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Using Technology to Develop Preservice Teachers' Reflective Thinking

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Abstract

Developing high-level reflection skills proves troublesome for some preservice teachers. To examine the potential of an online environment for increasing productive reflection, students in three sequential undergraduate education classes responded to regular online prompts. We coded student comments for productive and unproductive reflection, knowledge integration, and analysis of the four aspects of teaching (learners and learning, subject matter knowledge, assessment and instruction) as described by Davis, Bain, & Harrington (2001). We adapted a scoring approach recommended by Davis & Linn, (2000); Davis (2003) to analyze what aspects of teaching preservice teachers included, emphasized, and integrated when they reflected on their own beliefs about teaching. Discussion examines the utility of online environments for producing productive preservice teacher reflection.

Keywords

education, teacher reflection, comprehension, knowledge integration, analysis

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Abstract

Developing high-level reflection skills proves troublesome for some preservice teachers. To examine the potential of an online environment for increasing productive reflection, students in three sequential undergraduate education classes responded to regular online prompts. We coded student comments for productive and unproductive reflection, knowledge integration, and analysis of the four aspects of teaching (learners and learning, subject matter knowledge, assessment and instruction) as described by Davis, Bain, & Harrington (2001). We adapted a scoring approach recommended by Davis & Linn, (2000); Davis (2003) to analyze what aspects of teaching preservice teachers included, emphasized, and integrated when they reflected on their own beliefs about teaching. Discussion examines the utility of online environments for producing productive preservice teacher reflection.

Using Technology to Develop Preservice Teachers' Reflective Thinking

Preparing teachers to assume the complexities of classroom practice demands that professional preparation include opportunities for the development of self-reflection. While there are a number of perspectives regarding what constitutes reflective thinking and how to describe it, most theorists agree that developing reflective thinking skills is fundamental for professional competence (Cole and Knowles, 2000; Jay, 2003; Larrivee, 2000; Osterman & Kottkamp, 2004; Steffy, Wolfe, Pasch & Enz, 2000; Valli, 1997; York-Barr, Sommers, Ghore & Montie, 2001; Zeichner & Liston, 1996 cited in Cooper and Larrivee, 2006). In today's environment of increased federal and state accountability mandates, reflection becomes even more important to professional teaching practices. A current teacher education yearbook edited by McIntyre & Bird (2000) identifies constructivist theory as a primary concept behind change at all levels of educational practice, emphasizing that students and teachers must make meaning, solve problems, and apply learning to make informed decisions. Such changes require teachers to become reflective learning facilitators. Even though much has been written about what constitutes reflection and its importance for professional competence, the professional literature is less clear about how best to scaffold and encourage preservice teachers' reflective thinking. The purpose of this action research study is to examine the potential of an online learning discussion forum for increasing productive, preservice teacher reflection. For purposes of our study we utilized and adapted Davis (2006) and Loughran's (2002) notions of productive reflection as those written, online responses that demonstrate a complex view of teaching and learning through integrating and linking the

following four aspects of teaching: 1) learners and learning, 2) subject matter knowledge, 3) assessment, and, 4) instruction.

Historical perspective of reflective teaching

Reflective teaching, the ability of teachers to function as professional problem solvers, emerges in response to the technical view of teaching. Specifically, reflective practice emerged as a result of the process-product research prevalent during the 1970s (Vacca, Vacca, & Bruneau, 2005). However, reflective thinking and teaching can be traced all the way back to John Dewey (1933), who advocated that teachers must be thoughtful students of their own practice rather than followers of routines. Dewey depicts reflection as a “deliberate purposeful act that enabled teachers to use their artful skills to help students learn in meaningful ways.” He includes three critical attitudes teachers need to demonstrate: open-mindedness (ability to consider problems in new and different ways); wholeheartedness (ability to engage by thinking); and responsibility (ability to consider the consequences of one's actions).

More recently, Schon describes reflection as central to growth and development within all professions (Schon, 1983; Schon, 1987). Reflective practice is the ability to integrate professional experience with theory and research to formulate solutions to problem situations. Schon determines that reflective practice is a decision-making theory which defines a set of elements professionals might use for on-the-spot decision making, resolving unique or complex problems as they occur (Schon, 1983). Drawing on Schon's work, researchers (Osterman, 1990; Kirby & Teddlie, 1989; Hatton & Smith, 1994) theorized that studying the actions of competent professionals revealed much about how motivated teachers solved complex problems (reflection on action). It is critical that

professionals at all levels refuse to compromise the process of reflective practice. School initiatives must consider the ramifications of individual professional reflections. In order to support reflective practices, decision-making groups within the school system must embrace the concept that intentional actions are not haphazard reactions, enabling individuals to act rather than to react (Osterman, 1990). A number of researchers (Hollingsworth, 1989; Bartelheim & Evans, 1993; Osterman, 1990) noted the discrepancies between teachers' and administrators' reflective beliefs when making instructional choices in daily practice, or when implementing school reforms.

Van Manen's studies (1991) produced a more distinct description of reflectivity. He described three levels of reflectivity: technical, practical, and critical reflection. Technical reflection focused on the effectiveness of teaching strategies and student achievement. At level two, practical reflection emphasized how to apply specific teaching strategies to analyze and clarify personal experience. Finally, critical reflection, a systematic process of constant critique and self-questioning provided deeper insights into the meaning of experience itself.

Elements of Reflection

According to Vacca, Vacca, and Bruneau (2005) reflective practice values situational knowledge, promoting "knowledge on practice which is the heart of professional growth" (2005, p. 445). Osterman distinguished reflection from reflective practice, focusing on the difference between concentration and consideration, and action (1990). Likewise, Gur-Ze'ev, Masschelein, & Blake (2001) differentiated between reflection as a process and reflectivity as an action.

Zeichner and Liston (1987) determined that the purpose of reflection on practice is to help teachers better understand and control their own teaching and learning. There is no step-by-step approach to help practitioners learn to reflect (Marten & Spielman, 2005), but practitioners must be carefully guided through an interactive process. After establishing a collegial, collaborative environment, educators need uninterrupted time and space and a well-designed and predictable structure to participate in the reflective process (Marten & Spielman, 2005). Accordingly, discussing instructional practices and how they relate to student progress, scaffolds teachers' progression through the various levels of reflection. In order to guide teachers through this process, it is critical to pre-assess their levels of reflectivity. The facilitator must determine where to begin engaging dialogue, and how to move these learners from reflectivity to reflective practice.

Sarason, adds a final caution; "the more things change, the more they stay the same" (1971, p. 172). As teacher education programs move toward supporting a reflective process to support teacher reflectivity, they need to distinguish the domains of reflection quantitatively as well as qualitatively and provide support for new teachers to engage in reflective practice as well as administrator expectations for observing within teacher-reflective classrooms. Changes to an organizational structure must be purposeful, data-driven, reflective, and linked to student achievement.

Rationale for Reflective Teaching

All learning for students and teachers must support diversity, provide time for reflection, and offer opportunities for teachers and students to create practices that enhance learning, motivation, and achievement (McCombs, 2001). According to Tomlinson (2005), teachers face a daily challenge to tailor instruction to meet the diverse

needs of their learners. Even though reflection focuses on the moral, ethical, political, and instrumental issues embedded in teachers' daily thinking and practice, it helps practitioners better understand what they know in order to reconsider what they practice (Korthagen & Wubbels, 1991; Loughran, 2002). Superior reflective practice includes opportunities to observe the quality and recognition of teaching and student learning institutionally and within the content areas (Kreber, 2005). In order to develop an effective reflective practice, teachers must learn the skill of framing and reframing (Schon, 1983; 1987). Thus, according to Boud and Walker (1998), reflective processes must focus on both the teachers and learners' assumptions and expectations of learning.

Reflective practitioners must rely on their skilled observations of student performance and their professional reactions to the students' performances. They are more open to innovation; therefore, reflection leads to more creative thought in the development of strategies to cope with the cultural, social and political environments where learning takes place (Davis, 2006; Hammersley-Fletcher & Orsmond, 2005). Students and teachers must make sense of and appreciate beliefs, values, understandings, and perceptions (Hammersley-Fletcher & Orsmond, 2005). When teachers and students consider all of these areas, then we can conclude that someone is truly learning how to reflect (Korthagen & Vasalos, 2005).

Productive, or effective reflection, includes an analysis of integrated knowledge (Davis, 2006). Schon (1983, 1988) shares that reflective teachers have the ability to critically and intelligently examine personal premises in their schools' assumptions of educational practice. It is only during the process of reflection that professionals become conscious of how thought transforms human experience, helping them develop and

demonstrate complex views of teaching (Armstrong & Hipp, 2006; Davis, 2006).

Reflective practice involves the process of teaching and the thinking behind teaching, rather than simply evaluating instructional delivery. Therefore, reflection addresses the question of why as opposed to how, and the most critical phase of reflection is learning from the process (Hammersley-Fletcher & Orsmond, 2005).

Teachers are challenged when they reflect on educational research in relation to their own teaching (Kreber & Cranton, 2000). Action research encourages reflective practitioners to provide opportunities for refining their instructional delivery. Reflection leads to self-knowledge, a vital component for successful professional development (Hammersley-Fletcher & Orsmond, 2005). Similarly, Loughran (2002) argues that reflection helps develop the habits, skills, and attitudes necessary for teachers' self-directed growth.

Researchers must indicate how their conceptualization of reflection is related to the characteristics which they consider fundamental to teaching, permitting them to explore deeply the quality of their reflective skills (Korthagen & Wubbels, 1991). Kreber (2005) supports further research by suggesting that people who excel in what they do tend to reflect on the experience more so than people who perform less well. It is important and encouraging to see a professional question his or her practice through another's eyes; if learning through practice matters, then reflection on practice is crucial (Loughran, 2002). Consequently researchers must study the impact of reflectivity on student achievement.

Newer online instructional formats offer an instructional tool for promoting reflective thinking. As online learning packages become more available in college and

university environments, it seems worthwhile to examine their utility for scaffolding reflective thinking. Blogs and blogspots (Philleo & Stiler, 2003), wiki technology (West, Wright, & Graham, 2005), eportfolios (Pelliccione, Dixon, & Giddings, 2005), email and online discussions (Whipp, 2003) show some promise for developing reflective thinking, but more research is needed to understand how best to apprentice reflective thinking.

As Loughran (2002) so appropriately quoted Soren Kierkegaard; “the irony of life is that it is lived forward but understood backward.” To examine our own professional practices in preparing reflective practitioners, we investigated the impact of our instruction on preservice teachers by examining online reflection in three, sequential teacher education classes at Gettysburg College. As part of regular coursework in our program sequence we explored:

1. the content of our preservice teachers’ reflections, including what they consider, emphasize and integrate in online postings
2. whether student posted reflections yielded productive reflection

Our approach extended and adapted Davis’ (2006) work by examining whether students’ postings yielded productive reflection in online discussion board forums.

Methods

Participants

This study took place in our classes during the fall semester of an undergraduate teacher education program at a small U.S. liberal arts college. The sample consisted of 44 students, seventy-five percent of which were female; all but one student in the study were Caucasian and traditional students. The majority of participants, sophomores taking their first or second education classes (n=29), offset the smaller number of juniors and seniors

(n=15). The authors requested permission to conduct this action research in Social Foundations of Education (n=20), Educational Psychology (n=20), and Developmental Reading Instruction (n=4). Two students were members of two courses simultaneously, although only one student met the criteria used when coding class reflections. Therefore this student contributed to the data twice, once for each class in which she participated.

While a ninth semester student teaching option is available, most students complete our teacher education program within four years. The program adheres to the standards established by the Interstate New Teacher Assessment and Support Consortium (INTASC, 1992), is competency-based, and has received accreditation from the Pennsylvania Department of Education. The liberal arts are central to the program's teacher education efforts. Students seeking certification must complete an academic major in addition to an education minor. The program requires all students to successfully complete two of the courses for certification included in this study, Social Foundations of Education (Ed 209) and Educational Psychology (Ed 201). Students from a variety of certificate areas complete the third course, Developmental Reading Instruction (Ed 331). Additionally, the program requires forty hours of field experience for admission to the student-teaching semester. Field experiences focus on topics relevant to course material and objectives.

Data sources

Online Posts

Preservice teachers completed a minimum of one reflection entry per week, each written online, in a course management system called 'Angel'. Angel features a variety of tools to assist with teaching and learning, including areas for links, course resources,

online file distribution and collection, chat rooms, instant messaging, assessment design and implementation, grade, group, and attendance management, and discussion boards. As a regular part of coursework, we emphasized the importance of student reflection early and often during the semester.

Focusing on academic topics covered in coursework, we did not grade student reflections. We examined the first and fourth posts produced by students, each post a response to an instructor-generated prompt. Instructors imposed a twenty-four hour window on students to complete their reflection. Instructor-generated prompts encouraged students to create connections between content topics and teaching and learning methodologies, as well as the evidence required to make those connections. In total, the 44 preservice teachers in this study composed 88 journal entries. As this study examined both the first and fourth posts completed by students, we excluded from the sample students that completed only one of the two posts (nineteen students in Educational Psychology, and one from Social Foundations).

Coding and analysis for research question

Our research question examined “whether student posted reflections yielded productive reflection” in an online discussion board format. To characterize what aspects of teaching and learning preservice teachers included in their reflections, we adapted the coding structure used by Davis (2006) to analyze reflection on action, coding comments within each entry as focusing on learners and learning, subject matter knowledge, assessment, and/or instruction (Davis, 2006). We coded comments about a student’s level of participation within a democratic classroom, for instance, as focusing on learners and learning. A comment referring to the text or article used in class would be coded as

subject matter knowledge. If a preservice teacher reflected on the value of authentic assessment, we coded that comment as focusing on assessment. Finally, any comment dealing with the elements of a lesson or the mechanics of teaching we coded as focusing on instruction. Davis (2006) elaborated on these four aspects of teaching, as found in Appendix A; her work does not frame student reflection as a developmental progression, but instead focuses on the connections preservice teachers make among the four aspects of teaching. Concerned with how students describe learning environments, she incorporated subject matter knowledge and assessment (Bransford et al., 1999) rather than focusing on self talk, students, a task, or situations.

We coded comments into three areas: what preservice teachers included, emphasized, and integrated in their online reflections. Davis, working from a scoring system used in previous studies (Davis & Linn, 2000; Davis, 2003), recognized integration as an indicator of productive reflection, but also measured inclusion and emphasis.

In Davis' (2006) study, inclusion, or how many of the four aspects of teaching appeared in each reflection, quantified the concerns and topics preservice teachers brought to bear in their journal entries. Emphasis examined the aspects of teaching that a preservice teacher emphasized in their journal entries. Integration, an indicator of productive reflection, identified how many of the four aspects of teaching preservice teachers combined within the context of their journal entries on their own teaching. For example, if a preservice teacher reflected on how an assessment worksheet did not engage students with lesson content, and instead allowed them to complete it without higher level thinking, then that preservice teacher connected ideas about all four aspects

of teaching (Davis, 2006). Davis' scoring system allowed integration scores to accumulate throughout the entire content of a reflection, allowing preservice teachers multiple opportunities to integrate all four aspects of teaching. For example, if assessment and instruction were integrated in paragraph one, and learners and learning and subject matter knowledge were integrated in paragraph two, that student would be scored as integrating all four aspects of teaching in their journal entry.

Our study differs in several key ways. First, we do not limit the pool of student reflections to those on action, but expand our analysis to include reflections on academic work and its relation to other content areas, field experiences, and actions. Secondly, we focused our analysis on whether or not students integrated the four concepts used when coding their reflections, learners and learning, subject matter knowledge, assessment, and/or instruction.

Given that our sample consisted of non-student teachers, we revised scoring procedures to better capture the full range of our students' academic and field experiences. These revisions to Davis' (2006) scoring model allowed us to more accurately assess the content of student reflection. Since Davis used only reflections on action, every student received at least a score of '1' in inclusion, as every reflection included the instruction aspect of teaching. As such, each entry also received at least a score of '1' in emphasis, as even the single appearance of an aspect of teaching, as recorded in the inclusion score, yielded at least one opportunity for emphasis on the same aspect of teaching. Given that our study expanded the pool of reflections available for analysis by removing the automatic scoring elements for both inclusion and emphasis.

Thus, in our study, it was possible for a student to receive '0' in both inclusion and emphasis. Making this change improved the validity of student scores.

Additionally we did not score emphasis from 1 to 4, as Davis did, allowing us to measure the frequency of comments on all aspects of teaching, as opposed to the overall emphasis on any particular aspect(s) within the reflection. By scoring all aspects of teaching mentioned in the emphasis score, we gained insight into the potential relationship between inclusion and emphasis. Additionally, this change encouraged further study of the potential relationship between word count and emphasis, and also word count and integration. All of these adjustments improve the integration score's ability to predict the productivity of any given reflection, as students had to (1) include at least two aspects of teaching (inclusion score) for an integration score to exist, and then (2) sufficiently develop their reflection (emphasis score) to allow for true integration of the aspects of teaching. A summary of our scoring system is found in Table 1.

Table 1 *Scoring system for inclusion, emphasis, and integration scores*

Score	Range	Notes
Inclusion score	0 (no aspects of teaching included) to 4 (4 aspects of teaching included)	<ul style="list-style-type: none"> All entries could score from 0 to 4, as no inclusion score was awarded based on the data sources
Emphasis score	0 (no aspects of teaching emphasized) to X (X times any aspect of teaching was emphasized)	<ul style="list-style-type: none"> Entries with no clear emphasis were coded 0 Entries did not have a maximum emphasis score, as we measured every instance that an aspect of teaching was mentioned
Integration score	1 (no integration) to 4 (4 aspects of teaching integrated)	<ul style="list-style-type: none"> An entry might be coded as integrating all four aspects of teaching if the preservice teacher integrated any combination of all four aspects, throughout the entirety of the reflection

Results

Our study examined the content of preservice teachers' reflections and whether posted online reflections could be classified as either productive or unproductive reflection in three sequential classes required in the Education program. We determined what students considered (inclusion score), what they emphasized (emphasis score), and what they integrated (integration score) when they posted online reflections. Our findings indicated that students in all three classes most frequently included ideas about learners and learning followed closely by postings incorporating instruction and subject matter knowledge. Preservice teachers in our sample infrequently included assessment in their reflections though they integrated assessment with instruction, learners and learning, and subject matter knowledge in their postings.

Quantitative analysis for the content of preservice teachers' online reflections

We characterized the student postings in each class by describing the concepts students included, emphasized, and integrated relative to teaching. While the inclusion and emphasis scores merely describe reflection, the integration score suggests more productive, analytical reflections. Average inclusion, emphasis, and integration scores by each class are summarized in Table 1.

Table 1 *Average inclusion, emphasis, and integration scores by class for 88 postings*

Class	N	Mean word count	Mean inclusion	Mean emphasis	Mean integration	Mean class score /post
Ed 209	20	260	2.975	8.975	2.8	14.75
Ed 201	20	175	2.675	6.775	2.4	11.85
Ed 331	4	130	2.5	7.75	2.5	12.75
Grand Total		188				

Inspection of Table 1 reveals that the preservice teachers in this sample did not write more extensive reflective postings, include, emphasize, or integrate analytically between concepts as they advanced through the program. In fact the highest scores for all categories occurred in the first course in the professional sequence (Ed 209). Preservice teachers in the third course in the sequence (Ed 331) scored only slightly higher on all reported measures than preservice teachers in the second course of the sequence (Ed 201). Higher emphasis scores appeared to be consistent with more fully integrated reflections, and higher integration scores appeared to be important for productive reflection, findings that are discussed more fully in our analysis of reflective postings. For Ed 209 and to a lesser extent for Ed 331, higher word counts seem related to higher integration scores for preservice teachers in this sample, although the nature of this relationship warrants further investigation. The reflections varied a great deal in length. The mean word count for a reflection across the examined classes was 188. The word count across all reflections ranged from a low of 73, produced twice by two students, and a high of 645. Measuring word count provides a tantalizing opportunity to further

examine productive and unproductive reflection via the depth and focus students bring to bear when producing their reflections.

Productive vs. unproductive reflective thinking

Our second research question focused on whether or not posted reflections yielded productive, analytical reflections that applied a complex professional vision and made connections to more expert teacher practices. To examine the role that integration plays in producing productive reflections, we categorized high and low reflective scores based on the average scores of individual posts. We defined high productive scores as those scores of 15.5 and above, derived by averaging total individual post scores with an integration score of either 3 or 4. Similarly, unproductive reflection scores categorized as 10 or below were derived by averaging total individual post scores categorized with an integration score of either 1 or 2. Only 12 individuals (27%) achieved productive reflections online; 32 individuals (73%) demonstrated unproductive reflection. Table 3 summarizes the number and percentage of students creating productive and unproductive reflections in each sampled class using the integration score criteria defined above.

Table 3 Number and percent of students producing productive/unproductive reflections by class

Class	Productive reflection			Unproductive reflection	
	N	f	%	f	%
Ed 209	20	9	(45%)	11	(55%)
Ed 201	20	3	(15%)	17	(85%)
Ed 331	4	0	(0%)	4	(100%)

Table 3 reveals that entry level students in the program sequence (Ed 209) produced the bulk of productive reflections. These data indicate that for this sample of students, the

number of students creating productive reflections from online postings decreased as students advanced through the program. The number of students creating unproductive reflections persisted in 300 level coursework.

Table 4 below summarizes the percentage of productive and unproductive reflective posts derived from integration score ratings by class.

Table 4 Percentage of productive and unproductive posts by class

Class	N	Productive reflection (Integration rating 3-4)	Unproductive reflection (Integration rating 1-2)
Ed 209	20	62.5%	37.5%
Ed 201	20	40%	60%
Ed 331	4	50%	50%

Within the entire sample, 51% of students crafted productive posts, while the remaining students submitted unproductive reflections. These figures lend further support for examining the large number of individual postings labeled as unproductive; they suggest that while students may have the ability to construct productive posts, they may not do so consistently across assignments. These data support the interpretation that for some students productive reflection may progress developmentally.

Productive post samples with coding

To demonstrate the differences between productive and unproductive reflective posts categorized by the computed integration score, we selected productive postings from two representative individuals in ED 209 and Ed 201 for further discussion.

Ed 209 student post scored high integration and high total score:

Although I do not believe the American school system is as much of a failure as Ayers [To Become a Teacher] suggests, I do believe there is room for improvement and that many of his suggestions have the potential to make a profound impact in the classroom. [K] His first suggestion in particular, that classrooms could be lived in the present tense, made me realize how much of my own education has emphasized preparation as the value of education, whether for the next exam, the next educational level, or for standardized tests. [L-A] We were hardly ever encouraged to value education for its own sake and this affected our motivation to learn. [I] I therefore strongly feel that teachers should demonstrate the present and inherent value of what students are being taught. In addition, I believe Ayers' fourth suggestions also important and that all schools should encourage their students to embrace diversity. This can only be done by exploring the concept of race and racism—in the past as well as the present and in the world as well as the local community. [K-I-L]. I believe this is an important step in discouraging racism in the future. This, in my opinion, would be an instance in which Ayers' sixth suggestion could be enacted—where adults could tell children the truth. As for teachers telling students the truth with regard to other issues, I do not always feel it is appropriate for them to do so. [K-I] My question for Ayers would be the motivation behind and purpose of telling an inner-city student, for instance, that academic success is strongly dependent on family income and class background. [I-L] As a teacher, you have the opportunity to motivate, challenge, encourage, inspire, and in general have a positive impact on this student's life. [I-L] In my opinion, telling them the truth as Ayers presents it is enough to discourage any student from valuing or respecting education, and you would therefore lose your authority as a teacher. [I-L] They might completely lose their motivation to attend school if they view the entire educational system set up to make them fail. And how in the world would this be beneficial to them? In conclusion, although I do not agree with all of Ayers' suggestions, I do feel that many of them have the potential to have a profound impact in the classroom. [K-L].

Table 5 Scoring for Ed 209 student post scored high productive reflection (word count 388)

4 Aspects of teaching	Inclusion	Emphasis	Integration	Total Score
Instruction	1	5	L-A	
Learners & learning	1	5	K-I-A	
Assessment	1	1	I-L	
Subject matter knowledge	1	4	K-L	
Totals	4	15	4	23

This student's post demonstrates that she is thinking deeply about the effects a teacher may have on learners and she questions the ethical responsibility of teachers to remain optimistic about student potential. This student has included assessment in her posting, atypical of most student responses in our sample. The integration score shows good variety for connections among the four aspects of teaching that are well-explained

and meaningfully elaborated. Her word count, 120 words more than the average posted word count for her class, demonstrates her commitment to written reflection.

Ed 201 student post scored high integration and high total score:

Through the in-class simulation I felt very conflicted in how I previously thought about how I want to teach my students and what kind of teacher I will be. [K-I] In a perfect world all of my children will come from upper low to middle SES with loving families and participate in enriching extracurricular activities...but this is not reality. I've volunteered and observed inner city classrooms in Philadelphia and I've seen troubled students with my own eyes. [L] After this simulation I have come to the decision that even though a child with all odds against him or her will benefit in some ways, shape, or form from receiving one to all of the developmental assets that I can provide.[K-L] Even though it did not seem to make a huge difference if a student had 5 red cards and only one green card because he/she in the end had 4 red cards, but that's when you know that you have to persevere. [K-L]I understand that improper technique and interventions can do more harm than good, but if properly advised by counselors, I feel that it would help.

It is going to take work, in and outside of the classroom, and I will try to get parents involved in their student's academic life and achievements through assignments [I] that both student and parent have to collaborate on or possibly planning a night or weekend activity [I-L] where the child and parent come to the classroom or see their child's artwork, etc. I plan to do my best to bring the information to the student, making it engaging and relatable to them so there's a smaller probability that the student will look at school as a waste of time. After this simulation, I realized that even after all of my efforts, if I still have a student who does not want to learn or be in school, then that is their choice. I will be there to listen to them, help them, and find others who can help them equally if not more than I can throughout their academic career. [I-L]

Table 6 Scoring for Ed 201 student post scored high productive reflection (word count 346)

4 Aspects of teaching	Inclusion	Emphasis	Integration	Total Score
Instruction	1	4	K-I	
Learners & learning	1	5	K-L	
Assessment	0	0	I-L	
Subject matter knowledge	1	3		
Totals	3	12	3	18

This student clearly sees the complexity of teaching and is beginning to recognize that environmental influences may impact significantly both learners and learning. She recognizes that she will have to work hard instructionally to motivate learners and that she will play a role in student acquisition of developmental assets. Additionally, she notes the key role that parents will play in supporting their student academically and she

specifically addresses pedagogical strategies for involving parents in academic curriculum. One hundred and seventy words more than the average word count for her class, this student demonstrates elaborated productive reflection.

Unproductive post sample with coding

To characterize unproductive reflection more concretely, we included one representative post from Ed 201 for further discussion:

Ed 201 student post scored low integration and low total score:

I think I learned a lot from this simulation. I realized how difficult it is to come back and thrive if you start at a disadvantage. [L] So many more things can happen to you than if you had started off privileged or with the green protective cards. This helped me understand why it is so difficult to get through to at risk students and how important it is to start helping at risk students young.[K-L]

Table 7 Scoring for Ed 201 student post scored low integration unproductive reflection (word count 73)

4 Aspects of teaching	Inclusion	Emphasis	Integration	Total Score
Instruction	0	0	K-L	
Learners & learning	1	2		
Assessment	0	0		
Subject matter knowledge	1	1		
Totals	2	3	1	6

Her word count score well below the average word count for posts in her class (100 words), this student does not elaborate her thinking about teaching and learning and demonstrates little disposition for written reflection. She focused primarily on learners and learning in her post, but she offers no concrete instructional pedagogical strategies for helping at risk students learn content. While her post has potential for moral and ethical considerations, she does not explore them; she merely puts together her ideas about learners and learning.

We also examined the posts and scores of those students who achieved total scores just below the cut off score for productive reflection (15.5+) to gain further insights into the consistency and development of their reflections. In almost all of these cases, students' total scores dropped because of one descriptive posting addressing a students' lack of consistent commitment for creating critical reflection. In all but two cases in our sample, low integration scores were associated with low ranking post scores; these posts failed to meet the necessary criteria to be classified as productive reflection.

Discussion

Since our results showed that a high percentage of students in all three classes created both unproductive and productive reflections, questions about consistency and the methodology of reflection inevitably arose. Marten & Spielman (2005) called for a collegial collaborative environment that provided scaffolding opportunities for reflective practices. Given the inconsistent quality of reflections produced by the students across all three classes, we questioned the content and methodologies instructors used to teach preservice teachers about reflection.

It is clear that reflection in an online environment yielded productive reflection, as measured by the integration score of each post, but it is entirely possible that facilitating reflective growth and consistency requires instructors to offer students multiple avenues and opportunities for practicing reflective thinking. Because we could not determine what factors influenced students at the time they submitted their online reflection, we questioned whether the online discussion board environment supported or hindered the reflective process.

Key to our concerns were student surroundings during reflective thinking and posting; was their concentration impaired by the noise and confusion of a disruptive environment, or were they in a location that encouraged quiet and extended introspection? Also we worried that the online environment removed students from the relevant content by allowing them an extended time period between exposure to content and their resulting reflection. It also gave students the flexibility to avoid reflecting on their experiences at all, as there was no teacher/student accountability in the online ungraded discussion forums. Simply put, students may have chosen not to, or forgot to, submit their reflections.

A possible solution aligned with the suggestions made by Marten and Spielman (2005) incorporates an opportunity for reflection within the classroom, and then combines an initial reflection with a supplemental online posting. While increasing the work load for instructors, this strategy provides immediate feedback on student understanding of relevant content in the form of reflections, and then challenges students to use their understanding by responding to an online prompt, a mechanism that encourages integration of the four aspects of teaching while scaffolding students toward a productive reflection.

Recommendations for further study

The data and resulting discussion leaves us with a number of unanswered questions that warrant further study. Chief among these is that while integration clearly predicts the productivity of an individual post, the percentage of “productive” students across all three classes encourages us to examine the perceived relationship between integration as a measure of productivity, and word count. While the current data is

inconclusive when attempting to predict integration, and thereby productive reflectivity, via word count, there does seem to be a potential relationship between the two measurements. Similarly, the data also suggests that further work be done to determine the nature of any relationship between word count and emphasis; does a longer post help us predict the depth of focus (emphasis score) of a particular post?

As for understanding the relationship between integration and productivity, we also feel the data suggests further investigation on the ability of students to be reflectively productive more or less frequently when unprompted as opposed to prompted. This issue may also be influenced by the content students use to reflect; experience-based reflection versus academic reflection. Lastly, this study encourages us to look to the online discussion board posting of reflections as a tool for developing reflection across an education program. Further research must be done to determine the best vehicles and methodologies needed to truly measure and scaffold this assertion.

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Appendix A *Coding for the four aspects of teaching*

We utilized the following representative examples for the four aspects of teaching (2006) to code student online reflections (adapted from Davis, 2006).

Learners and Learning	Subject Matter Knowledge	Assessment	Instruction
Alternative ideas or students' ideas Prior knowledge & experiences Engagement and motivation Collaboration Individual students Commonalities across students Cognitive & social developmental processes Social context of learning	Nature of subject area content Nature of knowledge Inquiry Subject area content Connections among concepts, facts, & theories, etc.	Methods Timing Goals Learning outcomes Multiple approaches Multiple uses Assessment approaches requiring the use of concepts, facts, theories, & methods of inquiry	Constructing knowledge Elements of lesson planning Links to later & previous activities Management (of students, materials, and/or activities Artifacts and/or worksheets Finding lesson ideas Instructional representations Activities Instructional goals Driving questions Amount of time Teacher confidence Instructional sequence & goal alignment