacher's use of think alouds varied from explicitly modeling while using a think aloud to modeling and then asking questions.

The project provided me with a foundation of how to learn through research articles. As a first-year teacher, I know I'll be looking for resources to guide me along the way and I feel confident using the knowledge from the topic I've chosen and reading research articles to help me as a new teacher. I am excited to study topics more in-depth in my classroom. Learning how to analyze data prepare me to examine student data by giving me the opportunity to categorize, code, and find nuances within a set of data. I feel more prepared to look at both numbers (quantitative data) and what the data means in terms of student knowledge and growth (qualitative data).

Learning about what research has been done and what has been successful is something I do as a teacher. I think it comes down to good teaching practices based on what's been deemed successful with data to back it up. The ability to analyze data and figure out the big takeaways are all skills I will use as a teacher both within lessons and figuring out the next steps for supporting my students. In terms of leadership, I now have a deep understanding of teaching strategies that I am interested in and want to implement. Even as a first-year teacher, I feel like I can bring the results of what I have learned to see if it matches up in my classroom. I am excited to use what I have learned about metacognition and think alouds to implement research-based practices in my grade or school. I think it gives me the chance to make a name for myself as a teacher within my grade level, even as a first-year teacher.

Examining how a Mathematics iPad Activity Impacts Student Learning

I (Howerton) was interested in seeing how technology helped students with multiplication. I worked with fourth-grade students on a multiplication problem-solving app called Thinking Blocks. All of the students showed gains from the pre-test to the post-test and they all reported how much fun and how engaging the activity was. Through my research project, I was able to spend time in more classrooms before becoming a first-year teacher. I was able to receive more experience and see different classroom environments. Doing this project, I was also able to use the data to implement different techniques in my classroom.

From the project, I was able to begin looking at data from a group of students. I was able to see trends, different strategies, and common errors that students made. Through the data, I was able to implement interventions for each student. I will always be able to use these skills of looking at data and looking at trends. I will also continue to use different strategies with students to see what does and does not work best for students. Through this project, I have learned how to look at data and how to not be afraid to test out new ideas in the classroom. Related to leadership, I can

now clearly communicate about data, share my ideas and strategies with teachers, and use data to back up my ideas.

Examining How Teachers Differentiate Mathematics Instruction

I (Horne) was interested in seeing how teachers used technology when they taught math. I intended to focus on centers and personalized learning but ended up examining general technology use. I did teacher interviews with fourth and fifth-grade teachers about how they differentiated instruction. My findings indicated that teachers knew a lot of general technologies and mathematics-specific technologies but were not able to clearly articulate how they teach with them. In essence, they name dropped technologies, but could not explain how students used them or how they used them for instruction.

I think the research project prepared well for teaching with technology. I am able to better understand theories of teaching, I am able to understand and appreciate the research behind teaching strategies, and I understand appropriate and inappropriate ways to use technology with students. Also, I am better able to look at strategies and innovations, determine if they are working or not, and make changes if needed. In terms of leadership, I feel more confident as a beginning teacher because I have knowledge about a specific aspect of teaching. After reading about and examining how teachers did or did not engage students with technology in mathematics, I think I am now able to contribute to grade-level conversations about student engagement.

Action Research Projects by In-service Teachers

The graduate students were in-service, or classroom, teachers who were in the process of earning their master's degrees. Each graduate student completed ten courses, including a course where they identified a problem and wrote a literature review for an action research project and a course where they implemented and reported on their action research project. Most students in the master's program taught in partner schools, but that was not a requirement for inclusion in this article.

Examining Number Talks

I (Schmitt) was interested in examining how students solve number talks and mental math activities. The goal of my research was to answer two questions: 1) How will targeted number talks affect students' fluency when solving addition and subtraction computations? 2) How will number talks affect students' attitudes and mindsets about mathematics? During the research, my data collection was more in-depth than I would normally do. The extensive nature of the research pushed me to look at the formative assessment of students during the number talks. For my first research question, I used two different numerical values on their exit tickets, one for elements of fluency and one for strategies used. For my second research question, I collected numerical data on students' attitudes and mindsets about mathematics. This level of data allowed me to examine much more than just the accuracy of answers on their exit tickets. Examining this combination of data allowed me to make better choices for my next moves with students and with the number talks.

As a math instructional coach for my district, I already hold a position of leadership. Doing this research gave me more buy in from teachers about implementing the number talks. For example, we hold district-wide math meetings with two teachers from each school. Because my district values finding and sharing the "why" behind our work, I successfully shared my research project as well as my findings during one of these meetings. Then, I shared it with the entire staff of teachers at several of my focus schools, as well as with the 17 instructional coaches that work in my district. I now try to support all of my claims and decisions with research to support the resources our district is using to teach math.

Examining Mathematical Mindsets

I (Peake) was interested in investigating growth mindsets in mathematics, sometimes called mathematical mindsets (Boaler, 2015). In my classroom, I examined the influence of challenging and encouraging my academically and intellectually gifted (AIG) third-grade students to persevere through mathematical problem solving over the course of many weeks. I researched their determination through growth mindset surveys, their performance on challenging tasks, and the amount of time it took for them to complete the tasks. I found that my encouragement and comments encouraged them to persist through struggle, caused them to not give up, and helped them to explore mathematical tasks that were multi-step and complex.

This action/data-based research helped me to explain my teaching philosophy and the "why" behind my practice to all stakeholders, including my principal, other school and district administrators, my teaching team, and parents. After the project, when my district adopted a new math curriculum, I utilized only a small part of the new curriculum and continued to use a more hands-on, exploratory way of teaching. This project led me to feeling confident in my decisions and in my ability to look at my students' data and make appropriate choices about how to teach them.

Doing research made me mindful of the research process, gave me experience in analyzing data, and prepared me to discuss data in a meaningful way. I have been a teacher for four years. In this short time, I have been the math lead for my school for two years and the grade level chair for one year. I have worked for the district in both the math and social studies departments. I feel like my experience in research and data mindset has provided me these leadership opportunities. This action research project reinforced the importance of analyzing student data and provided the opportunity for me to learn this important skill. I have not had the opportunity to learn this skill on the job, so I feel it was very valuable to gain this experience in my master's degree program.

Discussion and Conclusions

Table 1 (below) includes a summary of the seven vignettes presented above. To make connections between them, we will close by describing how the process of conducting action research has contributed to the development of teacher candidates and in-service teachers as teachers and as potential teacher leaders.

Name	Topic	Data Sources	Growth
Burchard	How boys select literacy texts	Survey and interview	<u>Teacher</u>: More observations of classrooms, learning how to use and interpret multiple data sources to make decisions <u>Leader</u>: Confidence, expertise in an area
Castillo	Use of personalized learning in math	Classroom observations, interviews of teachers and students	<u>Teacher</u>: More observations of classrooms, personalizing learning based on students <u>Leader</u>: Opportunity to learn about one concept; able to communicate with other teachers about a topic
Drake	Use of think alouds in literacy	Lesson plans, classroom observations, interviews	<u>Teacher</u>: Developed expertise in a topic through reading and observations, practice analyzing and interpreting data <u>Leader</u>: Deeper understanding of specific teaching strategies
Howerton	Influence of a digital math game on multiplication	Student scores, observations, interviews	<u>Teacher</u>: Practice planning interventions, and analyzing and interpreting data <u>Leader</u>: Practice analyzing data, practice communicating data to others
Horne	Teachers' use of technology to support differentiation in math	Interviews and observations	<u>Teacher</u>: Deeper knowledge about determining if interventions are working or not, and how to modify them <u>Leader</u>: Able to contribute to conversations about teaching and student engagement
Schmitt	Mental math activities and achievement	Students' work on math activities	<u>Teacher</u>: Opportunity to look more closely at data and be intentional about how data leads to my decisions <u>Leader</u>: Developing dependence on data and using data to support decisions made as a district math leader
Peake	Influence of support while gifted students explored challenging math tasks	Observations and interviews	<u>Teacher</u>: Experience collecting and analyzing student data and using that to make decisions <u>Leader</u>: Knowledge of using data to make decisions and being able to communicate and share that as a grade level chair and work on district curriculum documents

Table 1: Synthesis of Vignettes

Benefits of Engaging in Teacher Inquiry and Action Research

In the descriptions shared in this article, both teacher candidates and in-service teachers report the benefits of action research and teacher inquiry research projects. The benefits reported include a focus on a deeper understanding of specific aspects of teaching and progressing toward expertise in an area of interest that closely connects to the work of teaching. Both teacher candidates and in-service teachers reported enjoying the process of reading research, designing and carrying out a study, and making sense of data in terms of suggestions for teachers.

In all cases, teacher candidates and in-service teachers studied either teachers or students, using data from a variety of sources, including surveys, interviews, and classroom observations. Teacher candidates Buchard and Howerton and both in-service teachers (Peake and Schmitt) studied students, while the other projects (Castillo, Drake, and Horne) focused on teachers. Regardless of the participants, all of the projects provided teacher candidates with opportunities for additional time in classrooms and in conversations with teachers. For in-service teachers, the projects provided an opportunity to be more intentional and explicit about trying an innovation and examining data related to the innovation.

The action research and teacher inquiry projects described in this article extends onto the current literature as they affirm the belief that teacher inquiry and action research can provide systematic ways for teacher candidates and in-service teachers to examine a problem, design and implement a solution, and analyze data about the impact of that solution (Babione, 2015; Cochran-Smith & Lytle, 1999; Putman & Rock, 2017). Further, these experiences allowed teacher candidates and in-service teachers to focus expressly on a specific context or topic related to teaching and develop expertise in that area (Harris & Lambert, 2003; Harris & Muijs, 2005; Smeets & Ponte, 2009; Urbina & Polly, 2017).

Future research projects looking at both teacher candidates and in-service teachers should examine whether and the extent to which teachers apply and make use of their research project after the project is completed (Polly, Binns, & Putman, 2017; Polly, Rock, & Zaionz, in press; Kruft & Wood, 2018). For example, Drake's project on think alouds in literacy may be followed up by examining how she uses think alouds herself and how her experiences doing inquiry research on the topic influences her decisions as a teacher. Further, there is a need to examine teachers and teacher candidates who have completed inquiry and action research projects to answer the question, how does completing the project influence teaching and students in the year or years following the project?

Developing Teacher Leaders through Inquiry and Action Research

In this article, each teacher candidate and in-service teacher was asked about leadership and how this project developed leadership potential or skills. Candidates reported many comments, including that engaging in research, developed their confidence in communicating in writing and orally about their project and about teaching in general. There were common sentiments that despite being young and new, they felt sure of themselves and willing to share what they found with teachers on their grade level as well as with other educators. Further, practicing teachers reported that the process fine-tuned their attention to data and research to the extent that they now look for data, evidence, and research to support their decisions in their various teaching and

leadership roles. For example, Schmitt, who is now a district mathematics coach, reported that she looks for data to support all of her decisions as a district leader. This article adds onto earlier work, which found that teacher candidates developed their leadership skills while engaging in teacher inquiry and action research projects (Ginns, Heirdsfield, Atweh, & Watters, 2001; Kruft & Wood, 2018; Ulvik & Riese, 2016).

Future studies need to examine teacher candidates and in-service teachers over time to see how their leadership skills develop over time. This should include studies that involve an action research or teacher inquiry project followed by other similar experiences, which may include multiple iterations of inquiry around a given topic for a given set of time (Fishman, Penuel, Allen, Cheng, & Sabelli, 2013). Leadership skills should be examined in research studies through multiple data sources including, but not limited to, data from interviews, surveys, or focus groups of not only teachers or teacher candidates engaging in action research and inquiry projects, but also those who interact with individuals engaging in action research and inquiry projects.

Limitations

This article provided a synthesis of action research and teacher inquiry projects completed by undergraduate- and graduate-level teachers enrolled at one higher education institution. While the findings provide insight to the field, we acknowledge that each teacher's context is different and that experiences are not generalizable.

Conclusion

In the NAPDS Nine Essentials (NAPDS, 2008), the following Essentials are central to the work embedded in action research and teacher inquiry projects:

Essential 4: A shared commitment to innovative and reflective practice by all participants.
Essential 5: Engagement in and public sharing of the results of deliberate investigations of practice by respective participants.

Based on these Essentials, PDS partnerships have potential to be contexts where action research and teacher inquiry is a central and integral component. If you consider Essential 1, related to the goals of PDS to promote equity for all students, and Essential 2 which talks about an intentional focus on integrating teacher candidates into the school community, it makes sense to consider inviting teacher candidates into the school and providing opportunities to collaborate with their clinical educators and other school-based faculty. Part of this collaboration should include experiences to examine an instructional problem related to equity and student performance, design, and implement an intervention and examine the impact of it, such as the action research projects presented in this article.

For educator preparation programs to provide these experiences for teacher candidates, there is a need for strong partnerships built on mutual respect and investments in these types of experiences for teacher candidates. In the examples in this article, either faculty helped connect candidates with schools to carry out the studies, or candidates conducted their research in classrooms in Professional development schools or partnership schools. In these schools, candidates were already completing clinical practice assignments for other courses in their program or faculty had a close relationship with the school. There is a need for educator

preparation programs to consider action research and teacher inquiry as one of the integral aspects of strong Professional Development School and school-university relationships. In the case of these studies, some districts and school partners maintain an open approach to both clinical practice and research in their school, while others allow only clinical practice and do not allow research to occur. While it is possible to have partnerships focused only on clinical practice without opportunities for teacher candidate inquiry and research, there is a need to explore the mutual benefit of partnerships that collaborate on inquiry and research projects between teachers and teacher candidates.

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