STUDENT TEACHER LEARNING THROUGH REFLECTION

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Abstract Student teaching has been viewed as an important part of developing into a skilled practitioner for over one hundred years. While most people acknowledge that important changes occur during that time, research on the details of those changes has been limited. This paper will present a model of research using reflections by the student teacher along with discussions with and observations by their mentor teacher as sources of evidence of learning. Examples from three former student teachers/interns will be given to illustrate the types of changes that may occur.

Keywords: student teaching, reflection, teacher action research

Introduction

Since the days of the first normal school in the United States in 1839, a practicum experience has been a graduation requirement for many new teachers. Many educators have viewed this field experience as the most valuable part of their teacher preparation program (Goldhaber, Krieg, & Theobald, 2017; Levine, 2006; Smith & Rayfield, 2017; Wilson, Floden, & Ferrini-Mundy, 2001). Cyrus Pierce, the principal of that first school, said that the goal of this experience was to "teach to pupils (i.e. the future teachers), by my example, as well as by precepts, the best way of teaching the same things effectually to others" (Haberman & Harris, 1982). Dewey later described the difference between the practice teaching experience and a student teaching one:

> It ought to go without saying… that criticism should be directed toward making the students thoughtful about his work in the light of principles rather than induce in him a recognition that certain methods are good, and certain other special methods are bad…criticism may be adapted to giving a training-teacher command of some of the knacks and tools of the trade, but are not calculated to develop a thoughtful and independent teacher. (Haberman & Harris, 1982, p. 45)

In my time working as a secondary mathematics teacher, I have been fortunate to serve as the mentor to many interns and student teachers. In that capacity I have tried to follow

Dewey's goal of developing thoughtful teachers, not just mimics of my methods. More recently Papastamatis, Panitsidou, Giavrimis, and Papanis (2009) stated that:

> Teaching professionals should be encouraged to try out new ideas, and even conduct their own classroom research on how well those ideas work with their learners and under what conditions they work best. They need to take time to reflect about what they are doing. Educational authorities need to provide them with opportunities to do so. (p. 87)

The attempt to follow this advice has been both exciting and challenging, given that student teachers come with their own views of what the process should entail (Calderhead, 1991). In the first few days of our time together I always scheduled time to talk together about their goals and expectations for that semester and found that my belief in the value of reflection did not always match theirs (Leatham & Peterson, 2009). Some have been very open to this method of development, while others were less enthusiastic but still agreed to follow Dewey's method of development.

Some of the hesitancy may have come from a view of reflection as unnecessary given their already developed ability (Pultorak, 2014), or they may have had previous mentors who did not engage in reflective activities with them (Leatham & Peterson, 2009). Additionally, while all teacher preparation programs that I have worked with require written reflections from their student teachers, some university supervisors seem to view this as a task to perform, not an activity to continually engage in (Tabachnick & Zeichner, 1984). If reflections are only cursorily read, and rarely discussed with the student teacher, they may devalue their importance.

Regardless of any initial hesitancy all of my student teachers have agreed to engage in critical reflection of their teaching, both on their own and with me as their mentor. My personal notes have accompanied these reflections, both verbal and written, on their preparation for and engagement in teaching activities. For many years I have kept these documents for my records, however recently I was thinking about the process of learning during the student teaching experience. Many researchers have had difficulty documenting the practical impact of reflection on what is done in the classroom (Greenberg, Pomerance, & Walsh, 2011; Stockero, 2008; Zeichner & Liston, 2013). Some have even feared that it may be impossible to find measurable effects of student teaching on learning and knowledge (Dunkin, 1994; Boyd, Grossman, Lankford, Loeb & Wyckoff, 2009) due to variation in mentor and mentee beliefs and differences in classroom experiences. As I looked through my records, I wanted the answer to the following question: Is there evidence that my student teachers' reflections on their teaching had an impact on their teaching and learning?

Literature Review

While having philosophical roots in Dewey and Socratic learning, much of the recent research on reflection and student teaching can be traced to Kenneth Zeichner and the implementation of formalized reflection in student teaching in the 1980's, beginning at the University of Wisconsin and expanding from there to nearly every teacher preparation program (Zeichner & Liston, 1990). Harford and MacRuaric (2008), when studying student teachers, claimed that "Reflective practice is widely recognized as a central tenet of the teaching and learning professional." They added that teacher education can "enable student teachers to achieve a level of reflection beyond their current ability level." To study this, they had student teachers review video tape of their own teaching, and working in a collaborative group with other student teachers, they "demonstrated tangible evidence of the development of reflective skills working in the context of a community of practice" (Harford & MacRuaric, 2008). While they were not able to prove that this improved reflection had an impact in how the student teachers performed in their placements, they did claim that an increase in reflective skills and greater awareness of classroom activities are skills generally associated with expert teachers.

Zeichner promoted "reflection about teaching and its contexts" as one of the key components in developing competent teachers (Zeichner & Liston, 1987). Unfortunately Zeichner was never able to prove that this reflection led to improved teaching either, finding instead that "students became more skillful in articulating and implementing the perspectives that they possessed in less developed forms at the beginning of the experience." (Tabachnick & Zeichner, 1984). However he theorized that this was because the student teachers, instead of reflecting on the work they were doing, viewed student teaching as "a time for the demonstration of previously learned skills" and had limited contact with the university supervisors who were to oversee their reflections.

Unfortunately, the difficulty in encouraging reflection leads to difficulty in studying student teaching as a reflective act. Korthagen (1985) claimed that "student teachers have to develop a reflective attitude before this period in order to become aware of the influence of utilitarian perspectives on their own activities in school." Leatham and Peterson (2009) found that only 25% of cooperating teachers felt that their primary duty was to facilitate reflection, while 28% believed they were to simply provide experiences for their student teachers and 40% felt their purpose was to model and share knowledge, both of which fit a socialization model of teacher development. Stockero (2008) found that reflection can be taught in a mathematics methods class, and that the skill is transferable to field experience activities. However the transferability may be questionable to future teaching, as it is unclear "how a reflective stance developed in a teacher education program ultimately affects teachers' day-to-day instruction."

More recently researchers have looked at different ways of eliciting and documenting reflection. Gelfuso & Dennis (2014) found that just having a content coach available did not improve reflection about the student teachers. Toom, Husu, & Patrikainen (2015) and

Körkkö, Kyrö-Ämmälä & Turunen (2016) used student teachers portfolios to examine reflective practices. Pérez & Batista (2017) incorporated peer teaching and peer observation to elicit reflection among both parties, while Krutka, D. G., Bergman, Flores, Mason & Jack (2014) used social media to improve student teacher interaction and reflection. All found that reflection was viewed as a valuable tool by the student teachers, and they felt that it contributed to their growth as educators.

Methodology

Within the last ten years I have served as a mentor teacher to two student teachers and one intern, who I will call Janet, Robert and Norma (names have been changed). The student teachers worked in my math class every day for one semester, and for roughly half of the semester ran the classroom, preparing and teaching all lessons. My intern worked with my high school students two days a week for one semester, planning and teaching roughly ten lessons over that time. In my role as a mentor, I always ask my interns and student teachers to provide me with a copy of their lesson plan before they teach. During the day I take notes on that paper about their lesson, noting how closely they follow the plan and any changes that they made from on class to another. Between classes I engage them in a reflective discussion based on three questions:

1. How do you think it went?
2. What were the best parts of the lesson?
3. What would you do differently for the next class?

This discussion usually happens in the few minutes between class periods, so I jot down the basics of this discussion on the lessons plans. Occasionally there is additional time, such as during lunch, where deeper discussions would occur. Thus the data that I looked at was my notes from observing lessons and from the discussions that I had about those lessons and teaching in general with these three future teachers.

To analyze this data, I looked for examples where a change had been made from one lesson presentation to the next, or from one day to another, and the student teacher gave an explanation for why that change occurred. I also looked for examples where a change could have occurred or was recommended by me but did not occur, and explanations from the student teacher regarding that experience.   Lastly I looked for changes that occurred over one unit of instruction and then over the entire semester. To develop a grounded theory (Corbin & Strauss, 1990) I used Shulman's (1987) categories of teacher knowledge (see Table 1) to code the types of changes (or non-changes) that were occurring.

Table 1: Shulman's 7 Categories of Teacher Knowledge

Content Knowledge	General Pedagogical Knowledge	Pedagogical Content Knowledge	Curriculum Knowledge	Knowledge of Learners	Knowledge of Educational Context	Knowledge of Educational Ends

Results and Discussion

My purpose in analyzing this data was to find if there is evidence that my student teachers' reflections' on their teaching has had an impact on their teaching and learning. The majority of the changes that I discovered occurred from one class period to the next, or within one day. These short-term changes occurred frequently, and the pre-service teachers usually had clear explanations for what they were changing and why. Long-term changes also occurred, with behaviors changing over a unit of instruction or after several months of working with a specific group of students. Many times these changes went unnoticed by the future teacher, but when asked they demonstrated a growth of knowledge and understanding.

Short Term Changes. Near the beginning of her time with me, Janet, a student teacher, was working in a geometry class. During the first class she wanted students to cut out pictures and definitions from handouts on their desks, match the two, then make a transparency of one of the pictures and provide a definition in their own words. Before the start of the second class, Janet had cut out the pictures and definitions herself and placed them in bags that she handed out to the groups while she was giving them instructions. In our conversation following the first class, she said that she was going to do this because, "Then I can distribute them, and have more people working, because they will be cut up." She also pre-assigned groups different pictures to put on their transparency so that all of the terms would be drawn by at least one group. In Shulman's (1987) categories of teacher knowledge, many of these changes would fall under the *Pedagogy* construct.

Shulman's Pedagogy construct focuses on administrative and classroom management skills to help students focus on important learning and maximize time on task. An intern, Norma, made similar changes to a presentation on factoring quadratics. After presenting the lesson to an Algebra class where students were asked to take notes from the board and follow the procedures to complete some problems, Norma and I discussed what she would do differently in the next class. Norma said that instead of her showing the notes on the board for the students to copy she would have it already written for them on a handout. That way, she hoped "more will get done" because students can move ahead instead of waiting for the next slide.

These changes in Pedagogy were often accompanied by changes in Understanding of Students. Janet, while thinking about the presentations she wanted students to make, said that in a later class she would "need to give some of the girls a specific role, like 'you're in charge of the transparency' or 'you're in charge of this'." Assigning specific roles streamlined the work students were asked to do, and demonstrated her increased understanding of student characteristics and how those would interact with the material. On a different day Janet changed a group activity in one class to a paired activity in another because she thought the students could "get more done, when it is just the two of them."

Changes in Content Knowledge may have occurred occasionally, but it was hard to differentiate between mistakes that were made due to lack of knowledge and mistakes due to anxiety or distraction. Robert, a student teacher, was working with a geometry class when we covered lines drawn in a triangle. He was going through a proof when he incorrectly identified a congruence theorem, and a student questioned him on it. Robert immediately recognized his mistake and corrected it. During our discussion he indicated that next time he would get it right, which he did in all subsequent classes. However, it is hard to say that he learned something in this experience, as he claimed that he knew it the first time but was going too fast.

The final area of short-term change that I observed was to the student teachers *Pedagogical Content Knowledge*. At times this occurred through our discussion and prompts by me as the mentor. When Norma was teaching students how to factor quadratics when a≠1 she began by using a method that had students rewrite the trinomial $ax^2 + bx + c$ as $x^2 + bx + a \cdot c$ and factor the new expression, removing an "*a*" from one of the binomials at the end. While this method produced valid answers, several students expressed confusion to Norma as to why it worked. She responded that "You can check that it does", yet in our conversation after the lesson she expressed concern that she didn't have a better answer for them. I asked if she knew other methods for factoring and she said this was how she had been taught and never thought to question it before. Norma began looking for other ways to factor and, with my encouragement, figured out another method that she taught the students the next day.

Other changes to *Pedagogical Content Knowledge* came entirely from the student teachers' reflection on their experience. When teaching a lesson on the concept of locus, Janet presented a problem (see Figure 1) asking for the set of points that are the same length as AB away from A. After students attempted to solve it, Janet presented her solution. In the 1st class this involved drawing two points A and B, drawing a line segment between A and B, and drawing several other line segments from A with the same length. In the last class points A and B were drawn, but a dotted line segment was drawn from A to B, and similar dotted line segments were drawn from A.

Figure 1: A and B line segment drawings
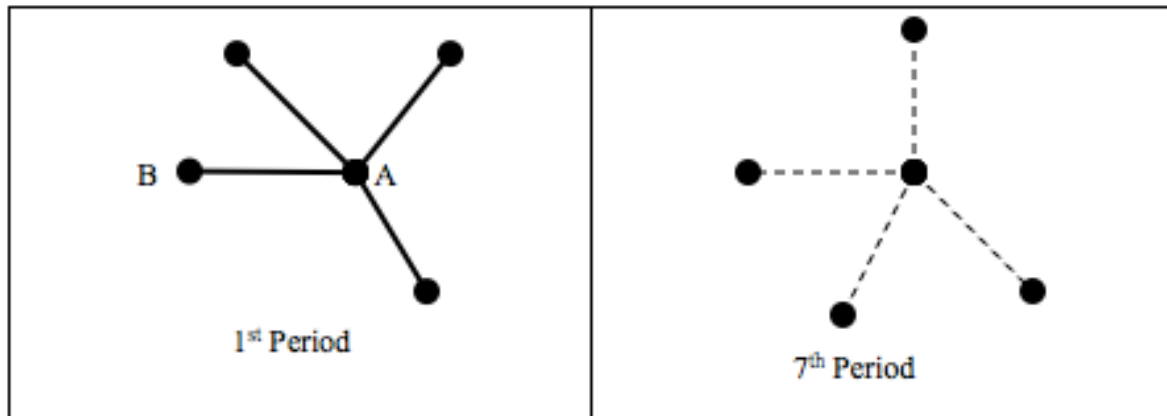
When I asked Janet how the lesson went she noted that in the first class, students felt that everything drawn, including the line segments, were part of the locus. In later classes the drawing was changed so that students understood that only those points indicated were part of the locus.

These changes were also reflected in the student teacher's ability to anticipate student misconceptions. Several times a mistake that students made in one class were incorporated into the lesson given to the next. In an Algebra class Janet asked students to solve $(x + 2)^2 - 4 = 12$. In the first class a student gave the answer as $\sqrt{12}$. When she said this is incorrect, several others students said they got the same answer. After she looked at several of their papers, Janet informed them that they distributed incorrectly, and showed them the correct way to solve it. On reflection Janet said she needed to do a better job of explaining how to solve the problem, so in the next class she preemptively asked students if they were multiplying the binomial, and presented an alternate method of solving the problem.

Long-Term Changes. There was some evidence of more long-term changes that occurred among my student teachers, though the pedagogical ones seem to have less to do with learning new ideas than comfort in trying out new things. Janet demonstrated an overall shift from providing the majority of the explanations in the beginning of her student teaching to requiring more student explanations near the end. Some of this was due to her overall comfort level with the students, with her becoming more trusting of their answers and discussions as the semester progressed. However, the more important reason for the change was her desire for student understanding and accountability, which could fall into Shulman's *Knowledge of Educational Ends*. In the first lesson of the first day, Janet presented all of the explanations for the warm-up and most of them during the lesson. When asked about this, she explained, "I guess I didn't really have an evaluation packet (process). I just thought that it might take a little bit longer if they drew all of them, so I

decided to draw some of them." A week later when planning an activity, she expressed a desire to have more student involvement, saying, "I want to assign…a kid to come up so that at least some of them are really being accountable." Three weeks later she had students coming to the board to answer other students' questions. She said on reflection that for the students, "It's not the questions, it's the concepts" that they need to master, and them sharing ideas will help them master them. Janet not only changed what she was doing pedagogically, but also seemed to show a change in her understanding of the value of the activities she had planned.

The other long-term change had to do with *Understanding of Students*. At the beginning of Norma's time in my class we spent a lot of time discussing what individual students had done in class and how she could modify their behavior. By the end of the semester our discussion had changed to examining why they were behaving a certain way and how the structure of the classroom affected student behavior. A student mentioned in the beginning as "driving me crazy" changed to being a student who "I think … is a little bit self-conscious, so maybe he is a little bit comfortable not in the front of the whole class."

All of the student teachers and interns that I have worked with exhibited growth during the process, but some showed more than others. While all were willing to discuss with me what had happened and what they would do differently, not all exhibited the same level of willingness to question or change what they did. In geometry class, Robert introduced the concept of the altitude of a triangle by hanging a large plum-bob from the ceiling in the front of the room. He explained that the altitude has similar properties, hanging straight down from the vertex to the opposite side. When students were asked to draw the altitudes for their notes most had a general idea, but their drawings showed a lack of understanding. When I asked how he thought the lesson went Robert expressed frustration that the students "didn't get it" and "they didn't seem to pay attention." I asked him what he could do differently to help them understand it and pay attention, but he said the problem was they weren't trying hard enough, and he didn't think he could change that. Although he understood there was a problem, his attachment to this instructional-aid limited his ability to question its usefulness or look for other methods.

Conclusion

The present study demonstrates a model for analyzing students' reflection as a tool for examining student teacher learning and for teacher learning in general using the Shulman (1987) framework. It is most effective when both mentor and mentee are willing to engage in reflective practice, discuss reflections on a regular basis, and make changes to their practice based on reflection. This method uncovered learning that occurred in the areas of *Pedagogy, Pedagogical Content Knowledge, Understanding of Students* and *Knowledge of Educational Ends.* This learning is observable in both the short term and on a more long-

term basis. Because of the limited number of participants (two student teachers and one intern), settings (one mentor teacher) and the fact that all were mathematics education majors, it is unknown how common these changes would be among student teachers in other settings working in other subjects.

Beyond the results of this study, the method of having mentor teachers reflect with their student teachers and document the results seems like a powerful tool (Frick, Carl, & Beets, 2010). Many researchers have lamented our lack of understanding regarding what is gained from the student teaching experience (Elliot, 1995; Greenberg, Pomerance, & Walsh, 2011; Levine, 2006). Roscoe and Butt (2010) explain that in teacher education the curriculum has been adjusted based on current research, but the assessments used to evaluate the student teachers performance has often lagged behind.   Many mentor teachers feel that their primary duty is to get out of the student teachers way (Leatham & Peterson, 2009), yet they are already being asked to evaluate their progress and document their strengths and weaknesses. Asking them to engage in a more structured reflection with their student teachers could lead to powerful results. Duncan's (1994) and Boyd's (2009) concerns about the difficulty of identifying changes and learning among pre-service teachers could be dealt with by taking large samples and identifying a priori which people held which view.

This process of student teachers' reflecting on their practices and making changes to their methods was not necessarily an easy one. One of the student teachers mentioned that in her previous placement as an intern prior to student teaching everything had been prescribed for her. When she needed to teach a lesson for one of her classes, she was told not only what to teach but how to do it. In that setting, unless classes were given in a lecture format, with students taking notes and working individually, it was frowned upon. I asked why she asked to be assigned to a different location for her student teaching. She was familiar with that setting, and I said that most people would have thought that it would be easier to go back there, where everything was the same and you didn't have to think about what you were doing. She thought about it for a minute. "Yes," she said, "it would be easier, if you didn't really care."

As educators we have a responsibility to ensure that our students are learning the content and developing skills and abilities that will assist them in the future. Mentor teachers have an additional role in ensuring that future teachers gain the knowledge and skills they need to become effective teachers. Small-scale studies of changes that individuals make can be useful in developing new models of teacher development and growth. By engaging with student teachers in reflection, and using that as a tool to study their development we can improve education not only for our own classes but for future student as well.

About the Author

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