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Using Blogs to Foster Inquiry, Collaboration, and Feedback in Pre-Service Teacher Education

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Abstract

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Keywords

educational assessment, education programs, online learning, blog

Disciplines

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Chapter XX

Using Blogs to Foster Inquiry, Collaboration, and Feedback in Pre-Service Teacher Education

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ABSTRACT

This chapter presents a critical case study on the use of information technology in a pre-service teacher education program. The authors integrated Weblogs (blogs) into two constructivist-oriented teacher preparation courses with the goal of helping students learn to think like a teacher through enhanced inquiry, collaboration, and feedback. The authors found that, through the use of blogs, pre-service teaching candidates grew in their abilities to reflect on their own teaching and to provide constructive comments to peers. The authors' experience also indicated that while instructor and peer feedback via blogs was valuable, it functioned best when paired with face-to-face meetings between the instructors and students. They discussed design principles for combining online and face-to-face environments and offer possibilities for the expanded use of blogs in pre-service teacher education.

INTRODUCTION

Constructivist theory suggests the centrality of active participation and social interaction to the learning process (Phillips, 1995). Although forms of constructivism in education range broadly from Dewey's (1938) notion of experience to Vygotsky's (1978) zone of proximal development, constructivism in education maintains a focus on student participation and interaction as central to learning. Information technology is uniquely situated to facilitate dynamic and collaborative learning environments supportive of constructivist principles. In higher education in general, information technology can provide structures to support learners in both making sense of their own experiences and communicating these understandings to a larger community (Garrison & Anderson, 2003). In teacher education in particular, it can bring authentic classroom experiences to the college curriculum through videos and artifacts, strengthening the theory-practice connection (Gomez, Sherin, Griesdorn, & Finn, 2008).

Working together as teacher educators and pre-service teachers, we used information technology in the form of weblogs (blogs) to enhance student inquiry, collaboration, and feedback in two teacher preparation courses at a highly-selective liberal arts college. In this chapter, we illustrate the partnership between constructivism and information technology through a critical case study of the use of blogs in our courses. In particular, we examine the ways in which blogging helped students learn to think like a teacher through inquiry, collaboration, and feedback. We then introduce data from the blogs and peer comments, analyzing it in relation to constructivist principles. We conclude with recommendations for future use of blogs in pre-service teacher education.

THEORETICAL FRAMEWORK

As teacher educators, we support a foundation of constructivist principles in our practice. Our classes, advanced undergraduate courses for pre-service secondary teachers, work toward the ultimate goal of teaching how to think like a teacher (Crowe & Berry, 2007). We believe that beginning teachers should have not only the knowledge and skills necessary for teaching, but also the ability to think critically about instances of classroom practice from a variety of perspectives. Five key principles for thinking like a teacher include:

- **Principle One:** Thinking like a teacher involves learning to see teaching from the viewpoint of the learner. Experiencing the role of learner is an important means of developing an understanding of the learner's viewpoint
- **Principle Two:** Prospective teachers need opportunities to "see into" the thinking like a teacher of experienced others
- **Principle Three:** Prospective teachers need opportunities to try out thinking like a teacher in order to develop their thinking as a teacher
- **Principle Four:** Prospective teachers need scaffolding (guidelines, questions, structures) to support them in the process as they begin thinking like a teacher
- **Principle Five:** Developing responsive relationships is at the heart of learning to think like a teacher and at the heart of supporting our students (Crowe & Berry, 2007, p. 33)

We believe that these principles create a core set of abilities necessary for pre-service teachers to reflect and think deeply about their practice and learn from experience. Exposure to these higher-level abilities during the undergraduate years can prepare future teachers to continue learning from their practice and interacting with communities of learners throughout their professional lives.

The Study

We supported these broad principles of teacher learning through the use of inquiry, collaboration, and feedback in our classes. We structured assignments to foster systematic inquiry into student learning and reflection on practice, integrating these principles into our practice in the following ways:

1. To apply principles one and three, we structured assignments to foster systematic inquiry into student learning and reflection on practice. Thus, our students learned to analyze learners' viewpoints and to practice thinking like a teacher.
2. To support principle five, we included online and face-to-face discussions of specific instances of practice to encourage meaningful collaboration which supported the development of responsive relationships. The face-to-face meetings included both the instructors and the student teachers.
3. To address principles two and four, we encouraged instructor and peer feedback to provide reflective, constructive suggestions as well as support to see into the thinking of others and provide scaffolding to support the process.

We wanted our pre-service teachers to develop a general understanding that inquiry is embedded in teaching. We drew upon the work of Cochran-Smith and Lytle (1999), who proposed the notion of inquiry-as-stance among educators. This idea, in combination with critical reflection (Gore & Zeichner, 1991; Richert, 1991; Smyth, 1989), encouraged pre-service teachers to continually examine their teaching in a systematic manner in order to construct knowledge collaboratively and ultimately enact change. In our classes, we asked pre-service teachers to select a focus for their inquiry, look carefully at student learning and experience, reflect on their instructional deci-

sions, and revise their lessons and assessments to better meet the needs of learners. This systematic investigation into teaching and close attention to student learning was designed to foster a stance of inquiry among future teachers to prepare them for their future classrooms.

Next, we wanted our pre-service teachers to operate within a collaborative community of professionals reflecting upon their own teaching. Here we based our efforts on the notion of professional learning communities, which provided opportunities for intellectual growth, knowledge development, and leadership for teachers (Grossman, Wineburg, & Woolworth, 2001; Lieberman & Grolnick, 1996; Little, 2003). We encouraged peer collaboration in our courses through blog comments and face-to-face discussions. We promoted instructor-student collaboration through formal and informal interaction on the blog, over email, in the college course, and in the secondary classroom. We designed multiple avenues for peer and instructor interaction with the idea that strong professional relationships are a critical context for ongoing professional growth among both beginning and veteran teachers.

Finally, we believed ongoing and interactive feedback is critical for developing effective practitioners (Hattie & Timperley, 2007). We used the strengths of instructional technology to encourage feedback about concrete instances of practice. Based on the recommendations of Ball and Cohen (1999), Lampert and Ball (1998), and others who advocate practice-based teacher education, we used blogs to illustrate instances of practice otherwise invisible in the college classroom. Pre-service teachers used their blogs to display edited videos of their lessons, scanned student work, lesson plans, and rubrics, demonstrating exactly what was taking place in the secondary classrooms where they were student teaching. We created these structures to foster concrete feedback on particular classroom situations, connecting theory with practice and providing more targeted and relevant feedback and support for pre-service teachers.

BLOGS

Blogs are basic websites that allow users to display text, pictures, videos, and links on the Internet. Regularly maintained and updated, blogs display entries in reverse chronological order so that viewers see the most recent entry first. Blogs distinguish themselves from traditional websites because they function as a social interface. Anyone with access to a blog may post comments, facilitating a form of online conversation. Bloggers can permit the public to view or restrict their blog to a select group of users. In order to maintain the privacy and confidentiality of both teachers and students, we restricted access to our blogs, including only those individuals involved in each pre-service teacher education course.

We selected blogs rather than various other forms of information technology for two key reasons. The first was practical: blogs are freely available and quite simple to use. As instructors, neither of us had any significant prior experience with blogs. We wanted a form of information technology which would support our purposes without burdening students to learn new and challenging technical skills. We selected Blogger (<http://www.blogspot.com>), a widely-used and freely-available weblog system, because it was free, simple, and more visually attractive than the blogging feature available on our campus' course management system.

The second was more conceptual. Blogs provided unique tools to support the implementation of constructivist principles in the classroom. In particular, blogs contained a combination of features to support inquiry, collaboration, and feedback:

- *Inquiry* We wanted our students to inquire into classroom contexts through ongoing reflection. Blogs provided a centralized environment for that reflection and also archived posts in reverse chronological order,

allowing students to look back at the end of the semester and observe their own growth over time. This provided an opportunity for metacognition, or thinking about one's thinking (Bransford, Brown, & Cocking, 1999), in which students could read over their posts and literally reflect on their reflection. We hoped this feature would support the development of reflection skills and an inquiry stance in pre-service teachers.

- *Collaboration* Blogs also supported our goal of collaboration through their social interface. The pre-service teachers read and commented on their classmates' reflections on a regular basis. This feature allowed them to operate in an online professional community, giving and receiving feedback from both peers and instructors. This feedback often came very quickly, permitting the pre-service teachers to use feedback almost immediately in the classroom, a critical feature for supporting theory-into-practice. Finally, the individual nature of each blog allowed the pre-service teachers to direct the conversation to their own teaching.
- *Feedback* Blogs also offered tools to support our goal of providing feedback, in which pre-service teachers reflected and commented upon specific, practice-based instances from the classroom. Blogs allowed students to display artifacts from the classroom, grounding reflection and feedback in particular instances of practice. However, unlike traditional websites, blogs also encourage comments on those artifacts, fostering more sophisticated practice-based reflection on teaching.

Overall, blogs served our purposes by providing a free and easy-to-use online environment with specific tools for encouraging constructivist goals among pre-service teachers.

LITERATURE BASE

Earlier work examining the use of blogs in teacher education has primarily focused on the logistical challenges of creating a social network via blogs. This is particularly true in courses with large numbers of students, where participation becomes an issue. For example, Makri and Kynigos (2007) used blogs in a pre-service mathematics methods course and found participation varying from blog enthusiast to frequent visitor to blog skeptic. Work by West, Wright, Gabbitas, and Graham (2006) in a pre-service instructional technology course identified additional implementation challenges. They suggested that successful use of blogs depends upon advance preparation, technical training, and comfort with the particular online writing style. Lock (2006) postulated that the effective design and development of an online community, along with its reliability and scalability, directly affect the quality of online professional development. Together, these studies suggest that student skepticism and lack of familiarity with technology pose considerable challenges to blog implementation in pre-service teacher education courses. Increasing student comfort with various skills necessary for blogging is an important prerequisite to implementation. Our study aimed to move beyond such implementation issues in order to examine the conceptual dimensions inherent in blog use.

Some studies examined issues of reflection and social interaction among pre-service teachers in blog contexts. Barab, MaKinister, Moore, and Cunningham (2001) noted that collaboration among individual community members in an online environment fostered the notion of a collective whole working toward the joint goals of the community. Stiler and Philleo (2003) found that students were generally satisfied with the use of blogs in pre-service multicultural education and technology courses. Additionally, student reflections appeared to be at higher levels than in previous courses, although they were not sys-

tematically evaluated using a rubric. Kuzu (2007), using blogs in an online information technology in education course, found that students generally held positive views about the social interaction fostered through blogs. Finally, Dickey (2004) found that blogging prevented feeling of isolation and alienation among distance learners. Although these studies took a critical first step toward examining the ways in which blogs can support teacher growth, they relied heavily upon reports of self-reports of teacher satisfaction.

Our case study aimed to build upon existing work by providing direct evidence of inquiry, collaboration, and feedback through rich examples of student reflections, comments, and face-to-face interactions. We operated in an idealized environment, with small groups of students and a distinct lack of implementation problems. Because our context was unique, it allowed us to push our analysis past a focus on implementation and reports of pre-service teacher satisfaction and toward an identification of the types of reflection, collaboration, and feedback which took place in the blogging context. Although the small scale of our study limited it in certain ways, this same small scale allowed us to look deeply into what blogs afforded our pre-service teachers and the ways in which blogs helped them to think like a teacher.

METHODS

We studied the implementation of blogs in two pre-service teacher preparation courses using a qualitative case study methodology, selected for its ability to look closely at bounded situations of interest (Stake, 1995). Our idealized instructional context certainly created a situation of interest because it allowed us to look past issues of implementation yet began to provide an opportunity for us to take an initial look at the growth of pre-service teachers through blogging. We specifically focused on understanding the ways in which blog

use in pre-service teacher education courses facilitated inquiry, collaboration, and feedback. We collected and analyzed data in a variety of forms, including pre- and post-course surveys, weekly blog entries, student comments, emails, and field notes on face-to-face communications.

Context

This case study focused on two courses with extremely limited enrollment. Once again, this ideal teaching situation allowed us to develop close instructor-student relationships and avoid some of the implementation issues faced by other teacher educators. It also provided us with the ability to collaboratively analyze our practice, continuing the work of reflection that we began during our semester together. Because of the constraints inherent in this, and any methodology, findings from this study are not intended to be generalized to the larger population. However, we hope they can provide insight transferable to educators of all forms looking to integrate instructional technology into higher education classrooms (Donmoyer, 1990). We focus on the relationship between course goals, in the form of constructivist principles, and their outcomes as mediated by one particular technology, blogging. Lessons from our critical case study can be translated to a variety of teaching and learning contexts using information technology as a pedagogical tool.

Participants

We worked with five pre-service teacher candidates enrolled in two different upper-level education methods courses during the fall semester of 2007 (Table 1).

All students were seniors, three females and two males. Data from all five participants were used for analysis, although absence from consistent peer-to-peer blogging comments led to some difficulty during analysis. The pre-study survey indicated that while all of the students were familiar with a variety of forms of information technology, including email, internet, and social networking, some were not familiar with blogs. Three of the five pre-service teachers had previously used a blog for other purposes and two of the participants had no or very limited previous blog experiences. Despite this range of interest and experience levels regarding blogs, students generally found the blogs easy to use and reported no substantial technical difficulties.

One course focused on secondary English education and the other, concurrent with the student teacher semester, on secondary science and math education. Expectations in both courses included using theory to develop and refine effective instructional practices within their respective fields of study. Teacher candidates in both courses maintained ongoing blogs in which they systematically inquired into and reflected upon

Table 1. Characteristics of students using blogs in teacher education courses and study participants

Student	Gender	Prior Blogging Experience	Year	Certification Area
Evan	Male	Yes	Senior	Science
Lauren	Female	No	Senior	Science
Joyce	Female	No	Senior	Mathematics
Jarred	Male	Yes	Senior	English
Marilyn	Female	Yes	Senior	English

issues of practice using narrative and classroom artifacts. These frequent entries included reflections on student learning, classroom management, instructional strategies, assessment practices, as well as the politics of teaching in a public education setting. As instructors, we also maintained our own blogs with ongoing entries focused on the process of integrating instructional technology into pre-service teacher education. These blogs served to enhance our own reflective practice and as a model for pre-service teachers.

Procedure

As instructors, we incorporated blogging into our course syllabi. We informed the pre-service teachers that the course requirements included the completion of non-traditional reflective journals using Blogger. We explained that this blogging opportunity would provide a method to express their concerns, celebrations, and confusions and better apply instructional theory to practice. In both courses, teacher candidates interacted collaboratively with the instructor to provide both online and face-to-face feedback on instructional practice. In order to develop collegial relationships with peers and the instructors, the courses began with face to face sessions in a traditional classroom context. These sessions included course overviews, blogging expectations, and questions for discussion regarding lesson planning and archiving student artifacts online. Throughout the semester, the English education students held weekly and then bi-weekly face to face meetings with the instructor. The secondary science and math students met bi-weekly throughout the entire semester. Instructors and peers also commented on each blog entry with questions, connections, and suggestions in order to encourage the blogger to move to a higher level of reflective thinking. These face-to-face and online sessions worked together to support students' pedagogical needs to learn in a variety of instructional contexts.

The course expectations about blogging differed based on the structure of the course. For the English education course, which took place prior to the student teacher semester, teacher candidates were expected to post to their blogs after every teaching session, usually twice per week. As the teaching load increased later in the semester, their blogging expectation changed to one post per week. The science and math education course was taken concurrently with the student teaching semester; thus the pre-service teachers were in the secondary classroom full time. They were expected to conduct a systematic case study through their blogs, posting topic selection, lesson plans, lesson revisions, classroom artifacts, and reflections throughout the semester. Although the particular structure of blog use differed slightly between these two courses, the overall goal to foster thinking like a teacher remained constant.

Instruments

We analyzed the data using the three categories of inquiry, collaboration, and feedback. In order to better understand the development of inquiry abilities over time, we coded all blog entries using a rubric based on Arter and McTighe's (2001) work (Table 2).

Students used this rubric throughout the education program to evaluate their levels of reflection. The rubric also provided clear standards to allow for consistency when evaluating blog comments. In coding the data, we noticed that three levels did not entirely capture the complexity of reflection present, and thus we added a fourth category, medium-high reflection, which included some but not all features of high-level reflection. This revised rubric captured individual levels of reflection as well as change in reflection over time.

We scored the reflections between one and four, with one indicating low self-reflection and four indicating high self-reflection. A level one reflection consisted primarily of description:

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Table 2. Departmental rubric used to evaluate blog posts and comments based on degree of self-reflection

High Self Reflection	Medium Self Reflection	Low Self Reflection
Detailed, with specific examples provided	Identifies ideas but does not provide a full discussion	Vague
Many points covered	Begins to take ownership	Simple restatements
Self-revelation	Describes performance but leaves rationale out	Descriptions only
Student is motivated	Focuses on only a few ideas	Focuses mainly on surface features
Sets goals for the future	Considers content, context or process, but not all three	Obvious content reported with no new insights
Considers more content, context, and process	Is sometimes inaccurate with theory applications	No examples
Takes thinking risks	Doesn't seem completely honest	I like it/I don't like it
Growth is supported with examples	Lacks sincerity	One dimensional
Organized	There are descriptions of some key events affecting thinking, but no comparisons over time	Superficial
Sincere & honest	I have to make inferences about what you mean	Low to no awareness of need to set goals or make progress
Gives comparisons of personal thinking over time		Inaccurate
Shares feelings, but includes theory anchors		No personal ownership of ideas
Examines both strengths & weaknesses		Disorganized-difficult to follow your meaning
Analyzes in depth looking at various perspectives		Hard to read
Provides good reasons & explanations		
Reveals thoughts		
Develops personal voice and ownership of ideas		
Easy to read & neat		
Examines skill improvements		
Gives personal reaction		
Sets goals & looks ahead		
Interesting		
Considers ethics		

Mrs. Patrick forgot that it was junior picture day during my class period...I was surprised that when the students returned to the classroom, they immediately began reading or studying their recitation without any prompting from Mrs. Patrick or I (Marilyn).

A level two reflection identified key ideas embedded in practice but did not provide a full discussion of those ideas:

This lesson definitely had its flaws. But in some ways it's better not to succeed at your first go at something. I have definitely learned more from this lesson than I have from other lessons that have gone smoothly (Lauren).

A level three reflection used explanations and examples, including personal reactions to the situation:

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We've done a lot of activities and labs, but this is the first real world application of physics I've exposed the students to. They were engaged the whole time and did exactly what I expected of them. Kevin was able to participate in the entire experience, with the aid of his teammates and his graphic organizers (Evan).

The highest level of reflection, level four, included a discussion of feeling and also anchored those feelings in theory. In this example, the student linked her experience in the classroom to the educational notion of scaffolding, or support for student learning:

So as I continued scaffolding my students to make the connections between the meanings of word elements and word definitions, I never actually showed them how to do this, or what to do when they come across unknown words in a text (Marilyn).

Using these benchmarks, we categorized initial blog reflections and their change over time.

We also analyzed student-to-student comments on blog posts in order to better understand the nature of the collaboration taking place. Initially, we coded these comments superficial versus constructive, although during the process we refined our categories to include constructive without theory and constructive with theory. This analytical process helped us to better understand the content as well as the structure of peer collaboration in each of the courses. Superficial feedback was largely descriptive in nature, praising the students' ideas without offering concrete suggestions for improvement or making connections to theory:

I really like your lesson. I like how you begin it with video clips—something the kids will really relate to and enjoy. Then, you have the kids explore the material in different ways. I love the assignment where they have to come up with their own

examples. I think your plan sounds awesome, and I can't wait to see how it turns out! (Joyce)

On the other hand, constructive feedback analyzed the initial post and offered questions or suggestions to enhance teaching skills:

I thought the lesson was very creative, however, I do have one question for you. Do you think your guardians will be able to follow this type of instruction? As a guardian who loves structure and formatted notes... what will you do for these learners? (Lauren)

Some of these comments even included theory and methods drawn from the education curriculum. The following comment connected to the idea of assessment in education:

About informal assessment, do you call on the kids that you worry about? I try to call on everyone at least once every-other day. Also, I don't know how your class is set up, but we do a ton of group work, so while they're working, I go around and monitor and probe for explanations. Finally, do you ever have students come up to teach the material? For me, I've found it works really well because, even if the student got the answer wrong, it helps everyone learn... especially because there are almost always other people who have done the same error (Joyce).

Finally, we analyzed student responses on the pre- and post-course surveys and field notes from face-to-face meetings to integrate student feedback into our analysis and examine student growth in inquiry, collaboration, and feedback. These data provided students' perceptions of the process as they experienced it and supported our desire to integrate student feedback into our analysis.

In investigating the use of blogs in these pre-service teacher education courses, we worked together as teacher educators and pre-service

teachers. We saw this study as a co-construction of knowledge, with blurred lines between investigators and participants. Although the teacher educators were primarily responsible for designing and implementing the courses and the pre-service teachers for reflecting collaboratively on their practice, we worked together to analyze our experiences. We saw this collaboration as an extension of, rather than a departure from the constructivist approach we took in the course themselves. We also saw this collaborative self-study as enhancing, rather than detracting from the validity of the research (Lather, 2001).

RESULTS

The data from this study supported the use of blogs in constructivist-oriented pre-service teacher education courses. The data showed that pre-service teachers improved their reflection abilities on blogs over the course of the semester and most reached a high level of self-reflection. Our data also indicate that the feedback among peers was supportive and helpful. We found the feedback as overwhelmingly constructive and traced the development of some lessons directly

to peer feedback. Data from surveys however, suggested that blogging should be only one element in a comprehensive teacher education course.

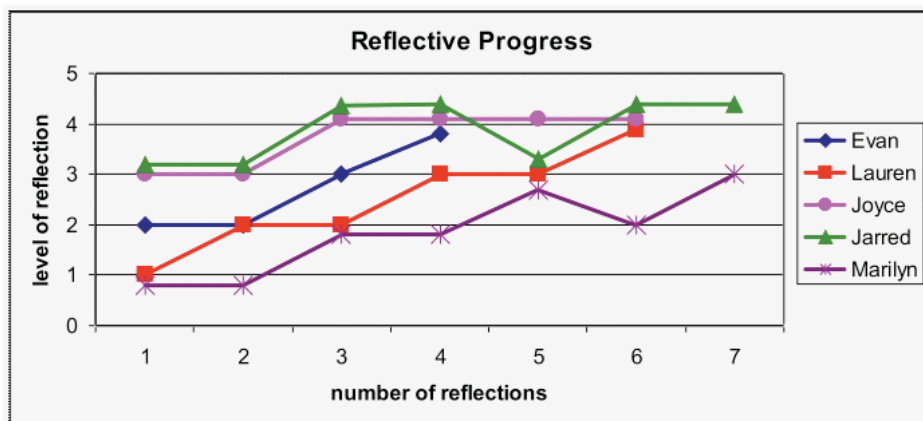
Inquiry

Scored student reflections (Figure 1) showed that reflective abilities, as demonstrated on the blog, consistently improved over time.

Even though students started out on different levels, all students continually advanced in their reflective abilities. In Lauren's case, she initially reflected with more description. She identified problems and discussed them, but her posts failed to show her personal thoughts on the important issues embedded in practice:

The school in which I am student teaching does not believe in separating students according to their abilities. There are advanced (honors) classes, but all the other classes are a melting pot of alternative education students, ESL students, special education students, autistic students, and everyone else. I believed this method of inter-mixing the students would not only be difficult for me to teach but also be unfair to the children without disabilities (Lauren).

Figure 1. Graph showing student reflection level as measured by the rubric over the course of the semester



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A later post illustrates her growth. She discussed the same topic but with greater emphasis on specifics from her classroom:

I want all the students in this class to receive the same education and do not want to slow down the pace to suit one student if it means holding back for students with higher abilities. The solution I pose to this question is differentiated instruction. This is modeled after "fair is not always equal." I intend on using tools such as graphic organizers, fill-in notes, and other means of organization to heighten the educational experience for these students with varying abilities. I plan on measuring the success through observing informal assessment/class participation. I observed that the majority of students who volunteered to answer a question during the class period were those students who did not suffer from a learning disability. My goal is to have equal voluntary participation in the class (Lauren).

In this reflection, Lauren discussed the recurring problem in greater depth and outlined a solution using strategies learned from courses within the education program. Over the course of the semester, she demonstrated an improved her ability to think critically about her classroom and connect theory to practice.

Marilyn grew over the semester as evident in her blog posts. Marilyn began reflecting on a very basic level, simply describing the classroom environment or the day's events. From there she improved slightly as she started to incorporate personal conflicts that arose such as:

My biggest fear throughout this entire lesson was that they would ask a question or insert a comma somewhere and I would not know if they were correct or how to answer their question. Would they discover I was a fraud and my weakness was grammar? There were a few questions and I am not sure I answered them clearly or correctly but overall, the students seemed to understand.

One of the students actually found an error in my paragraph that I didn't catch! (Marilyn)

Toward the end of the semester, Marilyn's reflections began to do more than paint a picture of the classroom. In the following excerpt from Marilyn's reflection, she identified her concern and also posed a potential solution, grounded in the assessment strategy of rubrics:

I still doubt myself. My biggest fear is having a student demand to know why they got a certain grade and I would not know what to say. Having a rubric makes it easier for the students to understand their grade and easier for me to determine what grade they should get. I know that I always hate when I spend the time to write a paper or write an essay exam and I get it back with just a grade on it, no comments or indication of why I got the grade. Rubrics make it easier on everyone! (Marilyn)

These examples from Lauren and Marilyn illustrated improvement in reflective abilities and a stronger grounding of practice in theory over the course of the semester.

Collaboration and Feedback

Data also indicated that substantial student collaboration was achieved in the blogging context. We analyzed peer comments on student blogs and found that the comments were overwhelmingly constructive, as opposed to superficial in nature. The majority of blog comments encouraged growth and development in teaching. Students posed questions, offered advice, made connections to their own teaching, and referred to theory or in-class discussions. One such constructive comment offered:

The easiest way to fill in the gaps, especially in a lesson like this, has to be informal assessment. One of the things that I like to do is anticipate potential

hang ups for the students and pre-formulate some questions that address them. Then when you're walking around during group activities, you can pull them out to dipstick the students you know may be struggling. Sometimes (rarely) I even think of specific questions for specific students based on misconceptions identified in previous assessments. Try this and watch your students light up when you individually question them and seemingly pluck their confusion out of mid air. Your exit tickets can be a great tool for this type of practice (Evan).

This comment gave advice and suggested methods, motivating improvements.

Eighty-three percent of all comments were, as with this example, constructive in nature. Moreover, 35% of the constructive comments went an additional step and connected to various aspects of educational theory. This was a surprising result for us. We developed a term, constructive-with-theory, to refer to these events. The following example of a constructive-with-theory comment suggested engaging students by activating their prior knowledge, a technique discussed in numerous education courses:

I think it is very important to keep the students engaged which you could have done a number of ways, but utilizing your knowledge of their CSI interest was above and beyond. Good job :) (Lauren)

This sophisticated level of feedback, constructive-with-theory, connected prior experience in the education program with specific instances of practice within the context of a professional community of educators.

In some cases, improvements in particular lessons could be traced back to constructive feedback given by peers. In one example, Lauren posted:

The high school I have been placed at does not use tracking. The classes are a mixture of students at

different ability levels. In one such classroom I have six learning disabled students, one ESL student, and an autistic student. This class has brought me to question what the best way of teaching to these students would be. I want all the students in this class to receive the same education and do not want to slow down the pace to suite one student if it means holding back for students with higher abilities (Lauren).

She received the following comments:

Comment 1: I find it's also important to prevent ability divisions within your classroom. Don't allow a "smart group" of students to form. Encourage collaboration between all of your students. You said yourself you need more teachers, so recruit some students! Don't be afraid to use that "special helper" tactic to get your bored gifted students helping your challenged students" (Joyce).

Comment 2: The same thing is happening with a class at our school. I think that one of the hardest things may even be not completely bashing all the confidence of the lower-level students. Have you all tried peer scaffolding groups? Maybe make groups according to academic ability, say 1-7, 1 being the most advanced. Then 1 scaffolds 2; 3, 4; etc (Jarred).

Lauren took the advice of her peers and developed student groups in advance of her next small-group activity, taking into consideration student ability. Through direct peer collaboration on blogs and constructive feedback, pre-service teachers connected to theory and even improved their practice.

Student Response

Students responded with overwhelmingly supportive comments to using blogs in their pre-service teacher education courses. In a post-course survey, participating students rated and answered questions about their experience with blogging

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throughout their course. All students responded that blogs were helpful to very helpful in allowing them to practice thinking like a teacher. They also reported that the blogging process was helpful to very helpful in allowing them to receive support for the process of learning to teach. Seventy-five percent of the pre-service teachers found that maintaining blogs allowed them to understand how experienced teachers think. All of the students found that their colleagues' comments on blogs were somewhat helpful to very helpful.

Although the data supported the use of blogs to enhance reflection and collaboration, student feedback suggested that blogs should only be one element of a comprehensive teacher education course. The final question on the post-course survey asked students to rank the importance of other means of communication used throughout the course. Participants ranked formal in-person meetings with instructor and students, email communication with instructor, out-of-class communication with classmates, and blog comments from 1, most helpful, to 4, least helpful (Table 3).

The results showed that students found formal in-person meetings to be the most productive source of feedback in the course. Marilyn commented:

I liked the feedback I could receive on each lesson/day. Because we didn't meet often during the

semester, I could ask questions and get advice that I could implement in my next lesson. It was also helpful to see how other students were doing and how their problems/issues were similar or different from my own.

Her comment supported blog use but suggested that they were most helpful when face-to-face meetings were not possible.

Just as blogs provide certain affordances for learning, face-to-face discussions also have particular advantages. During a face-to-face meeting, classmates and instructors can build on one another's ideas in a more immediate fashion to reach a general consensus. One student developed a lesson and received minor comments on it via the blog. Later, during a subsequent face-to-face conversation, students and the instructor worked together to substantially revise the instructional approach of the lesson. This type of collaborative knowledge-sharing would not have been possible in the turn-taking approach inherent in blog comments. Face-to-face meetings also provided the opportunity to examine numerous student work samples at the same time. Although it is possible to look at student work on a blog, clicking on large numbers of scanned classroom artifacts can be time-consuming and laborious. Using the low-tech alternative of hard copies is far simpler and more effective. While technology continues to

Table 3. Student responses to the post-course survey question, "Which of the following did you find to be the most productive source of feedback in the course? Please rank (1= most helpful; 4 = least helpful)"

	In-person	Email	Out of class	Blog comments
Evan	1	3	4	2
Lauren	3	1	2	4
Jarred	1	4	3	2
Marilyn	2	4	3	1
Group Average	1.75	3	3	2.25

*Joyce did not complete the post-course survey

evolve, it is important for us to not lose sight of the comfort and advantages that can be provided by face-to-face discussions. Also, since there is a learning curve involved when initiating a blogging forum, educators must consider the advantages and disadvantages of this form of communication, based upon the student teachers' strengths and needs. Blogging should not replace in-person communication. Rather, it should be one element of many in the further development of collaborative communities.

CONCLUSION

We used blogs in the context of two pre-service teacher education courses designed around constructivist principles. In particular, we wanted pre-service teachers to learn to think like a teacher (Crowe & Berry, 2007) and designed a variety of online and face-to-face experiences in support of that goal. Our in-depth case study of student experience in these two courses investigated the ways in which blogging fostered inquiry, collaboration, and feedback among teacher educators and pre-service teachers. We found that student reflection on blogs increased in sophistication over the course of the semester, from mainly descriptive to more theory-based. We also found that student collaboration on blog comments was overwhelmingly constructive and at times spontaneously linked theory to practice. However, one important pedagogical drawback to blogging did emerge. The pre-service teachers felt that the blogging experience was a critical element of their preparation, but could not operate in isolation. Rather, it worked best in conjunction with face-to-face meetings which allowed for group analysis and synthesis of ideas.

Based on this case study, we concluded that blogging can be considered an effective strategy for fostering high levels of reflection, peer-to-peer collaboration, and concrete feedback based on theory and practice. In doing so, blogging

supported general constructivist principles of student participation and interaction in learning. This case study in teacher education strengthened earlier work by Gomez et al. (2008), indicating a role for information technology in building social relationships and encouraging reflective teaching. It also exemplified the framework suggested by Garrison and Anderson (2003), in which information technology can be used in higher education for sense-making and community building.

Our case study, together with earlier research (Kuzu, 2007; Stiler & Phileo, 2003), indicated that blogging can be used successfully in teacher education. Our experiences indicated however, that the key to effective use in the college classroom is not only thoughtful implementation (e.g., Makri & Kynigos, 2007; West et al., 2006) but also an appropriate course design combining blogging with more conventional instructional methods. For example, both of our courses included face-to-face meetings and artifact-based collaborative conversations which yielded results unique to that particular teaching context. Moreover, one particular student valued one-on-one email interaction with the instructor above collaborative blog comments. This reflected findings by Dickey (2004) indicating that while blogs are successful on the whole, they may pose serious challenges for particular students. We suggest that future teacher education courses using blogs carefully consider the most effective combination of methods in order to achieve the best possible educational experience for students.

FUTURE TRENDS

We also envision future possibilities in which blog use can be extended beyond the higher education context to bring in valued professionals from the field. This integration of authentic, real-world connections into the college classroom is supportive of the constructivist ideal of learning from experience (Dewey, 1938). In the context of

teacher education, these blogs could be expanded to incorporate individuals from the K-12 school setting, such as student teaching supervisors or cooperating teachers. In an even more elaborate form, blogs could connect pre-service teachers with other beginning or veteran educators nationally or even internationally, providing a far-reaching professional network. Although issues of student confidentiality, pre-service teacher comfort, and commitment to the online environment would have to be addressed in order for these models to succeed, we see broad possibilities for using and even expanding this model of information technology in teacher education. Technological refinements such as integrated university-school networks, increased sophistication of video streaming, and enhanced online artifact display would facilitate the achievement of these greater constructivist goals.

FUTURE RESEARCH DIRECTIONS

Our case study had a number of limitations, including its small scale, idealized instructional environment, and absence of implementation challenges. However, the in-depth examples of student reflection, collaboration, and feedback offered a rich context for understanding the types of student learning which took place in an online environment. Further research on this topic should expand upon our findings to investigate an ideal combination of instructional methods for pre-service teacher education. More broadly, it should also consider the integration of inquiry, collaboration, and feedback through blogs with fields outside of teacher education. Finally, it should investigate the possibilities inherent in a more inclusive blog context, one which brings together individuals from higher education, K-12 schools, and beyond. Information technology has been used successfully to promote constructivist principles in teacher education; future research should move toward a more nuanced understand-

ing of its use in supporting pre-service teachers and educators in general.

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