

DOES SCAFFOLDED BLOGGING PROMOTE PRESERVICE TEACHER REFLECTION?  
EXAMINING THE RELATIONSHIPS BETWEEN LEARNING TOOL AND SCAFFOLDING  
IN A BLENDED LEARNING ENVIRONMENT

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This dissertation is dedicated to  
my wife, Rachel, for her love, support, and encouragement.

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This study examined the effect of two variables, type of online tool and type of hard scaffolding, on the levels of reflection by preservice teachers. The online tools were a discussion forum and personal weblogs (blogs). The scaffolding types were minimal and enhanced. The participants were forty-eight preservice teachers and their instructor from a course on integrating technology into K-12 environments. The preservice teachers reflected online after watching an online video case study and after planning a lesson that integrated technology. Multiple sources of data were collected and analyzed in order to triangulate findings: the reflective online discourse, two questionnaires, interviews with preservice teachers and the instructor, and observations of classroom and online behavior. Levels of reflection were measured by using a reflection rubric by Hawkes and Romiszowski (2001) and a reflection scale by Crotty and Allyn (2001). The results revealed that enhanced scaffolding had a statistically significant effect on promoting higher levels of reflection over minimal scaffolding. This was because the guiding questions in the enhanced scaffold provided structure and focus as well as an expert practitioner's perspective on technology integration. The type of online tool did not have a statistically significant effect on promoting higher levels of reflection. Results suggest that this was due to the different personal preferences of the preservice teachers and their perceived affordances of the online tools. This study suggests that the nature of scaffolding has a more critical role in promoting reflection than the technical affordances of the online tool. In addition,

as a result of the computer-mediated discourse analysis, this study suggests a modified method of measuring reflection.

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## Table of Contents

CHAPTER 1: INTRODUCTION .....	1
Statement of the Problem .....	2
Research Questions .....	3
Definitions .....	4
Preservice Teacher (PST) .....	4
Reflection .....	4
Scaffold .....	6
Discussion Forum .....	7
Blog .....	8
Overview of the Study .....	9
Implications of the Study .....	10
Limitations of the Study .....	11
CHAPTER 2: REVIEW OF LITERATURE .....	13
Introduction .....	13
Teacher Reflection .....	14
Definitions, Nature, and Elements of Reflection .....	14
The Importance of Reflection .....	17
The Difficulties of Promoting Reflection in Actual Practice .....	19
Scaffolds .....	23
Taxonomy of Scaffolds .....	24
Influence of Scaffolds on Learning .....	26
Scaffolding General Education .....	27
Scaffolding Teacher Reflection .....	28
Strategic Use of Scaffolds .....	29
Tools for Scaffolding Reflection .....	30
Benefits of Using Traditional Journals .....	30
Discussion Forums and Blogs .....	31
Affordances of Forums and Blogs .....	32
Research on Tools for Reflection .....	33
Research on Reflection in Forums .....	33
Research on Reflection in Forums and Blogs .....	35
Research on Reflection in Blogs .....	36
Research Gaps on Reflection in Blogs and Forums .....	38
Importance of the Study .....	39
CHAPTER 3: METHODOLOGY .....	41
Introduction .....	41
Hypotheses .....	41
Design of the Study .....	42
Setting and Participants .....	44
Data Sources .....	45
Materials .....	47



Scaffolds.....	47
Discussion Forum.....	47
Blogs.....	47
Questionnaires.....	49
Procedures.....	49
Instructor Recruitment and Training.....	49
Participant Recruitment and Communication.....	50
Establishment of Treatment Groups.....	51
Tasks Performed by All Treatment Groups.....	51
Tasks Performed by Discussion Forum Groups.....	52
Tasks Performed by Blog Groups.....	53
Tasks Performed by Instructor.....	53
Tasks Performed by Researcher.....	54
Administration of Initial Questionnaire.....	54
Computer Mediated Discourse Analysis of Reflections.....	55
Interviews.....	57
Administration of Terminal Questionnaire.....	59
Observations.....	59
Data Analysis.....	59
Initial Questionnaire.....	59
Computer Mediated Discourse Analysis of Reflections.....	60
Face-to-face Interviews.....	66
Terminal Questionnaire.....	66
Observations.....	67
CHAPTER 4: RESULTS.....	68
Participant Characteristics.....	68
General Demographics.....	68
Internet Tool Preferences.....	69
Internet-related Abilities.....	69
Reflection Characteristics.....	69
Participant Characteristics Summary.....	70
Research Questions One and Two: Differences Due to Tools and Scaffolds?.....	71
Participation Measures.....	71
Structural Measures.....	72
Summary of Participation and Structural Findings.....	78
Comparison of Reflection Levels.....	78
Summary of Visual Comparison of Reflection Levels.....	83
Statistical Comparison of Reflection Levels.....	83
Summary of Statistical Comparison of Reflection Levels.....	86
Research Question Three: Interaction Between Tool and Scaffold Variables?.....	86
Research Question Four: Reasons for Differences in Reflection Levels?.....	86
Findings from the Questionnaires.....	87
Findings from the Interviews.....	91
Findings from the Observations.....	101
Summary of Findings.....	106

Chapter 5: DISCUSSION AND CONCLUSION .....	109
Review of Findings and Links to Literature.....	109
General Effects of Types of Online Tool and Scaffolding on Reflection.....	109
Effect of Scaffolding Type on Reflection .....	113
Effect of Type of Online Tool on Reflection .....	115
Implications.....	117
Research on Online Reflection.....	117
Strategic Use of Scaffolds to Promote Reflection.....	119
Use of Online Tools to Promote Reflection .....	119
Limitations .....	120
Soft Scaffolds .....	120
No Control Groups .....	121
Online Tools Examined.....	121
Survey Instruments.....	122
Gender Not Examined.....	122
Sample Size.....	122
Generalizability .....	122
Directions for Future Research .....	123
Larger Sample in Variations of the Study.....	123
True Scaffolding Study .....	124
Perceptions of Blog Ownership.....	124
Learner Engagement .....	124
Conclusion.....	124
References .....	126
Appendix A: Minimal Reflection Scaffold of Video Case Critique .....	138
Appendix B: Enhanced Reflection Scaffold of Video Case Critique .....	140
Appendix C: Minimal Reflection Scaffold of Lesson Plan Reflection.....	142
Appendix D: Enhanced Reflection Scaffold of Lesson Plan Reflection.....	143
Appendix E: Initial Questionnaire.....	144
Appendix F: Terminal Questionnaire.....	146
Appendix G: EC301 Course Requirements .....	149
Appendix H: Interview Protocol for Preservice Teachers .....	150
Appendix I: Interview Protocol for EC301 Instructor .....	152
Appendix J: Observation Schedule .....	153
Appendix K: Examples of Coded Macrosegments Using a Modified Version of Hawkes and Romiszowski's Coding Scheme.....	154

Appendix L: Examples of Coded Macrosegments Using a Modified Version of Crotty and Allyn's Coding Scheme .....	156
Appendix M: Questions Discussed In Class for Video Critique Demonstration.....	158
Appendix N: EC301 Lesson Plan Template .....	159
Appendix O: In Class Hard Scaffold For Lesson Plan Critiques.....	162

## List of Tables

Table 1.1 Types of scaffolding used in this study based on Hannafin, Land, and Oliver (1999) .....	7
Table 2.1 Crotty and Allyn's (2001) developmental model of teacher reflection .....	22
Table 2.2 Categories of scaffolds based on the classification scheme by Hannafin, Land, and Oliver (1999) .....	25
Table 3.1 Number of participants by the day of the week each EC301 class was conducted .....	45
Table 3.2 Overview of research questions, data sources, and data analysis .....	46
Table 3.3 Simplified version of Hawkes and Romiszowski's (2001) seven-level reflection rubric .....	62
Table 3.4 Crotty and Allyn's (2001) reflection scale for novice teachers based on Bloom's Taxonomy .....	62
Table 3.5 Modified version of Hawkes and Romiszowski's (2001) seven-level reflection rubric .....	64
Table 3.6 Modified version of Crotty and Allyn's (2001) reflection scale for novice teachers .....	65
Table 4.1 Participation measures of reflective discourse in the four treatment groups .....	72
Table 4.2 Length measures of reflective discourse in the four treatment groups .....	74
Table 4.3 Pronoun frequencies in the reflective discourse in the four treatment groups .....	75
Table 4.4 Formality measures of the reflective discourse in the four treatment groups .....	77
Table 4.5 Video case critique assignment: Reflection levels as percentages of the total number of coded segments in each treatment group .....	79
Table 4.6 Post lesson plan reflection: Reflection levels as percentages of the total number of coded segments in each treatment group .....	79
Table 4.7 Significance values of reflection levels as a result of different scaffold types for the video critique assignment .....	85
Table 4.8 Significance values of reflection levels as a result of different scaffold types for the post lesson plan reflection assignment .....	85
Table 4.9 PSTs ratings of their assigned online tools for reflection .....	88
Table 4.10 PSTs ratings of their assigned scaffolds for the video case assignment .....	90
Table 4.11 PSTs ratings of their assigned scaffolds for the post lesson plan reflection assignment .....	90
Table 5.1 Combined reflection scale based on Hawkes and Romiszowski's (2001) rubric and Crotty and Allyn's (2001) reflection scale for novice teachers .....	118

## List of Figures

Figure 1.1. Anatomy of a sample Oncourse discussion forum. ....	8
Figure 1.2. Anatomy of a sample Blogger.com blog. ....	9
Figure 3.1. Using a 2 by 2 factorial design to study the effects of tool type and scaffolding on reflection levels .....	42
Figure 3.3. Screenshot of a class blog showing links to PST blogs and small groups (names of participants hidden) .....	48
Figure 3.4. Summary of tool and scaffold assignment in different treatment groups.....	51
Figure 3.5. Matrix illustrating the criteria for selecting interviewees.....	58
Figure 4.1. Average number of words written by PSTs in each treatment group for the video case critique assignment.....	73
Figure 4.2. Average number of words written by PSTs in each treatment group for the post lesson plan reflection assignment.....	73
Figure 4.3. Pronoun frequencies (per 1000 words) in each treatment group for the video case critique assignment.....	76
Figure 4.4. Pronoun frequencies (per 1000 words) in each treatment group for the post lesson plan reflection assignment.....	76
Figure 4.5. Reflection levels for the video case critique assignment.....	80
Figure 4.6. Reflection levels for the post lesson plan reflection assignment.....	81

## CHAPTER 1: INTRODUCTION

A weblog or blog is a Web site that takes the form of an online journal that is comprised of short, informal, and chronological entries. The entries may include comments, opinions, reflections, and links to relevant websites, all of which are related to the blogger's life, work, or observation of phenomena. As Carlson (2003) aptly put it, blogs are "used by scores of memoirists, editorialists, exhibitionists, and navel gazers, who post their daily thoughts on Web sites for all to read" (p.A33). Blogs have been a feature of the Internet since the mid-1990s but have only recently become a cultural and educational phenomenon (Blood, 2002; Downes, 2004; Herring, Scheidt, Bonus, & Wright, 2004; Kadjer & Bull, 2003).

Blogs have been used to share news and views after 9/11 (Herring et al., 2004) and to solicit support and funding during the 2004 U.S. Presidential race (Downes, 2004; Jensen, 2003; Yahoo! News, 2004). Some journalists have become bloggers because blogs are editor-free and can be published independently and instantly (Donovan, 2003; Kadjer & Bull, 2003; Smolkin, 2004). A growing number of researchers nurture ideas online and share them with students, colleagues, or other likeminded bloggers (Glenn, 2003; Roberts, 2003).

As was the trend with other Internet tools, blogs have also made their way into K-12 and higher education classrooms. A small number of educators in K-12 and higher education use blogs for a variety of purposes such as announcement boards and course management systems, or activities such as out-of-class discussions, summary readings, critical reflections, project collaboration, student portfolios, and student mentoring (Downes, 2004; Lohnes, 2003; Oravec, 2003; Richardson, 2004; Roberts, 2003). Furthermore, Toner (2004) reported how blogs were used to help teachers share their ideas and vent frustrations while others have used blogs to

facilitate reflective journaling among preservice teachers (Hernández-Ramos, 2004; Stiler & Philleo, 2003; West, Wright, & Graham, 2005).

### Statement of the Problem

Reflection is a critical component of teaching practice. It is a strategy that aids teachers in identifying and solving problems (Dewey, 1910) and adapting to specific situations (Schön, 1987). For preservice teachers, reflection is an important learning strategy for promoting higher level thinking (Payne, 2004; Rosenshine & Meister, 1992) and for linking theory to practice (Brubacher, Case, & Reagan, 1994; Greene & Magliaro, 2004; Valli, 1992).

Teacher educators have been using various tools and strategies to promote reflection among preservice teachers (Hernández-Ramos, 2004; Roskos, Risko, & Vukelich, 2003; Stiler & Philleo, 2003). Such tools include traditional teaching journals, electronic portfolios, and discussion forums. Blogs have recently been included in that list of tools because numerous authors believe that blogging encourages reflective writing (Blood, 2002; Downes, 2004; Ge & McAdoo, 2004; Hernández-Ramos, 2004; Kadjer & Bull, 2003; Oravec, 2003; Roberts, 2003; Stiler & Philleo, 2003; West, Wright, & Graham, 2005; Williams & Jacobs, 2004). The *situational* use of blogs for reflective journaling has been largely attributed to their technical affordances, e.g. ease of use. However, the *strategic* use of blogs in teacher education may be a better measure of their value. One strategy for facilitating reflective writing is the use of scaffolds (Rosenshine & Meister, 1992; Scardamalia et al, 1984). However, there are numerous types of scaffolds (Brush & Saye, 2002; Hannafin, Land & Oliver, 1999) and some forms of scaffolds may promote reflection better than others (Gilbert & Dabbagh, 2005).

Roskos, Risko, and Vukelich (2005) reviewed 128 reflection studies from 1993 to 2003 that met their criteria of reflection, teacher education, and preservice education. Over this 10-

year period, only 11 of those studies met the majority of standards for scientifically-based research (107<sup>th</sup> Congress of the United States of America, sections 133 and 134 of the Educational Sciences Reform Act, 2002). The authors concluded that more rigorous research using an evidence-based approach was required to test principles used in interventions on the instruction of reflection.

The claim that blogging promotes reflection has not been empirically tested. While Stiler and Philleo (2003) and West, Wright, and Graham (2005) concluded that blogging promoted preservice teacher reflection, they did not provide definitive measures of reflection. Some researchers have tried to quantify reflection in discussion forums (Hawkes & Romiszowski, 2001) or compare reflection in forums with that in blogs (Hernández-Ramos, 2004). However, it is not known if and how blogs are better at promoting reflection than discussion forums. Furthermore, it is not known if other strategic factors such as scaffolds influence the level of reflections in blogs and discussion forums.

### Research Questions

The overall research question of this study was: Does scaffolded blogging promote reflection among preservice teachers? The aim of this study was to compare levels of reflection in blogs with those in discussion forums. Specifically, the research questions were:

- Q1. What were the quantitative and qualitative differences between preservice teachers' reflections in discussion forums and blogs?
- Q2. What were the quantitative and qualitative differences between preservice teachers' reflections when scaffolding was minimal and when it was enhanced?
- Q3. In terms of reflection, how did the tool and scaffolding variables moderate or interact with each other in the following situations:



- forum with scaffolds vs. blogs with no scaffolds?
- forum with no scaffolds vs. blogs with scaffolds?

Q4. What might have accounted for any observed differences in reflection levels between the treatment groups?

### Definitions

Some of the terms used in this study, while commonly used by educators, have varied meanings. To facilitate common understanding and accurate measurement, the following terms are operationalized: preservice teacher, reflection, scaffold, discussion forum, and blog.

#### *Preservice Teacher (PST)*

Throughout this study, the undergraduate student majoring in education was referred to as a “preservice teacher” or PST. Even though PSTs have a limited amount of authentic teaching experience, it is this researcher’s belief that these individuals begin to think and act as teachers. PSTs are distinguished from novice teachers in that the latter are typically first-year teachers already working in schools. The PST was typically 20 to 21 years-old and was a college junior or senior who had some K-12 classroom knowledge through observation and field experience.

#### *Reflection*

The definitions of reflection may be divided into two broad categories. By defining reflection as the “active, persistent and careful consideration of any belief or supposed form of knowledge in light of the grounds that support it and the further conclusions to which it tends” (p.6), Dewey (1910) effectively categorized reflection as a means of thinking and learning. In other words, reflection was about critical and continuous self-evaluation and monitoring. In the second category reflection is an action. Schön (1987) argued that teachers should be able to adapt to unanticipated circumstances by improvising and experimenting during teaching, and labeled

this reflection-in-action. Both of these categories of reflection tend to be reactive in nature because reflection occurs after the experience or teaching event (Killion & Todnem, 1991). However, reflection can also be proactive. Greene and Magliaro (2004) emphasized that it was important for PSTs to reflect not only on what they learned, but also on how they might use this knowledge in the future. In other words, by reflecting, PSTs should connect new knowledge and skills with their subsequent application.

In an attempt to operationalize this complex concept, this study combined the principles behind the instruments that Hawkes and Romiszowski (2001) and Crotty and Allyn (2001) used to measure reflection. Hawkes and Romiszowski considered teacher reflection to be a collaborative venture and based on actual teaching practice. Their measures were reactive and took into account context, values, and the morals of the teacher. In measuring reflection, Crotty and Allyn based their scale on Bloom's Taxonomy (1956) and considered reflection to be an individually-centered and cognitive activity. This measure recognized that reflection was proactive, in that the teacher could rely on prior knowledge and experiences while engaging in activities like lesson planning.

This study defined and measured reflection as both cognition and action, i.e., involving critical and continuous self-evaluation and adaptation. As reflection may be a strategy for PSTs to realize where they have been, where they are at present, and where they will be in future (Brubacher, Case, & Reagan, 1994; Valli, 1992), reflection was considered both reactive and proactive in nature. However, while Herrington and Oliver (2002) point out that reflection may be practiced individually or facilitated collaboratively, this study focused more on individual PST reflection but recognized that such reflection may be influenced by an individual's peers and instructor.

### *Scaffold*

Of the four types of scaffolds defined by Hannafin, Land, and Oliver (1999), two were used in this study. They were strategic and metacognitive scaffolds (Table 1.1). These two scaffolds may be considered both soft and hard (Brush & Saye, 2002) by nature. According to Brush and Saye, soft scaffolds are “dynamic, situation-specific aids provided by a teacher or peer to help with the learning process” (online journal). Hard scaffolds, on the other hand, are “static supports that can be anticipated and planned in advance based upon typical student difficulties with a task” (online journal). These include printouts of guiding questions or support structures that are embedded within the learning medium.

In this study, strategic and metacognitive scaffolds were provided as hard scaffolds (see Appendices A to D). These scaffolds were divided into two treatments: minimal and enhanced. The minimal scaffolds (Appendices A and C) were designed to provide enough guidance to help PSTs provide answers to questions on technology integration. Enhanced scaffolds (Appendices B and D) included additional questions that were designed to promote deeper exploration of issues. However, both scaffolds were designed to be open enough so that PSTs could write about issues that they considered relevant or important.

Soft scaffolds might take the form of proactive instructor encouragement and prompting that was situation dependent. PSTs might also have provided soft scaffolds for one another as they interacted. The exact nature of the soft scaffold was difficult to predict or limit. Soft scaffolds were intrinsically linked to socially-mediated reflection and were spontaneous and situation dependent. The researcher recognized the difficulty of completely defining, controlling, or restricting the soft scaffolds that originated from the instructor and PSTs. However, measures

to account for this factor are described in the Procedures section. The example of soft scaffolds that emerged is presented in the Results section.

Table 1.1

*Types of scaffolding used in this study based on Hannafin, Land, and Oliver (1999)*

Scaffold	Description	Examples
Strategic	Guides in analyzing and approaching learning tasks or problem.	Expert advice, start-up questions.
Metacognitive	Guides how to think during learning.	Suggest cognitive strategies, propose self-regulation and monitoring.

### *Discussion Forum*

The discussion forum, as used in this study, refers to a Web-based, threaded, asynchronous discussion tool as it is used in some higher education institutions (Hernández-Ramos, 2004). It does not refer to public or bulletin board type forums, e.g., those offered by online newspapers or Yahoo!. The discussion forum in this study was part of a larger course management system, Oncourse. For convenience, the discussion forum in this study was referred to as Oncourse (Figure 1.1) as it was the most commonly used tool in the system. As Oncourse was hosted on university servers, its use was restricted to individuals who had been authorized to take a course offered by the university.

The instructor owned the course (EC301) in Oncourse and PSTs had to be authorized to participate in the forum. The instructor started a discussion by asking one or more questions. PSTs replied to the initial posting and thread of discussion started. All course participants were able to read and reply to one another's postings and were also allowed to start new threads in Oncourse. Postings and threads were presented to the reader in chronological order, i.e. oldest

posting first. To distinguish reflections in the discussion forum from the ones in blogs, reflections in Oncourse were referred to as postings.

### *Blog*

There are currently at least four types of blogs (Tan, 2005): text blogs, photo blogs, audio blogs, and video blogs. The most common type of blog is text-based and was the type that was used in this study. As such, the blog may be thought of as an online journal. Blogs are Web-based and may be hosted by the educational institution or may be provided by an external host. The externally hosted blog service, Blogger.com, was used in this study (Figure 1.2).

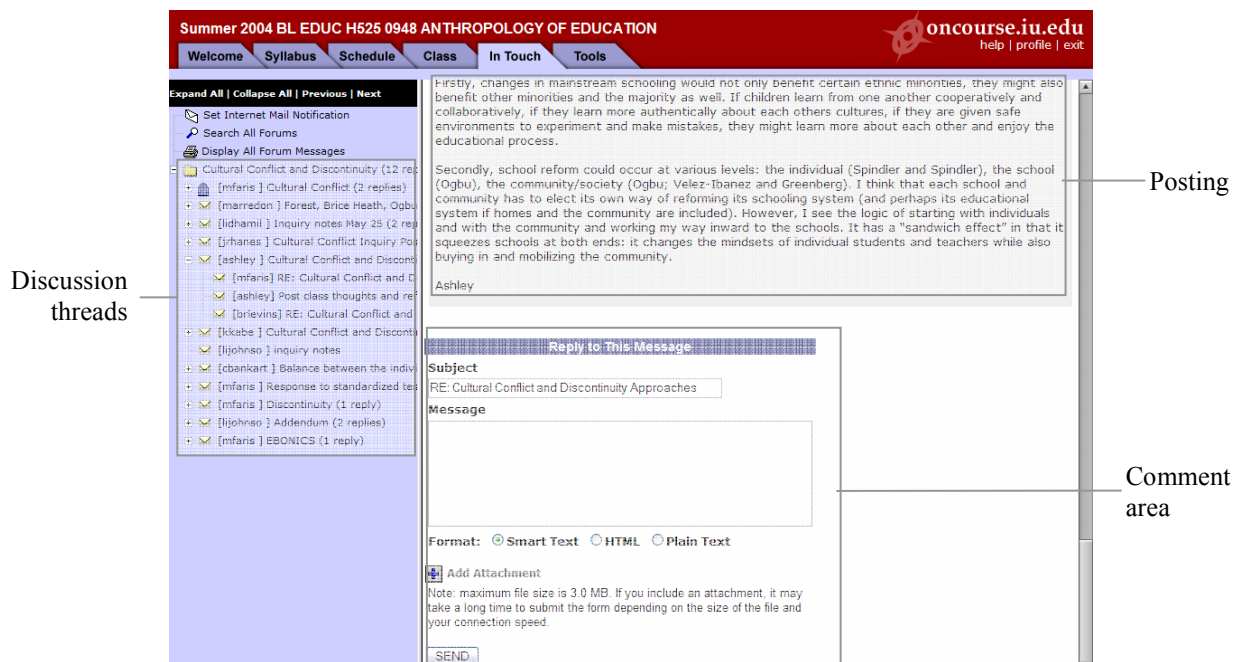


Figure 1.1. Anatomy of a sample Oncourse discussion forum.

PSTs were assigned their own blogs. They were able to partially customize the URL of their blog, select a design template, and make other customizations to their blogs. Thus ownership of the blogs lay with the user. While PSTs could blog anything they wished, they

were asked to maintain their blogs for the purpose of the course, i.e., to reflect on class-related activities. PSTs initiated entries that were unthreaded and appeared in reverse chronological order, i.e. newest entry first. The instructor or other PSTs could reply to an entry by clicking on a “reply” or “comment” link. Blogger.com automatically created archive links to older entries and linked the last 10 entries in a side bar. The archiving interval and the number of previous entries were user-customizable. The user was also able to create links to other blogs or Web sites. To distinguish reflections in the blog tool from those in Oncourse, reflections in Blogger.com were referred to as entries.



Figure 1.2. Anatomy of a sample Blogger.com blog.

### Overview of the Study

The purpose of this study was to determine if the type of reflection tool, the extent of scaffolding, or both, had an impact on the quality of preservice teacher reflection. This study was

designed as a 2 by 2 factorial quasi-experimental study with mixed methods to examine the effects of tool type (discussion forum vs. blog) and scaffolds (minimal vs. enhanced) on the reflection levels of preservice teachers. Data originated from the electronic discourse of participants and from questionnaires, interviews, and classroom observations. In order to determine reflection levels, electronic discourse was coded and measured with two scales: a cognitive scale designed by Crotty and Allyn (2001) and an alternative scale designed by Hawkes and Romiszowski (2001). The impact of the treatment variables was determined statistically by analysis of variance and the differences in reflection levels were determined statistically by independent t-tests. Surveys, interviews, and observations of participants were included to uncover possible reasons for the differences or lack thereof in reflection levels.

#### Implications of the Study

As the literature review in the next chapter will illustrate, the use of discussion forums, and more recently, blogs have caught the attention of technophiles and early adopters in teacher education. In some cases, these tools have completely replaced traditional journals for promoting teacher reflection. However, such studies were descriptive in nature and not critical of the effectiveness of such tools. Such studies generally did not define reflection, quantitatively measure reflection, empirically test the effectiveness of such tools, or consider the effect of strategic factors like scaffolding on reflection.

This study defined reflection clearly based on an extensive review of literature and relied on two quantitative measures of reflection. Two measurement scales instead of one were used to take into account the complex nature of reflection. By combining these two measures, this study offered an improved method of measuring preservice teacher reflection. This quasi-experimental study utilized multiple methods and relied on multiple sources of data which facilitated an in-

depth collection, measurement, and analysis of reflection levels. In doing so, it provided a model for an empirical and critical examination of factors that might influence reflection. Finally, as this study included two different forms of scaffolding as a treatment variable, the effect of scaffolding on reflection was compared with that of the tool. Such a comparison was particularly important because a pedagogically significant strategy was considered alongside the use of the online tool for promoting reflection. This has implications on the way reflection may be studied in future research and on the way reflection is promoted by teacher educators.

#### Limitations of the Study

Notable limitations of this study included the following: soft scaffolding is difficult to standardize and control for, it was not ethical to implement a “no scaffold” group, and the survey instruments have not been used in any previously known studies.

The soft scaffolding provided by the instructor or PSTs was difficult to predict, standardize, or control. Its use depended on the learning needs of different situations and on the preferences or experience of the individual. The anticipated type and amount of assistance was discussed with the instructor in advance of the course. Forms of soft scaffolding that emerged from the instructor or other preservice teachers were recorded as qualitative data during the observations and interviews and used to moderate results as necessary.

The hard scaffolds that were designed for this study were based on those used in the previous iteration of the course. As their use was already part of the course, it was not possible or ethical to compare the effects of “no scaffold” groups and scaffolded groups. Instead, the scaffolds were augmented to take two forms: minimal support and enhanced support. This was the first time these scaffolds were used in this manner in the course. Therefore, they were not



previously tested. However, they were discussed and refined with the course instructor and course coordinator prior to actual use.

The survey instruments were not based on instruments used in other studies. Studies focusing on the online reflections of preservice teachers were scarce and such studies either did not conduct surveys or include samples of surveys in the publication. As a result, there were no measures of validity or reliability for the surveys generated for this study. It should be noted that the purpose of the surveys in this study was not to measure reflection levels. They were designed to profile participants and to probe them for reasons behind the possible differences in reflection levels.

## CHAPTER 2: REVIEW OF LITERATURE

### Introduction

There is an ongoing debate about whether the nature of teaching is a *science*, comprising a collection of technical skills, or an *art*, where the teacher is viewed more like a painter or a writer (Brubacher, Case & Reagan, 1994). In the latter case, teaching is a combination of in-borne talent, practice, and learning from experts. This researcher agrees with authors like Brubacher, Case, and Reagan (1994) and Sparks-Langer and Colton (1991) that teaching, like most other professions, is both a science and an art. A teacher needs to learn basic skills such as lesson planning and classroom management, practice them daily in the classroom, and hone them into a fine art.

A teacher is also a decision maker. A teacher has to consider a wide array of objectives, strategies, and circumstances in a critical and analytical way (Brubacher et al., 1994). To make these decisions, teachers may rely on their training, the experiences and advice of their peers, and their own experiences. In other words, teachers need to consider where they have been, where they are at present, and where they would like to be in the future. Therefore, to be good decision makers, teachers need to be reflective practitioners.

This review of literature will begin with the concept of reflection and outline pertinent research in that area. The review will illustrate that reflection is a complex skill that needs to be guided if it is to be promoted. The review then will continue with the general concept of scaffolds and how they might be designed to support high-level thinking skills like reflection. At the end of the review, two web-based tools, threaded discussion forums and blogs, will be described and discussed with respect to how they reportedly support reflection.

## Teacher Reflection

The need to nurture reflective practitioners is a current and pervasive theme in preservice teacher education (Crotty & Allyn, 2001; Rodgers, 2002), and numerous authors cite the ability to reflect as an important attribute of highly effective teachers (Henderson, 1996; LaBoskey, 1994; Lyons, 1998; Ross, Johnson, & Smith, 1992; Rodgers, 2002; Zeichner & Liston, 1996). However, there is no standard definition of reflection. According to Sparks-Langer and Colton (1991), it is easier to define what the opposite of reflection is, namely, “the mindless following of unexamined practices or principles” (p. 37). The following review of literature will show that reflection is more than just the mindful examination of practices or principles, highlight the importance of reflection, and outline the difficulties of promoting reflection in teaching practice.

### *Definitions, Nature, and Elements of Reflection*

Hatton and Smith (1995) defined reflection simply as the “deliberate thinking about action with a view to its improvement” (p. 52). Decades earlier, Dewey (1910) defined reflection as the “active, persistent and careful consideration of any belief or supposed form of knowledge in light of the grounds that support it and the further conclusions to which it tends” (p. 6). Over the passage of time, critical and continuous self-monitoring and self-evaluation have been central to the concept of reflection. Other authors believe that reflection is a strategy for developing higher level thinking skills such as self-assessment and critical thinking (Payne, 2004; Rosenshine & Meister, 1992). If cognition refers to domain-specific knowledge and strategies for information and problem manipulation, and metacognition includes knowledge of cognition and regulation of cognition (Driscoll, 2000; Duell, 1986), then reflection is both a cognitive and metacognitive process.

However, reflection is not limited to the cognitive domain. In a seminal book on teacher reflection, Schön (1987) pushed the concept further when he wrote that reflection helped teachers to adapt to specific situations. Unlike the conventional “stop-and-think” reflection (Arendt, 1971), Schön introduced the concept of *reflection-in-action*, in which teachers improvised and experimented on the spot when they encountered situations where routinized procedures did not work. He likened reflection-in-action to a group of jazz musicians who improvised as they listened to one another while they performed on stage. Like each jazz musician, each teacher already had a set of skills which through practice had become routine. However, each teacher had the capacity to improvise when faced with a surprise. Schön did not discount stop-and-think reflection and instead referred to it as *reflection on reflection-in-action*. He reasoned that both forms of reflection would add to a teacher’s arsenal of teaching skills and experience.

Killion and Todnem (1991) would have labeled Schön’s reflection-in-action as reflection-*in-practice*. They distinguished this from reflection-*on-practice* which would have taken place shortly after a teaching event. Both reflection-in-practice and reflection-on-practice are *reactive* in nature because they occur while or after the teacher is practicing. Killion and Todnem also coined reflection-for-practice, which was an intended outcome of their other two forms of reflection. The purpose of this reflection was “not so much to revisit the past or to become aware of the metacognitive process one is experiencing (both noble reasons in themselves), but to guide future action (the more practical purpose)” (p. 15, parentheses in original). Reflection-for-practice is thus *proactive* in nature.

Hawkes and Romiszowski (2001) took Schön’s definition further by defining it as a “social-professional activity in which teachers adapt knowledge to specific situations” (p. 289).

This definition highlights another difference in the nature of reflection: Is it a singular or social activity? A few authors described reflection as an individual activity. In particular, Widdowson, (1983) described it as an “internal monologue”, while Scardamalia, Bereiter, and Steinbach (1984), in the context of providing reflection aids for composition writing, referred to it as an “assisted monologue.” In a study conducted by Stiler and Philleo (2003), preservice teachers were required to maintain personal blogs to reflect on course readings, activities, discussions, and presentations. In this case, reflection was a tacit and individual activity.

However, other researchers view reflection as a collaborative process (Greene & Magliaro, 2004; Hawkes & Romiszowski, 2001; Hernández-Ramos, 2004; Kemmis, 1985; Knights, 1985; von Wright, 1992; West, Wright, & Graham, 2005). For example, Greene and Magliaro (2004) designed an online educational psychology course for preservice teachers that included in-service teachers and university faculty as mentors. The preservice teachers reported that the opportunities to reflect on video case studies in the presence of more experienced mentors helped them to understand and synthesize information they were learning. The in-service teachers and professors stated that the interaction allowed them to reflect on their own practice as they shared it with others.

Depending on the learning objectives and tasks, reflection may be both an individually and socially-mediated process (Collins, 1991; Herrington & Oliver, 2002; Lee, 2005; Lin, Hmelo, Kinzer, & Secules, 1999). Collins (1991) pointed out that by interacting with others and viewing their perspectives, learners may enrich individual reflection because it leads to new ways of thinking and learning. Lin et al. (1999) described reflection as “a social act when an individual seeks feedback from a community and modifies his or her practices based on group feedback” (p. 53). These authors argued that social interaction allowed learners to compare their thought and

problem-solving processes with those of experts or their peers, and in so doing, improved the process of individual reflection.

In sum, reflection may be said to consist of thoughts and actions that help teachers see where they were, where they are at present, and where they might be in future (Brubacher, Case, & Reagan, 1994; Valli, 1992). Furthermore, teachers may reflect individually or collaboratively.

### *The Importance of Reflection*

Reflection is important for any individual learning experience. Reflection helps learners deal with information explosion by making them take a step back and consider what is important, and in the process force them to make decisions and strategize (Lin et al., 1999). It is a higher order thinking skill that requires learners to monitor and evaluate their learning. As a process, reflection activates prior knowledge and helps the learner focus on important information, thereby ensuring that their learning is more meaningful (Ge, 2001; Lee, 2005; van Zee & Minstrell, 1997). In a group learning context, reflection is a means of resolving socio-cognitive conflicts within the group (Lee, 2005) or for learners to compare themselves with experts and their peers in varying stages of development (Collins, 1991; Herrington & Oliver, 2002; Lee, 2005; Lin et al., 1999).

Why is reflective teaching practice important? The National Commission on Teaching and America's Future (1996) declared that in order for teaching to be exemplary:

Teachers must be able to think systematically about their practice and learn from experience. They must be able to critically examine their practice, seek the advice of others, and draw on educational research to deepen their knowledge, sharpen their judgment, and adapt their teaching to new findings and ideas.

In addition, reflection is a standard set by the International Society for Technology in Education (ISTE). ISTE sets standards for preservice teachers during teacher education and for in-service teachers during practice and professional development. Standard V part b of the National Educational Technology Standards (NETS) and performance indicators for teachers states that teachers “continually evaluate and reflect on professional practice to make informed decisions regarding the use of technology in support of student learning” (ISTE, 2002). More importantly, reflection is a means of identifying and solving problems (Dewey, 1910) and helping teachers to adapt to specific situations (Schön, 1987). Furthermore, by reflecting collaboratively and critically, teachers may elicit local or systemic change in K-12 environments (McClaren, 1989; Sparks-Langer & Colton, 1991).

Reflection is particularly important for preservice teachers. In a study of the cognition of college students, Bruning (1994) discovered that most undergraduates were unaware of their thinking and learning process and that they did not direct their learning productively. Reflection by preservice teachers not only helps them create mental models of what it means to be a teacher (Payne, 2004), it can also help them link theory and practice (Brubacher, Case, & Reagan, 1994; Greene & Magliaro, 2004; Levin & Camp, 2002; Valli, 1992). Baird, Fensham, Gunstone, and White (1991) believed that reflection helped in the development of the affective and social components of teaching. In their study, preservice science teachers reflected on their beliefs regarding the nature of effective teaching and learning, and reported that reflection increased their perceptions about interpersonal relations.

The importance of reflection is summed up by Levin and Camp (2002), who stated that “without the disposition to reflect on their performance, teachers are less likely to improve their practice or to be able to see the links between theory and practice” (p. 572).

### *The Difficulties of Promoting Reflection in Actual Practice*

Despite the benefits of reflection and the value placed on reflective teaching, there are several obstacles to promoting reflection or encouraging higher levels of reflection in practice. Such factors include individual dispositions, invalid assessments of reflection, the inexperience of preservice teachers, and the complex, covert, and unstructured nature of reflection.

*Individual dispositions.* Just as different teachers have different teaching and learning styles, they have different dispositions towards reflection. According to LaBoskey (1994), only 20% of teachers are naturally reflective. In addition, most teachers simply do not appreciate the practice of reflecting (Crotty & Allyn, 2001). Furthermore, reflection requires much time and effort, and teachers, whether preservice or in-service, often view reflection as an added and unnecessary burden to their course or work loads (Baird et al., 1991; DiMauro & Gal, 1994; Hawkes & Romiszowski, 2001; Hernández-Ramos, 2004).

*Invalid assessments.* Many teacher education programs require preservice teachers to reflect as part of their coursework (Sparks-Langer & Colton, 1991). In some cases, however, the assessment of their reflections is a barrier to meaningful reflection. As Crotty and Allyn (2001) described, assignments such as journal writing were not effective when preservice teachers wrote what they thought their professors or instructors wanted to hear instead of reflecting on their work or practice. Crotty and Allyn pointed out that the goals and grading scheme or rubrics of the reflective exercise had to be explained clearly to preservice teachers in order to be more effective.

*Reflection is highly complex.* The complex nature of reflection makes it a daunting task. Sparks-Langer and Colton (1991) described reflection as comprising three elements: cognition, critical thinking, and narrative inquiry. According to the authors, *cognition* relates to a teacher's



pedagogical knowledge in the classroom and is rational and value-free. In contrast, *critical thinking* depends on the experiences, beliefs, sociopolitical values, and goals of teachers. These components help a teacher make judgments of worth and contrast with the straightforward cognitive reflection which is a means-to-an-end type of thinking. *Narrative inquiries* are highly contextual and personal reflections of a teacher. They are essentially stories told by teachers and are about teachers and teaching. The quality of narrative inquiries depends largely on the knowledge, skills, and experience of the teacher.

Reflection is both cognitive and metacognitive in nature (Driscoll, 2000; Duell, 1986). In order to think about process of thinking (metacognition), learners need to already have specific content or a problem in mind (cognition). Thus, the two constructs are intertwined (Ge, 2001). Difficulties with reflection then might lie in the area of cognition (e.g., a lack of knowledge in a particular subject matter or pedagogical theory) or in metacognition (e.g., the inability to self-evaluate). Both these problem areas might in turn be due to a lack of experience on the part of preservice teachers.

*Lack of readiness or experience.* Preservice teachers might not be ready to reflect or be able to reflect at higher levels. Several authors attribute the superficial nature of novice reflections to less developed schema in novices (Borko & Livingston, 1989; Carter, Cushing, Sabers, Stein, & Berliner, 1988; Leinhardt & Greeno, 1986). The ability to reflect and the resulting quality of reflections depend on the experience, knowledge, and skills of the teacher (Crotty & Allyn, 2001). For example, Hollingsworth (1990) conducted a longitudinal study of the changes and knowledge of teachers in a five-year teacher education program. Preservice teachers reflected on technical aspects of teaching in their first year and were able to focus on the needs of the learner only in their second or third year.

Crotty and Allyn (2001) treated reflection as a cognitive activity and coded the reflections of novice, intermediate, and expert teachers using Bloom's Taxonomy (Bloom, 1956) as a framework, i.e., reflections could be coded at the levels of knowledge recall, comprehension, application, analysis, synthesis, and evaluation. They discovered that the quality of reflection was a function of teaching experience and devised a model of reflective development (Table 2.1). While novice teachers were able to reflect at all cognitive levels, the quality of their reflections was still lower than their more experienced counterparts. For example, while all types of teachers were able to analyze (level 4, Table 2.1) from a teacher's perspective, only more experienced teachers were able to appreciate multiple perspectives.

*Reflection is tacit.* In Crotty and Allyn's (2001) model of reflective development, expert teachers not only reflected cognitively at all levels of Bloom's Taxonomy, they also wrote richer reflections based on their experience. However, even if expert teachers reflected at high levels, their thought processes were hidden from the view of other teachers (Schön, 1987), be they novices, intermediates, or other experts. Unless they were asked to "think aloud," expert teachers did not provide a model of their reflection. In the absence of such modeling, less experienced teachers were left without a potentially useful support structure.

*Reflection exercises are unstructured.* The unstructured nature of most reflections can also be a barrier to promoting meaningful reflection. For example, Reilly (2005) described a course where 65 preservice teachers voluntarily maintained individual weblogs for an academic year to obtain credit for integrating technology into the curriculum. The participants were required to write at least 20 entries during that time. They were not limited to any particular style of writing or given guidelines on how to write, except to write about their experiences as a student or student teacher. As Reilly pointed out, reflection was "not an explicit goal of the

Table 2.1

*Crotty and Allyn's (2001) developmental model of teacher reflection*

Cognitive Level	Novice Teacher	Intermediate Teacher	Expert Teacher
Knowledge (1)	Briefly describes the relevance of the evidence or artifact.	Supports and clarifies new understanding with evidence.	Supports insight, creativity and understanding with evidence and artifacts.
Comprehension (2)	Demonstrates an understanding of student development and relevant instructional plans.	Examines and recommends varied instructional strategies as a result of assessing student needs.	Demonstrates an in-depth understanding of pedagogical theory, subject matter and student development and uses correct terminology throughout.
Application (3)	Connects college coursework concepts with practical classroom applications.	Demonstrates an awareness of teaching and learning theory through classroom application examples.	Assists or mentors other teachers.
Analysis (4)	Shows evidence of taking a teacher's perspective.	Shows ability to take multiple perspectives (teachers', parents' students' and principals').	Includes multiple perspectives (personal, professional, political and philosophical) of individuals and society.
Synthesis (5)	Establishes short terms goals based on perceived strengths and weaknesses.	Establishes professional goals for teaching and learning.	Establishes long-term goals and commitment to profession.
Evaluation (6)	Includes an awareness of their own professional development as a teacher.	Includes references to feedback from other professionals (colleagues) about their own teaching.	Includes instances of giving and getting feedback from colleagues.

Note: The original model was shown in three separate tables and arranged in a list. It is presented here as a single table to facilitate comparison between development phases.

assignment” (p. 2069). In the absence of guidelines, the preservice teachers tended to write about keeping a journal, their experiences as students, and simple descriptions of teaching practice. Their entries were not meaningful because they lacked focus and did not link theory to practice. As Reilly pointed out in the title of his paper, they were documenting the mundane and reflecting on the bothersome.

In the absence of requirements or guidelines, more experienced teachers reflect at low levels as well. Hawkes and Romiszowski (2001) compared the offline and online collaborative reflection levels of 28 in-service teachers who attended a professional development course on problem-based learning. Offline reflections took the form of audio taped face-to-face meetings between teams of teachers while online reflections were collected from various computer-mediated communication (CMC) tools. There was “no moderator, no mandatory use required” and tool use was “unstructured and left to the design of the teacher teams” (p. 295). Hawkes and Romiszowski coded the reflections using a rubric similar to the one shown in Table 3.2. The researchers found that the majority of messages (70% of face-to-face and 63% of CMC) were rated at very low levels of reflection. A lack of structure and guidance may have contributed to low levels of reflection in these studies.

### Scaffolds

Crotty and Allyn (2001) proposed that systematic methods for providing feedback to novice teachers could aid in the development of reflection as a professional development skill. Scaffolds might be a class of systematic methods or strategies to promote reflection. What are scaffolds and how might they help teachers reflect?

A basic tenet of scaffolds is Vygotsky’s (1978) concept of the zone of proximal development (ZPD). Put simply, the ZPD is the difference between what a learner can currently

do or currently knows and what that learner can potentially do or know with assistance. When the learner achieves the higher development level with assistance, that new state becomes the starting level for another ZPD. Scaffolding is one form of assistance that allows the learner to progress from one zone to another.

### *Taxonomy of Scaffolds*

Various authors have devised classification systems for different types of scaffolds. One way of classifying scaffolds is by their delivery control mechanisms. In the area of computer-based learning, Guzdial (1994) distinguished between two broad types of scaffolds: adaptable scaffolding and adaptive scaffolding. In adaptable scaffolding, the learner changed or removed the scaffolds. In adaptive scaffolding, the decision to do the same was part of an internal decision making process of the computing system.

Another way of classifying scaffolds is by their functions. Jackson, Krajcik, and Soloway (n.d.) created three types of scaffolds that they incorporated in a program for teaching software design: supportive, reflective, and intrinsic. Supportive scaffolds supported learner tasks by guiding, coaching, and modeling various processes. Reflective scaffolds helped the learner in planning, predicting, and evaluating their work. Both of these types of scaffolds did not modify the task but could be faded so that the learner internalized the support. Intrinsic scaffolds, on the other hand, changed the task, for example by reducing its difficulty, in order to focus the learner's attention.

Hannafin, Land, and Oliver (1999) defined scaffolds for use in Open Learning Environments (OLEs). OLEs are learner-centered in that the learner defines learning needs, goals, and activities (Hannafin, Hall, Land, & Hill, 1994). One such OLE is the World Wide Web (WWW). Hannafin et al. (1999) organized scaffolds into four categories: procedural, conceptual,

strategic, and metacognitive. Each type of scaffold served a different function (see Table 2.2 for examples).

Table 2.2

*Categories of scaffolds based on the classification scheme by Hannafin, Land, and Oliver (1999)*

Scaffold	Description	Examples
Procedural	Guides how to utilize tool features.	“Help” function in various tools.
Conceptual	Guides the learner on what to consider.	Structure maps, content trees, suggestions for suitable tools to use.
Strategic	Guides in analyzing and approaching learning tasks or problem.	Expert advice, start-up questions, suggestions for alternative methods.
Metacognitive	Guides how to think during learning; finding and framing problems.	Suggest cognitive strategies, propose self-regulation and monitoring.

Scaffolds can also be distinguished by their nature. Brush and Saye (2002) defined two broad forms of scaffolds: hard and soft. Hard scaffolds are static and can be planned in advance by anticipating potential difficulties learners might have. For example, an instructor might provide learners with guiding questions on a printed handout or an instructional designer might embed strategically placed prompts in a computer software interface. Soft scaffolds, on the other hand, are dynamic and are more difficult to anticipate. Such scaffolding tends to originate from instructors or peers who provide guidance based on a continuous diagnosis of the learner’s needs. For example, an instructor might ask probing questions to help a learner think more deeply about a problem.

### *Influence of Scaffolds on Learning*

Whatever the classification system, scaffolds can help learners deal with a wide range of learning tasks by providing support that is gradually removed so that the learner internalizes the learning process. Some advantages of using scaffolds are that they help:

- Set goals and focus attention (Hogan & Pressley, 1997; Keller & Burkman, 1993; Wood, Bruner & Ross, 1976). As learners' minds may stray off task, human intervention or other scaffolds may keep them on track so that they meet learning objectives.
- Reduce degrees of freedom (Wood et al., 1976). Given a complex problem or issue, a learner may not know where or how to begin. Scaffolds may simplify learning tasks by providing boundaries, reducing the number of possible options, or restructuring the learning task so that the learner can manage it.
- Accentuate critical tasks (Wood et al., 1976). Scaffolds may also help learners evaluate what they are doing so that they focus on critical or relevant tasks. This in turn ensures that learners do not stray or lose interest.
- Reduce frustration and increase motivation (Hogan & Pressley, 1997; Wood et al, 1976). By focusing only on critical tasks and performing them more efficiently, effectively, or both, learners are less likely to feel frustrated.
- Make the learner's thinking explicit (Lin et al., 1999). A product of learning is often explicit, e.g., written work, but the process is often tacit. Scaffolding can expose the learner's own methods, strengths, and flaws of thinking. This in turn leads to greater self-awareness.
- Make the expert's thinking process explicit (Ge, 2001; Rosenshine & Meister, 1992; Scardamalia et al, 1984; Wood et al, 1976). Scaffolds can make an expert's tacit thoughts explicit, and in so doing, help novices or learners to retrieve knowledge and enhance

understanding and metacognition. Learners may then internalize methods to perform a task more efficiently or effectively.

- Assist internalization (Applebee & Langer, 1983; Hogan & Pressley, 1997; Meyer, 1993).

With expert strategies made explicit by scaffolding, learners are able to mimic their mentors while restructuring and adding to their schema. Eventually the learner-modified versions of the scaffolds may be internalized and retrieved for later use.

### *Scaffolding General Education*

Most of the scaffolds described in the literature were used in traditional learning environments (e.g., Wood et al., 1976). While previous research on scaffolds has focused largely on improving learners' comprehension, some research has been conducted on supporting learners' higher order thinking skills, such as problem-solving, by scaffolding cognitive and metacognitive thinking (e.g., Brush & Saye, 2002; King, 1991; Schoenfeld, 1985).

Most examples of scaffolding in the literature have concentrated on supporting writing and reading. For example, Scardamalia et al. (1984) described how hard scaffolds in the form of cue cards and soft scaffolds by teacher think-aloud modeling were used to teach writing. Soft scaffolds in the form of modeling and dialogue have been used to aid reading comprehension (Palincsar, 1986; Palincsar & Brown, 1984; Palincsar, Brown, & Martin, 1987). Scaffolds have also been described to a smaller extent in the teaching of science. For example, Davis (1996) used procedural scaffolds in the form of context-specific activity prompts and checklists as well as metacognitive self-monitoring prompts.

The reports on the effects of providing scaffolds have been positive. For example, Osman and Hannafin (1994) provided a hard scaffold in the form of embedded orienting questions to students of introductory genetics. The control group did not receive this scaffold. The scaffold



treatment group significantly outperformed the control group in post-treatment tests for factual recall and problem-solving ability. Likewise, Lee (2005) designed reflective scaffolds that provided cues for the “subject domain and activity process.” The scaffolds were hard (embedded cues in learning tools) and soft (interpersonal interaction) in nature. One group of learners received both hard and soft scaffolds, one group received only hard scaffolds, and the control group did not receive any scaffolds. The treatment groups scored higher than the control group in a posttest and the first treatment group’s results were significantly higher than the other two groups.

### *Scaffolding Teacher Reflection*

Research on efforts to scaffold preservice teacher reflection has been limited. In their handbook on teaching, Roe and Ross (1998) suggested a paper-based (hard) scaffold to facilitate reflection-on-action (Schön, 1987) by novice teachers, but there is no data on the effectiveness of that scaffold. Herrington and Oliver (2002) designed an online certification program for teachers where reflection was a central requirement. Teachers were required to design an online course that was suited to their own work situations while taking on the role of teacher, instructional designer, researcher, or professional developer. The researchers provided job-aids for each role as well as resources necessary for the teachers to complete their tasks. However, Herrington and Oliver only described their tools and scaffold, and did not provide any results on the effectiveness of the scaffolds.

Where data on scaffolding teacher reflection was available, it tended to be qualitative in nature (e.g., Baird et al., 1991; Levin & Camp, 2002; Spalding & Wilson, 2002). Furthermore, definitive measures of reflection were not mentioned in such studies. For example, Baird et al. (1991) provided scaffolds in the form of evaluation sheets and classroom discussions to cohorts

of preservice teachers over a three-year period. The participants reflected individually and in groups. Two findings emerged from this naturalistic study: reflection was important for the intellectual development of preservice teachers, and collaboration was critical in fostering reflection. While the data in these case studies was rich, it originated from only four preservice teachers. Even though the generalizability of qualitative studies was in principle left to the reader, the broader question of how the findings in this study apply to other contexts remained.

### *Strategic Use of Scaffolds*

While scaffolds have the potential to support learning, they are by no means cure-alls or permanent crutches. Broadly speaking, scaffolds should only be used when the learner is ready and when the scaffolds bridge the ZPD gap (Rosenshine & Meister, 1992; Vygotsky, 1978).

Various researchers have used different strategies to promote reflection among learners. November (1996) used reflective journal writing with commerce students and provided scaffolds that varied depending on the stage of journal writing. In the early stages, he provided a list of general questions to be answered in the journal, such as “Who are you? Your background? Your interests? What are your personal objectives in this course?” (p. 122). As the students progressed in the course, he asked them to think of an agenda for their learning or to reflect on their learning difficulties. McCrindle and Christensen (1995), on the other hand, provided more detailed questions to guide journal writing, such as: “Write *what* you have learned in today’s session ... then write *how* you learned that... also assess the way that you learnt it” (p.174, italics in original).

Lin et al. (1999) categorized four types of scaffolds: process displays (of problem-solving and thinking processes), process prompts (of learner attention to specific processes while learning was in action), process models (of expert thinking), and social discourse. They

suggested that the type of scaffolds used should match with the goals of the course. If, for example, the goal was to help learners understand how an expert would think through and solve a problem, the scaffold should model processes of an expert. It should not display the learners' thinking processes. Alternatively, if the goal was to provide learners with multiple perspectives on subject matter or a particular process, then the scaffold should take the form of reflective social discourse instead of specific process prompts.

In summary, scaffolds may be strategically employed to guide the complex task of reflection. They may be hard or soft in nature but should take the form of strategic and metacognitive scaffolds so that a novice reflects systematically and learns how an expert might think.

#### Tools for Scaffolding Reflection

Common tools used to promote preservice teacher reflection have included traditional journals (Sparks-Langer & Colton, 1991; Valli, 1992; Zeichner & Liston, 1996) and electronic portfolios (Crotty & Allyn, 2001; Levin & Camp, 2002; Sparks-Langer & Colton, 1991). To date there are few studies that focus on scaffolded reflection using CMC tools, specifically electronic discussion forums and weblogs (Lee, 2005; Lin et al., 1999; West et al., 2005). This part of the review will begin with a summary of the perceived benefits of reflective journaling using various tools, and continue with an examination of research on preservice teacher reflection using discussion forums and blogs.

#### *Benefits of Using Traditional Journals*

Various authors have written about the benefits of maintaining paper-based journals. By keeping a journal, learners conduct internal monologues that not only help them develop self-awareness or knowledge (Costa & Kallick, 2000; November, 1996; Woodward, 1998), but also

provide them with a space for thinking, imagining, and making decisions (Black, Sileo & Prater, 2000). Some authors have also argued that journal writing promotes critical thinking (Hatcher & Bringle, 1997; November, 1996) and allows confidential communication between the learner and instructor (Black et al., 2000; Zeichner & Liston, 1996).

### *Discussion Forums and Blogs*

More recently, some teacher educators and researchers have started using discussion forums and weblogs as online versions of journals (e.g., Hernández-Ramos, 2004; West et al., 2005). In most higher education contexts, a discussion forum is an asynchronous, Web-based, threaded discussion tool that is used by authorized members for dialogue over short but sustained periods. Participants may read, add, and reply to comments in the forum which are threaded (arranged by topic) and possibly archived for later reference. (Definition derived from Ge & McAdoo, 2004; Hernández-Ramos, 2004)

A weblog, or blog as it is commonly referred to, is an asynchronous, Web-based tool that is similar to a traditional journal. It allows one or more authors, otherwise known as bloggers, to post entries that are displayed in a Web page. Access to most blogs is usually available to anyone with Internet access, a Web browser, and the Web address of the blog of interest. Bloggers are able to add, edit, or delete entries as they wish and embed links and images, and more recently, sounds and videos to each entry. Visitors to a blog may comment on blog entries or the comments of other visitors. Typically blog entries are arranged in reverse chronological order, i.e., the latest entry is displayed first. Most blogging systems automatically archive entries at an interval defined by the user. (Definition derived from Ge & McAdoo, 2004; Herring et al., 2004; Schiano, Nardi, Gumbrecht, & Swartz, 2004; Stiler & Philleo, 2003; Williams & Jacobs, 2004)

### *Affordances of Forums and Blogs*

Since discussion forums and blogs are being used as online journals for reflection, they may have the same advantages as traditional journals. With the change in medium, some authors have focused on the technical affordances such as the ones listed earlier. Lin et al. (1999) outlined some general ways that technology could support reflection more effectively or efficiently compared to traditional media. The affordances that apply to discussion forums and blogs are that they:

- Record and display the learner's process and progress. The regular use of these tools not only makes the user's thoughts explicit, it also leaves a permanent electronic record of the user's thoughts as forum postings or blog entries, be they current or archived.
- May provide an expert model for learners to emulate. It is possible to embed templates consisting of guiding questions designed by experts in both tools. This would allow learners to match their thought and problem-solving processes with those of experts.
- Allow individuals from different cultures and communities to interact. As both discussion forums and blogs are Web-based, they have the potential to allow anyone with Internet access and a Web browser to interact. More realistically, the tools allow small circles of writers and readers who are drawn by common purposes to respond to one another. In doing so, they may learn to see things from other perspectives.
- Provide an audience of more than one. The number of participants in academic discussion forums is typically limited to members of a class and the instructor(s) or facilitator(s). Blogs may attract anywhere between a few to a few thousand readers. Whatever the case, reflections and revisions are more motivating when there are others to critique the work of the writer.

Another affordance that any asynchronous communication tool provides is user-determined time for writers to formulate and articulate their thoughts before they post them online. However, once shared, the messages are instantly available to recipients (DiMauro & Gal, 1994).

### Research on Tools for Reflection

Research that focuses on promoting or supporting teacher reflection in discussion forums or blogs is sparse. The studies that could be found are discussed in the next three sections.

#### *Research on Reflection in Forums*

In an early study conducted by DiMauro and Gal (1994), 10 to 12 in-service teachers used a discussion forum to discuss ways to enhance the learning of science. The researchers analyzed messages for emergent patterns of reflective discourse, with the aim of identifying features in the professional development program that helped or hindered reflection. In so doing, they had to distinguish reflective mode messages from other modes, i.e., informative and responsive, by the tone of the message. Reflective messages provided a snapshot of the teacher's mind and did not offer information with explicit details, evaluations of worth, or seek affirmations. The researchers placed high value on reflective messages because they made the reflector's thoughts and/or feelings explicit and opened up dialogues between teachers who normally worked autonomously in their classrooms. However, they rarely encountered reflective postings and attributed this phenomenon to the difficulty of writing such posts and the personal nature of such posts. The researchers then reviewed literature on sociotechnical theories and relied on their own experience with the project to suggest technological and social factors that might promote reflective discourse. The technological factors included:

- Protected workspace for reflection. The researchers suggested that setting aside a forum area exclusively for the teachers and facilitators would encourage openness in writing.

- Asynchronous communication. The researchers reasoned that this would allow participants time to formulate and articulate their ideas and responses.
- Maintaining and retrieving dialogues. The messages should be arranged chronologically to reflect the flow of messages. The messages should also be archived but remain searchable for later reference.

The social design factors that promote reflection included:

- Structured dialogue and inquiry. The researchers suggested that reflections began with detailed personal accounts of a teacher's experience followed by shared experiences followed by reflection-on-action. Such events would culminate in a reflection on the sharing process. DiMauro and Gal also highlighted the importance of formulating guiding questions that "blend structure and openness for inquiry, which invites and directs, asks and advocates" (p. 134).
- Linking action with reflection. Teachers need a context for acting before or after reflection. The reflections should be based on what teachers have done or might do in actual classroom environments.
- Participatory motivation. Teachers need to feel like they belonged to a group, had a role to play in that group, and identified with the goals of the group.
- Extending the time frame. The researchers recognized that composing reflective messages was time consuming, and suggested that extended time frames were needed for reflection.

How does this study relate to the literature review on reflection and scaffolding? First, reflection was viewed as a social or collaborative activity, not an individual one. Second, the researchers identified scaffolding in the form of structured dialogue and inquiry as critical to supporting reflection.

### *Research on Reflection in Forums and Blogs*

More recently, Hernández-Ramos (2004) described a study where 56 preservice teachers were required to reflect in both discussion forums and personal blogs. The researcher had two reasons for this requirement. First, he reasoned that requiring reflections in both the discussion forum and blog would change the mindsets of a journal being *intrapersonal* (the learner with him/herself) or *dyadic* (learner-instructor). In effect, the goal was to establish reflection as a social or collaborative venture. Second, Hernández-Ramos wanted to encourage preservice teachers to see themselves as creators of knowledge whose ideas were worthy of consideration by their peers. Based on the researcher's own experiences and a brief review of literature, he had hoped that writing and publishing in the more public spaces of discussion forums and blogs would result in material that was of higher quality.

In the forum, preservice teachers were required to answer three discussion questions over a 10-week period. In the blogs, preservice teachers were directed to write one reflection a week over the same 10-week period about the "broad subject of teaching, learning, and technology."

In the forum, all preservice teachers met the requirement to answer the instructor's questions, while only about half met the requirement to reply to a peer's posting. The researcher also provided anecdotal evidence that the preservice teachers were learning from one another and reflecting collaboratively. However, there were no definitive measures of reflection beyond the researcher's judgment on what was considered reflection. He also commented that the "online discussion forum experience did not develop as the intellectual agora that the instructor and many others... envisioned for this medium" (online journal). Therefore, while the preservice teachers probably learned that reflection could be socially-mediated, they did not necessarily reflect any better.



While forum postings were guided by the instructor's three questions, there were no firm guidelines beyond the broad topic for blogs. As a result, preservice teachers wrote about a wide range of topics, although a common theme was their experiences during their school placements. Their entries included their reactions to the time they spent with children in classrooms, interactions with master teachers, reflections on their learning needs, and the challenges or opportunities for integrating technology into their teaching. However, their feelings about reflecting with blogs were polarized. Some preservice teachers, concerned about privacy, were anxious about writing for a potentially large, unknown audience. This was in contrast with five preservice teachers who embraced the idea and expressed their intention to incorporate blogs into their own teaching.

While Hernández-Ramos was not explicit about it, the study was set up so that the blogs facilitated individual reflection, while the discussion forum promoted collaborative reflection. The instructor questions and the resulting discussions served respectively as hard and soft scaffolds in the discussion forum. The variety of blog entries was not surprising considering the lack of scaffolds. However, the quality of reflections made with either tool is unclear, since there was no definitive measure of reflection.

#### *Research on Reflection in Blogs*

Various authors believe that blogging engages bloggers and encourages reflective writing (Downes, 2004; Kadjer & Bull, 2003; Oravec, 2003; Stiler & Philleo, 2003). However, they offer little or no empirical evidence of the reflective affordances of blogs, and instead cite the technical or sociotechnical advantages of blogs. For example, compared to websites or course management tools, blogs are easy to create and update (Downes, 2004; West et al, 2005). Blogs also offer users a selective audience and promote ownership of content (Downes, 2004; Godwin-

Jones, 2003; Kadjer & Bull, 2003; West et al, 2005). The link between these affordances and high quality reflections might be reasoned cognitively, but they have yet to be based on empirical evidence. A few researchers have attempted to provide this evidence, but have not done so convincingly.

Stiler and Philleo (2003) designed a study where 63 preservice teachers were required to sign up for their own blogs at Blogger.com and use them as reflective journals. When surveyed, most of the preservice teachers indicated that it took less than an hour to learn how to use a blog, that they were easy to use, and that they were satisfied with the blog provider. However, most of the preservice teachers did not recommend that blogs be used in future courses, and stated that they would not use them in their own classrooms for technical reasons. Upon examining their reflections, the researchers commented that their entries were “more analytic and evaluative... longer and written in ways that indicated that students were considering the bases and motivations behind their beliefs” (p. 795). However, the authors did not describe how they determined differences in the quality of reflections compared to more traditional journal writing activities.

West et al. (2005) reported how 120 preservice teachers used blogs and RSS aggregators to reflect on video or in-class examples of technology use by a teacher. RSS (Really Simple Syndication or Rich Site Summary) aggregators are tools that collect entries from blogs that are of interest to the user. RSS relies on push technology, i.e., relevant information comes to the user, instead of pull technology which requires the user to visit individual blogs. Aggregators allow users to subscribe to specific blogs and make information retrieval more convenient.

The preservice teachers were required to sign up for their own blogs at Blogger.com. They were divided into groups of six and were required to read their group members' reflections

by using the aggregator tool. They were also required to read the instructor's blog. After overcoming a brief but intense learning period, the preservice teachers were very positive about using blogs to reflect. Participants found blogging to be highly effective at supporting them in their reflection assignments. When asked to rank tools for reflection, blogs came in second after face-to-face discussions and were ahead of discussion forums, email, and traditional journals. Participants also indicated that blogging gave them the opportunity to express themselves and that they felt that they owned their own blog and its contents.

Stiler and Philleo (2003) set up the use of blogs as individual reflection tools while West et al. (2005) used blogs for collaborative reflection. The instructor in West et al.'s study provided soft scaffolding by modeling reflection in the instructor blog. Stiler and Philleo did not mention if scaffolds were provided in their study. Nonetheless, it would be premature to suggest that scaffolded and collaborative reflection promotes reflection, because the quality of the preservice teacher reflections was not definitively measured in either study.

#### *Research Gaps on Reflection in Blogs and Forums*

One of Hernández-Ramos' (2004) conclusions was that requiring preservice teachers to reflect in both forums and blogs was probably overwhelming, and proposed that a future study focus on the use of only one tool. Which tool is better at promoting reflection? Studies have revealed that both discussion forums (DiMauro & Gal, 1994; Herrington & Oliver, 2002; Lee, 2005) and blogs (Reilly, 2005; Stiler & Philleo, 2003; West et al., 2005) have some capacity to promote reflection.

If reflection is considered an individual activity, do the tools naturally promote "internal monologues" (Widdowson, 1983), or should reflections be scaffolded so that they are "assisted monologues" (Scardamalia et al., 1984)? If reflection is socially-mediated, do the tools promote

dialogues among the learner and his/her peers, cooperating teachers, and instructors so that they engage in deliberation, confrontation, and critical inquiry (Schön, 1987)?

Some researchers have cautioned that providing reflective tools to learners is no guarantee that they will reflect as expected or at high levels (Hatcher & Bringle, 1997; Hatton & Smith, 1995; Woodward, 1998). For example, Woodward noted that what was written in journals at her institution was often little more than a record of events and activities. As Woodward (1998) and Herrington and Oliver (2002) point out, there must be a process which enables reflection to occur.

#### Importance of the Study

There are three important contributions of this study with respect to promoting preservice teacher reflection online. First, this study critically examines the affordances of online tools in promoting preservice teacher reflection. While the use of threaded online discussion forums in higher education has been well documented, the use of blogs has been documented only very recently. One specific use of forums and blogs has been to promote reflection among preservice teachers. However, such studies rarely cast a critical eye on blogging or compare the effect of using blogs with forums. More importantly, the technical affordances of such tools (e.g., asynchronous communication or personal reflection space) have been previously cited for the ability of these tools to promote individual reflection. This study compares the effects of forums and blogs on promoting reflection, and critically examined their technical affordances.

Second, this study tests the hypothesis that scaffold type might be more important than tool type on promoting reflection. Previous studies largely ignored the effect of strategic factors such as scaffolding on learning outcomes, and instead attributed the quality of reflection to the

tool. This study incorporates two different forums of hard scaffolding (minimal and enhanced) in order to determine their influence on the quality of preservice teacher reflection.

Third, this study clearly defines reflection and quantitatively measured reflection. Unlike other studies that assumed a common understanding of the term “reflection,” this study includes an extensive review of the concept of reflection and defines it clearly in order to measure it. Two reflection scales are used to measure preservice teacher reflection levels in blogs and in discussion forums. By so doing, this study provides a new approach to measuring reflection and provides empirical evidence on the reflective benefits (or lack thereof) of preservice teachers’ use of two different online tools and two different scaffolds.

## CHAPTER 3: METHODOLOGY

### Introduction

The purpose of this study was to determine if the type of reflection tool, the type of scaffolding, or both, had an impact on the quality of preservice teacher reflection. The research questions were:

- Q1. What were the quantitative and qualitative differences between preservice teachers' reflections in discussion forums and blogs?
- Q2. What were the quantitative and qualitative differences between preservice teachers' reflections when scaffolding was minimal and when it was enhanced?
- Q3. In terms of reflection, how did the tool and scaffolding variables moderate or interact with each other in the following situations:
- forum with scaffolds vs. blog with no scaffolds?
  - forum with no scaffolds vs. blog with scaffolds?
- Q4. What might have accounted for any observed differences in reflection levels between the treatment groups?

### Hypotheses

With respect to the first research question, the null hypothesis,  $H_0$  is: There will be no significant differences in preservice teachers' reflection levels they use a forum or blog, or when scaffolding is optimal or enhanced. The hypotheses for the next two research question are,  $H_1$ : The use of blogs will facilitate longer reflections, more personally relevant and informal reflections, and higher levels of reflection than discussion forums, and  $H_2$ : The use of enhanced scaffolds will facilitate longer reflections, more personally relevant and informal reflections, and promote higher levels of reflection than minimal scaffolds.

With respect to the third research questions, the hypothesis  $H_3$  is that the tool and scaffold will not significantly interact with one another. Finally, with respect to the fourth research question, the hypothesis  $H_4$  is that the use of enhanced scaffolds will have a more significant impact on promoting reflection than the type of tool used because the scaffold provides structure for reflection.

### Design of the Study

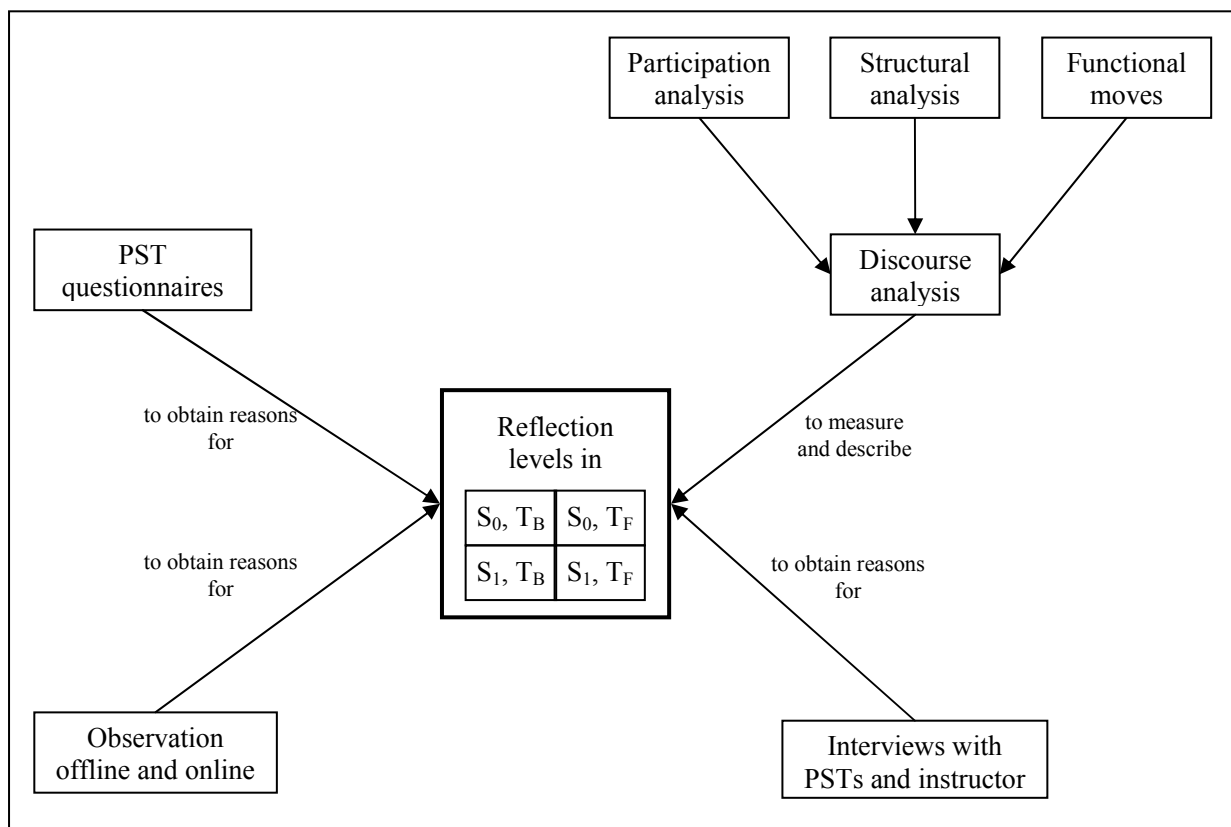
Two methodologies defined this study: quasi-experimental research and mixed methods. The design was quasi-experimental because the sample consisted of four intact classes of preservice teachers enrolled in EC301 (Integrating Technology in Teaching – Part I). The experiment was based on a 2 by 2 factorial design (Figure 3.1).

<b>Tool</b>	<b>Scaffolding</b>	
	Minimal ( $S_0$ )	Enhanced ( $S_1$ )
Oncourse ( $T_F$ )		
Blogger ( $T_B$ )		

*Figure 3.1.* Using a 2 by 2 factorial design to study the effects of tool type and scaffolding on reflection levels

The first independent variable was the type of technology tool while the second was scaffolding. There were two levels for each variable. For tool type, the levels were the Oncourse discussion forum ( $T_F$ ) and the Blogger.com blog tool ( $T_B$ ). For scaffolding, the levels were minimal scaffolding ( $S_0$ ) and enhanced scaffolding ( $S_1$ ). One group of PSTs used Oncourse ( $T_F$ ) while another group used Blogger ( $T_B$ ) to reflect on the same two course assignments in EC301. Both these groups received minimal scaffolds to guide the reflective process ( $S_0$ ). Another two groups reflected using the different tools but were provided with enhanced scaffolds to guide

reflection ( $S_1$ ). The same instructor taught all four groups. This design not only allowed the researcher to assess the effect of each independent variable on reflection levels, but also whether these variables interacted with one another (Fraenkel & Wallen, 2003).



*Figure 3.2.* Methods used in this study to determine differences in reflection in treatment groups

The methods used in this study are represented in Figure 3.2. The mixed methods consisted of the collection and analyses of quantitative and qualitative data from questionnaires, qualitative data from interviews, quantitative and qualitative data from electronic discourse (henceforth referred to as computer-mediated discourse analysis or CMDA), and observations of the classroom offline and online. The inclusion of CMDA was to provide descriptions and measurements of PSTs reflection levels. Questionnaires were used to collect demographic and



other data that might explain the observed reflection levels. Interviews were conducted to “aggregate perceptions or knowledge among multiple respondents” (p. 65, Stake, 1995) while observations were conducted to record the researcher’s perceptions of the same phenomena. These multiple sources of data were included in order to triangulate findings. The rationale for the mixed methods was to take advantage of the strengths of each method, and in doing so, provide a deeper and more critical analysis of the factors that affected reflection.

### Setting and Participants

The participants were from the Education School of a large Midwestern university. The participants were preservice teachers (PSTs) who took “EC301 - Integrating Technology in Teaching (Part I)” as part of their curricula requirements. EC301 was a one-credit, semester-long course that was taught in a blended learning environment, i.e., participants met both face-to-face and online. The purpose of this course was to provide PSTs with skills and experiences that would allow them to plan a lesson that effectively and appropriately integrated technology. As part of EC301 requirements, PSTs had to critique one video case study and develop a lesson plan that was based on content and technology standards. These activities provided excellent opportunities for the PSTs to reflect individually on content, standards, instructional strategies, learner needs and contexts, assessment methods, and other factors.

EC301 was divided into multiple sections to accommodate two distinct cohorts of PSTs. While EC301 was offered to both elementary and secondary cohorts, the participants of this study originated from only the elementary cohort. Elementary majors experienced a more uniform curriculum, whereas secondary majors had experiences that differed according to their content areas.

Four intact classes were selected for this study. Each class comprised an average of 24 PSTs who were typically 20 or 21 years old and were either juniors or seniors. The average gender ratio was approximately 14 females : 1 male. Out of a total of 96 PSTs in the four classes, 48 volunteered to participate in this study. The breakdown of participants by class is shown in Table 3.1. The age of the participants ranged from as young as 20 to one individual who was 43 years-old. The gender ratio of the participants was 8 females : 1 male.

Table 3.1

*Number of participants by the day of the week each EC301 class was conducted*

	Mon	Tue	Wed	Thu	TOTAL
No. of participants	8	9	15	16	48

The EC301 instructor who participated in this study was a female in her late 20s. She had not previously taught EC301 but had about three years of experience as a K-6 classroom teacher. This instructor was selected from a pool of three EC301 instructors because she was the only one who was assigned four classes. The other instructors were assigned fewer than four classes. Four different classes were required for the design of this study (Figure 3.1). In selecting the same instructor for all four class sections, the researcher kept the instructor factor constant.

#### Data Sources

The primary sources of data were the PSTs' discussion forum postings and blog entries in all treatment groups. To determine the possible reasons for the differences (or lack thereof) in reflection levels between groups, all PSTs were asked to complete two questionnaires. In addition, the instructor and a purposive sub-sample of PSTs were interviewed. The researcher

also observed the classes online and offline throughout the semester. The research questions, data sources, collection schedule, and data analyses are summarized in Table 3.2.

Table 3.2

*Overview of research questions, data sources, and data analysis*

Research question	Data sources	Collection schedule	Data analyses
Q1. Differences in reflection levels between forum postings and blog entries.	Forum postings and blog entries by PSTs.	Prior to interviews and at end of semester.	CMDA and inferential statistics.
Q2. Differences in reflection levels when scaffolding was minimal and enhanced.	Forum postings and blog entries by PSTs.	Prior to interviews and at end of semester.	CMDA and inferential statistics.
Q3. Interaction between variables.	Forum postings and blog entries by PSTs.	Prior to interviews and at end of semester.	CMDA and inferential statistics.
Q4. Reasons for differences in reflection levels.	Questionnaires completed by PSTs.	At start and end of semester.	Qualitative analysis.
	Interviews of PSTs.	Near or after the end of semester.	Qualitative analysis.
	Interview of instructor.	At the end of semester.	Qualitative analysis.
	Observations of classes and lurking online.	Throughout semester.	Qualitative analysis.

## Materials

### *Scaffolds*

The scaffolds were Microsoft Word documents that took the form of question templates (see Appendices A to D). PSTs were expected to type their answers in the documents and save personal copies. They were then required to copy and paste the questions and their answers into text boxes for submission in Oncourse or their blogs.

The enhanced and minimal scaffolds were based on existing scaffolds from the previous semester's iteration of EC301. The researcher sat in on weekly EC301 instructor meetings to determine what changes could be made to the scaffolds so that they would suit the needs of this study while minimizing the negative impact on the PSTs. The researcher then collaborated with the participating instructor and the course coordinator to redesign scaffolds that provided minimal support and enhanced support.

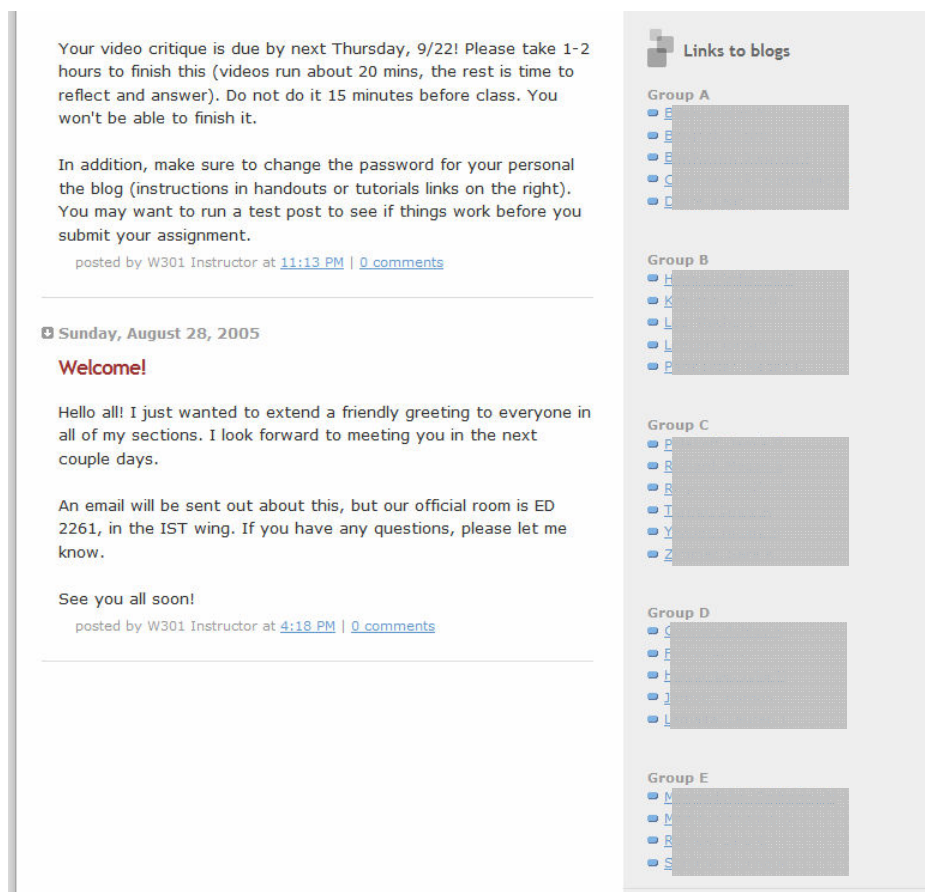
### *Discussion Forum*

PSTs in both discussion forum treatment groups ( $S_0, T_F$  and  $S_1, T_F$ ) were signed up by default in Oncourse when they registered for EC301. These participants were expected to complete their assignments by submitting their completed templates as individual postings in Oncourse.

### *Blogs*

Participants in the blog treatment groups ( $S_0, T_B$  and  $S_1, T_B$ ) were assigned individual blogs from Blogger.com. Instead of requiring the PSTs to sign up for these blogs, the researcher created individual blogs using their university IDs to create Blogger.com accounts. In addition, the researcher created two class blogs (one for each scaffold treatment group) on behalf of the

instructor. The instructor posted instructions for assignments there and the researcher created groups by creating links from each class blog to individual blogs (Figure 3.3).



*Figure 3.3.* Screenshot of a class blog showing links to PST blogs and small groups (names of participants hidden)

PSTs were informed of the URLs of their personal EC301 blogs in class, via email, and via links from the class blogs. These measures were necessary to make the experience equivalent to the forum treatment group: PSTs did not have to sign up for Oncourse forum space, had class announcement and reflection spaces, and were assigned to small groups. However, unlike the

forum treatment groups, these participants were provided with handouts on how to post or edit blog entries, how to customize their blogs, etc., because this was a newly introduced tool.

### *Questionnaires*

Two questionnaires were created for this study. The questionnaires were designed by the researcher based on the needs of this study and were not based on prior instruments. The first questionnaire (Appendix E) was designed to collect baseline data on all PSTs, i.e., general demographics, technology skills, disposition towards reflection, experience with reflection, and personal definitions of reflection.

The second questionnaire (Appendix F) was designed to collect PSTs' post-course perceptions of their abilities to reflect and preferences for reflection. This questionnaire also collected data on their rating of the online tools, the reflection scaffolds, the instructor, and the course as a whole.

### Procedures

The procedures in this study are presented in the rough chronological order that they were conducted.

### *Instructor Recruitment and Training*

Approximately two weeks before the EC301 course started, the researcher met with EC301 instructors and described this study. The instructor who was assigned to teach four different sections of EC301 was recruited as a participant. As the instructor was new to teaching EC301 and had not taught with blogs before, the researcher had originally planned on determining the exact content of the hard scaffolds (Appendices A to D) at the meetings before the course started. The plan was also for the researcher and participant instructor to collaboratively define and discuss the soft scaffolds that the instructor might use. In addition, the

original plan included providing training and practice for the instructor so that she knew how to maintain class blogs, read PST blogs, and show PSTs how to do the same. Training for Oncourse, however, was deemed unnecessary as the instructor was already familiar with its use and administration.

In contrast to original plans, circumstances during the week before and the week after the semester started prevented initial instructor training from taking place. The instructor's EC301 classes were not assigned rooms to meet in and two of her class rosters were not available to her. Furthermore, as EC301 was relatively new and evolving, the instructors decided to redesign and plan for each week's assignments only the week before it was presented to the PSTs. As a result, the instructor was understandably distracted by logistical issues and then later needed to focus more on preparing for each week's tasks. Furthermore, the instructor also worked as an assistant manager at a local store and had a full Masters course load. With these considerations in mind, the researcher decided that it was more prudent to provide training and discuss scaffolding issues with the instructor during the weeks when assignments had to be prepared. The researcher also took over some technical aspects such as creating online groups and signing up for individual blogs as described in the Materials section. Other than some logistical and technical support, the researcher did not offer any incentives to the instructor to participate in this study.

#### *Participant Recruitment and Communication*

At the beginning of the semester, the researcher informed each class of PSTs about the topic, duration, and participant commitments of the study and asked for volunteers. Volunteers were not offered any incentives to participate. The recruitment took place in phases (initial and follow-ups) and took about three weeks to complete. Volunteers read and signed the study information and participation form provided by the researcher. A copy of the signed form was

given to each participant the week after they were recruited. The researcher kept the original forms in a locked cabinet in his office. The online messages and behaviors of PSTs who did not wish to be part of the study were excluded from data collection and analysis. Thereafter, to communicate with the PST participants, the researcher sought permission from the instructor to make announcements face-to-face. The researcher also communicated with PST participants via listservs (e.g., reminders to complete questionnaires).

	T <sub>F</sub>	T <sub>B</sub>
S <sub>0</sub>	Oncourse discussion forums + minimal scaffolds (Tue class, 9 PSTs)	Personal blog + minimal scaffolds (Wed class, 15 PSTs)
S <sub>1</sub>	Oncourse discussion forums + enhanced scaffolds (Mon class, 8 PSTs)	Personal blog + enhanced scaffolds (Thu class, 16 PSTs)

*Figure 3.4.* Summary of tool and scaffold assignment in different treatment groups

#### *Establishment of Treatment Groups*

Each of the four treatments was randomly assigned to each class of PSTs. The allocation of tool and scaffold types is summarized in Figure 3.4. In addition, each class of PSTs was divided into groups of between four to six people for face-to-face or online group work, e.g., peer critiques of lesson plans. The researcher assisted the instructor by creating these small groups of PSTs in each treatment group. First the participants were separated from the non-participants. Both groups were then divided into smaller groups of four to six PSTs based on their last names. PSTs remained in their assigned groups for the duration of the course.

#### *Tasks Performed by All Treatment Groups*



The list of course assignments is shown in Appendix G. Prior to the data collection, two of the assignments — the video case critique and lesson planning — were identified and selected by the researcher as having potential to generate reflective writing. The video case critique was completed first. The activity lasted for one week and required PSTs to watch, individually critique, and submit online individual reflections on three videos of a teacher integrating technology in a K-12 setting. The lesson planning assignment lasted for approximately six weeks and required PSTs to create a lesson plan that integrated technology into a content area. PSTs critiqued one another's lesson plans in their small assigned groups both face-to-face and online at different stages of lesson planning. Once they had completed the final version, they were asked to reflect individually on the process of lesson planning.

All participants in all treatment groups completed similar assignments. The assignments differed only in the nature of the scaffolding provided ( $S_0$ , minimal or  $S_1$ , enhanced). These assignments were submitted as individual Oncourse discussion forum postings or individual blogs entries. The other EC301 assignments which were not part of this study were assisted with scaffolds that were common to all groups and submitted via the same assigned tool (discussion forum or blog).

#### *Tasks Performed by Discussion Forum Groups*

PSTs in both discussion forum treatment groups ( $S_0, T_F$  and  $S_1, T_F$ ) were familiar with using Oncourse as they had used it prior to EC301 in other content or technology courses. However, the researcher showed them how to post their reflections by copying and pasting the contents of their templates into a forum text box for submission. Regardless of the scaffold treatment, PSTs were required to answer all questions in each assignment individually in discussion spaces in Oncourse. The  $S_0, T_F$  treatment group received minimal scaffolding

(Appendices A and C) while  $S_1, T_F$  group received enhanced scaffolding (Appendices B and D) to guide their reflection. The enhanced scaffolds differed from the minimal scaffolds in that the former contained more strategic and metacognitive questions to guide PST reflections.

#### *Tasks Performed by Blog Groups*

The participants in the blog treatment groups ( $S_0, T_B$  and  $S_1, T_B$ ) were expected to submit their assignments by posting their completed templates as entries in their blogs. The researcher demonstrated how to post their reflections by copying and pasting the contents of their templates into a blog text box for submission. Regardless of the scaffold treatment, PSTs were required to answer all questions in each assignment individually in their own blogs. The  $S_0, T_B$  treatment group received minimal scaffolding (Appendices A and C) while  $S_1, T_B$  group received enhanced scaffolding (Appendices B and D) to guide their reflection. The enhanced scaffolds differed from the minimal scaffolds in that the former contained more strategic and metacognitive questions to guide PST reflections.

#### *Tasks Performed by Instructor*

For this study, the instructor had two primary roles: inform the PSTs of the requirements of each assignment, and monitor and grade their postings or entries. The instructor had the announcement tool in Oncourse but opted not to use this in favor of first outlining the assignment in class and following up with detailed email. Likewise, she had the option of using the class blogs to announce assignments. The instructor used the blog to announce the video critique assignment but not the lesson plan reflection as she found it more convenient to rely on verbal class announcements and email.

The instructor was able to read and grade the PSTs forum postings by visiting the forum spaces she created for them. To create an equivalent experience with the blogs, the researcher

showed the instructor how to install and use an RSS aggregator to read all her PSTs entries from a single interface. This removed the inconvenience of having to visit individual blogs.

#### *Tasks Performed by Researcher*

As mentioned in the previous sections, the researcher helped the instructor administratively by dividing her classes into groups first by participants and non-participants, and then each of these two groups into smaller groups for peer critiques, and creating blogs for all PSTs (participants and non-participants) in the blog treatment groups and preparing instructions for their use. The researcher helped the instructor technically by providing technical support for any PST who needed help on how to use Oncourse or their blog, and providing training and technical support for the instructor on using an RSS aggregator to collect PST blog entries. The instructor and researcher collaborated on the design of the minimal and enhanced hard scaffolds for the two selected assignments. Finally, the researcher sought permission from the instructor before recruiting participants, administering questionnaires, observing the classes, or any other intervention related to this study that required access to PSTs.

#### *Administration of Initial Questionnaire*

All participants of this study were asked to complete the first questionnaire (Appendix E) online using the Oncourse survey tool by the seventh week of class. Those who did not complete the questionnaire online were asked to complete a paper version in class. All PSTs took less than five minutes each to complete the questionnaire. PSTs did not receive any compensation to participate in the questionnaire. Out of the total of 48 participants, 46 returned complete and error-free questionnaires in one form or the other (24 online, 22 on paper). The results of this questionnaire were used to generate profiles of each treatment group and profiles of PSTs in each group for selecting interviewees.

### *Computer Mediated Discourse Analysis of Reflections*

The electronic messages were analyzed at the levels of participation, structure, and functional moves (Herring, 2004, see Data Analysis section for details). Discussion forum postings and blog entries were copied into Microsoft Excel spreadsheets as a permanent record. Hardcopies of these documents were made as a precaution. The use of Microsoft Excel spreadsheets was also to facilitate the measurement at the *participation* level and the manual coding at the *functional moves* level. In addition, Simple Concordance Program version 4.08 (available at <http://web.bham.ac.uk/a.reed/textworld/scp/index.html>) was used to automate word counts for the *structural* analysis of reflections.

*Coding macrosegments.* Of the four domains of language (structure, meaning, interaction, and social behavior, Herring, 2004), PSTs reflections were measured at the meaning or functional moves level. In reflecting, a PST may first recall an experience, then explain it, and finally analyze it.

Coding at this level afforded much flexibility. A coder may opt to code the entire message, individual paragraphs, or other chunks of text. This researcher opted to generally treat paragraphs as macrosegments (Longacre, 1992 in Herring, 1996), i.e., logical and thematic chunks of text. In this study, the macrosegments were answers PSTs gave to each question in the scaffold. The levels of reflection in each segment were coded using the two coding schemes described in greater detail the Data Analysis section. Briefly, each message was coded twice, first according to Crotty and Allyn's (2001) scale and then with Hawkes and Romiszowski's (2001) rubric (see Data Analysis, Tables 3.2 and 3.3). Each macrosegment in a blog entry or forum posting was assigned only one code per reflection scale. When there were two or more possible codes for a macrosegment, e.g., Crotty and Allyn's level I and II (recall and

understanding), only the higher code was assigned. Modifications to the coding schemes based on emergent patterns in the data were made and described in the Data Analysis section of this chapter.

*Inter-rater reliability.* To reduce the subjectivity of coding, the researcher recruited a second coder. The second coder was a doctoral candidate who was in the same program as the researcher. He was familiar with Crotty and Allyn's coding scheme as he was using it in his own study. Coder training consisted of four meetings lasting approximately two hours each. A random sample of just over 20% of reflections from each of the four treatment groups was given to the second coder in an Excel spreadsheet. At the first meeting, the researcher explained the coding schemes to the second coder. At the second meeting, the coders compared how they identified logical chunks (segments) for coding, compared their codes for each segment, discussed disagreements, and refined the coding scheme. At the next two meetings, the coders compared their codes for the entire sample, and resolved disagreements until both coders were in 100% agreement of assigned codes.

*Rationale for using percentage agreement.* In their review of content analysis schemes, De Wever, Schellens, Valcke, and Van Keer (2006) concluded that there was no consensus on the best index of inter-rater reliability, e.g., percentage agreement, Holsti's method, Scott's pi, Cohen's kappa, etc. For example, Holsti's method takes into account imprecise coding as a result of coders defining segments differently. However, segmentation in this corpus of data was based on answers to specific questions and was clarified during coder training. As a result there was no room for error in segmentation. Scott's pi and Cohen's kappa attempt to take into account two coders' codes that are close but not identical. However, the training resulted in precise definitions of shared codes. As a result, coding agreement due to chance was greatly reduced and

percentage agreement was used in this study. As De Wever et al. (2006) describe, an inter-rater reliability of 80% is considered good coding agreement. In this study, however, the coders discussed disagreements and refined the coding until 100% agreement was reached.

*Coding before interviewing.* Preliminary analyses of the levels of reflection were carried out before interviewing PSTs at the end of the course. The reason for carrying out the analysis before the interviews was to facilitate member checking (Stake, 1995), i.e., to confirm with the interviewees their intent and level of reflection. Other quantitative and qualitative measures of discourse (e.g., participation levels, length measures) were determined at the end of the course when there were no more additions to the corpus of data.

### *Interviews*

All but one of the interviews was conducted face-to-face in a small conference room located near the EC301 classroom and took between 45-60 minutes each. At the request of one PST, the interview was conducted via email. Otherwise, the interviews were digitally recorded and then transcribed by the researcher for qualitative analysis. Summary transcripts and researcher interpretations were presented to the interviewees by email roughly a week after each interview for member checking (Stake, 1995). The interviewees returned the email to indicate their approval and/or include modifications to the interview record.

*PST interviews.* These interviews were conducted with a purposive sub-sample of PSTs. The results of the first questionnaire were used to generate profiles of PSTs in each treatment group. The PST profiles were used for the selection of two interviewees per treatment group using the matrix shown in Figure 3.5. The aim of the selection process was to interview PSTs who were at both ends of the technology skills and reflection experience spectra.

	High technology skills	Low technology skills
High reflection experiences	X	
Low reflection experiences		X

*Figure 3.5.* Matrix illustrating the criteria for selecting interviewees. The “X”s indicate one PST with high technology skills and reflection experiences and one with PST with low skills and experiences.

The original plan was to interview one PST each from each end of the spectra, i.e., one with low technology skills, one with high technology skills, one with low reflection experience, and one with high reflection experience. However, due to limited time and availability of the PSTs, the researcher opted to interview only two PSTs per treatment group: one who rated high on the technology and reflection scales and another who was low on the same scales. There were a total of eight PST interviewees (two per treatment group).

The first interview was conducted approximately one month before the end of the course (when all participant PSTs had submitted the lesson planning reflection). The last interview was conducted at the beginning of the following semester. PSTs did not receive any compensation to participate in the interview.

The interviews were conducted to collect an in-depth picture of the participants’ experience with reflection and journaling, collect more detailed and personal definitions of reflection, ask for feedback about their use of the tools and scaffolds for reflection, verify their intent of specific postings or entries, and determine possible reasons for the differences in reflection levels between treatment groups. The interview protocol is shown in Appendix H.

*Instructor interview.* The course instructor was interviewed at the end of the semester to record her insight on her PSTs and to determine her impact on PST reflections. The interview protocol is shown in Appendix I. She was interviewed in the same venue and manner as the PSTs.

#### *Administration of Terminal Questionnaire*

The second questionnaire (Appendix F) was made available online three weeks before the end of semester. PSTs who did not complete the questionnaire online were asked to complete a paper version in class. PSTs took about five minutes to complete the questionnaire. PSTs did not receive any compensation to participate in the questionnaire. Out of the total of 48 participants, 41 returned complete and error-free questionnaires in one form or the other (26 online, 15 on paper).

#### *Observations*

The researcher maintained an observation journal of lessons that included the video critique and lesson planning activities (Appendix J). The in-class activities were observed over six weeks, and as there were four classes per week, a total of 24 separate observations were conducted. The main goals of the observations were to gain insights into PST characteristics and behaviors and record possible soft scaffolding, i.e., how the instructor interacted with the PSTs and how PSTs interacted with one another. In addition, the researcher lurked in the discussion forums and retrieved feeds from participant blogs to determine what soft scaffolds, if any, were provided by the instructor and PSTs.

### Data Analysis

#### *Initial Questionnaire*

The first questionnaire was designed to collect baseline data on all PSTs (Appendix E), i.e., general demographics, technology skills, disposition towards reflection, experience with



reflection, and personal definitions of reflection. Data from the initial questionnaire were used to build overall profiles of each treatment group and profiles of each participant. The group profiles were used to determine the homogeneity across groups in terms of gender, age, disposition towards reflection, etc. The individual profiles were used to aid the purposive selection of interviewees.

To determine the homogeneity across groups, data from the first questionnaire (e.g., PST demographics, disposition towards reflection) were analyzed by SPSS 13 and using the Chi-square method. To generate individual profiles, PSTs were ranked by their responses to questions on technology background and experience with reflection to identify technology skills (low or high) and reflection experience (low and high). PSTs who rated all their technology skills in Q3 (Appendix E) as excellent or good were ranked high in technology skills. PSTs who, in answering Q4-7, indicated that they had been required to reflect as part of other coursework, had kept a journal for coursework, rated themselves to be highly reflective, and considered reflection to be important were ranked high in reflection experience. These individual profiles were then used to select interviewees as previously illustrated in Figure 3.5.

#### *Computer Mediated Discourse Analysis of Reflections*

The overall method for analyzing PST reflections was computer-mediated discourse analysis or CMDA (Herring, 2004). Discussion forum postings and blog entries were analyzed at the levels of participation, structure, and functional moves.

*CMDA at participation level.* At the participation level, data were compared between groups for the quantity of reflection. This measure provided a gross quantitative comparison between groups. Posting frequency was not measured because PSTs were required to only make one posting or entry each for their video critiques and lesson planning reflections.

*CMDA at structural level.* At the structural level, online reflections were analyzed in terms of length measures, pronoun frequencies, and formality. These measures categorized the reflections along the speech to writing continuum (Yates, 1996) and provided a gauge of how personal or formal the reflections were. These measures were important because they provided a quantitative description of the discourse and highlighted basic differences in reflective writing between treatment groups.

*CMDA at functional moves level.* At the functional moves level, PST reflections were coded according to two different coding schemes. The blog entries and discussion postings were analyzed according to the reflection rubric designed by Hawkes and Romiszowski (2001) and a reflection scale by Crotty and Allyn (2001). The original coding schemes are shown in Table 3.3 and 3.4 respectively. Each coding scheme was designed to measure different aspects of teacher reflection.

Hawkes and Romiszowski's seven-level rubric was designed to measure reactive and collaborative reflection by in-service teachers, and as such, was a measure of reflection on actual teaching experience. In the case of PSTs, this was limited to peer or micro teaching or any authentic classroom experiences they may have had, e.g., during field placements. However, Hawkes and Romiszowski's rubric did not measure reflection as a cognitive or metacognitive activity. While the two assignments selected for this study were submitted individually, they may be considered a product of collaboration. In the case of the video critiques, PSTs were able to read the critiques of their peers before submitting their own. In the case of their lesson plan reflections, this was the culminating activity after a series two or three peer critiques both face-to-face and online.

Table 3.3

*Hawkes and Romiszowski's (2001) seven-level reflection rubric*

Level	Description
1	No description of event. Message unrelated to practice.
2	Events and experiences described in simple, layperson terms, generally unattached to classroom activities.
3	Description of events and experiences employ pedagogical terms.
4	Explanation of events or experiences is accompanied by rationale of tradition or personal preference.
5	Explanation of an event or experience using cause/effect principle.
6	Explanation provided that identifies cause and effect factors while also considering contextual factors.
7	Explanation of events, experiences, or opinions that cites guiding principle and current context, while referencing moral and ethical issues.

Table 3.4

*Crotty and Allyn's (2001) reflection scale for novice teachers based on Bloom's Taxonomy*

Cognitive Level	Description
1. Knowledge	Briefly describes the relevance of the evidence or artifact.
2. Comprehension	Demonstrates an understanding of student development and relevant instructional plans.
3. Application	Connects college coursework concepts with practical classroom applications.
4. Analysis	Shows evidence of taking a teacher's perspective.
5. Synthesis	Establishes short terms goals based on perceived strengths and weaknesses.
6. Evaluation	Includes an awareness of their own professional development as a teacher.

Crotty and Allyn's six-level scale for novice teacher reflection was based on a preexisting construct, Bloom's Taxonomy (Bloom, 1956), and these reflections were viewed as proactive, individual, and cognitive outcomes. The rationale for using this scale was that PSTs were likely to connect with teaching practice largely at a theoretical level because they did not have a great deal of teaching experience. Unlike the previous scale, however, this scale measured reflection as cognition and did not take into account teaching values, contexts, or morals.

*Rationale for using two reflection scales.* Hawkes and Romiszowski's rubric measured reflection as reactive, active, and socially mediated process. On the other hand, Crotty and Allyn's scale measured reflection as a proactive, cognitive, and individual process. As each scale compensated for the weaknesses of the other, both were used to obtain more complete measures of reflection levels. As reflection has been defined in this study as being both proactive and reactive, comprising cognitive, metacognitive, and active elements, and mediated both individually and socially, the use of both coding schemes better measured reflection.

*Modifications to the two scales.* Modifications were made to the coding schemes following emergent patterns in the data and coder training. Customized versions of these coding schemes were necessary to: provide more precise definitions to each code and adapt to the content of the reflective discourse. The revisions of the two coding schemes are shown in Tables 3.5 and 3.6. Two main changes were made to the coding schemes. First the definition of each code was made more precise. For example, Hawkes and Romiszowski's third level was simply "Description of events and experiences employ pedagogical terms." It was elaborated upon to read as "Description of events and experiences employ pedagogical terms (e.g., teacher modeling, jig-saw grouping, scaffolded activities, think-pair-share strategy, using the KWL framework (Know, Want to know, Lessons learned, etc)."

Second, one more level of reflection was added to

Crotty and Allyn's scheme so that it had seven levels and was equivalent to the other scheme.

The level added to this scheme was zero (Describes irrelevant event or description is absent).

Table 3.5

*Modified version of Hawkes and Romiszowski's (2001) seven-level reflection rubric*

Level	Description
1	No description of event. Message unrelated to practice. Description missing.
2	Events and experiences described in simple, layperson terms.
3	Description of events and experiences employ pedagogical terms (e.g., teacher modeling, jig-saw grouping, scaffolded activities, think-pair-share strategy, using the KWL framework (Know, Want to know, Lessons learned, etc).
4	Explanation of events or experiences is accompanied by rationale of tradition or personal preference. Typically has "... because..." statements; preservice teacher remains largely in own comfort zone.
5	Explanation of an event or experience using cause/effect principle. Typically has "... because..." and "if... then..." statements; rationalizes from a theoretical, broader, or an otherwise outward looking perspective.
6	Explanation provided that identifies cause and effect factors while also considering non-imagined contextual factors (e.g., environment, learner, community, etc.).
7	Explanation of events, experiences, or opinions that cites guiding principle and current context, while referencing moral and ethical issues.

*Coding examples.* Examples of discourse that were assigned specific codes using the modified Hawkes and Romiszowski's coding rubric are presented in Appendix K. Examples of discourse that were assigned specific codes using the modified version of Crotty and Allyn's coding scale are presented in Appendix L.

*Statistical analysis.* After coding the reflective discourse of all treatment groups, descriptive statistics and charts were used to illustrate the patterns of reflective discourse as a result of each treatment variable. Using SPSS 13, two-way ANOVA was used to determine if

there were significant differences in reflection levels due to the two treatment variables for the two reflection assignments, and if there was any interaction between the variables. For the variables that had a statistically significant impact on reflection, independent t-tests were conducted to determine if there were significant differences between the means of each reflection level for each coding scheme, e.g., the mean for level I reflections of coding scheme 1 due to the minimal scaffold was compared with that of the enhanced scaffold. As there were seven reflection levels per coding scheme, the Bonferroni adjusted level of significance was  $0.05/7 = 0.0071$ .

Table 3.6

*Modified version of Crotty and Allyn's (2001) reflection scale for novice teachers*

Cognitive Level	Description
0. Missing or irrelevant recall	Describes irrelevant event or description is absent.
1. Knowledge/recall	Briefly describes the relevance of the evidence or artifact. Factually states examples or experiences.
2. Comprehension	Demonstrates an understanding of student development and relevant instructional plans. Provides a straightforward explanation of a phenomenon or observation.
3. Application	Connects college coursework concepts with practical classroom applications (e.g., from educational psychology: constructivist environment, information retrieval, etc.; classroom management techniques; linking objectives to content and assessment, etc.). Connection of past concepts with the present situation.
4. Analysis (deconstruction)	Shows evidence of taking a teacher's perspective. ("... because..." statements; elaborations based on preference, experience, understanding, etc.)
5. Synthesis (reconstruction)	Shows evidence of learning from teacher's perspective based on new experiences. Possibly establishes short terms goals based on perceived strengths and weaknesses.
6. Evaluation	Includes an awareness of their own professional development as a teacher. Evaluates current teaching abilities and determines what is needed for the future.

### *Face-to-face Interviews*

The main goal of the interviews was to try to identify possible reasons for differences or similarities in reflection levels among treatment groups. Bearing this in mind before, during, and after each interview, the researcher used the constant comparative method which was based on the grounded theory approach (Glaser & Strauss, 1967). The researcher used a similar procedure outlined by Lincoln and Guba (1985) to compare, integrate, delimit, and describe emergent themes from the PST and instructor interview data. These themes were used to explain resulting reflection levels between treatment groups. For example, the researcher first analyzed the interview transcripts of the two interviewees from within the  $T_{FS_0}$  group. The researcher then compared the tool effect by comparing with the  $T_{BS_0}$  group and also the scaffold effect by comparing with the  $T_{FS_1}$  group. At each stage, one or more hypotheses were generated and tested against new comparisons until there was reasonable evidence to support those hypotheses.

The interviews were also an opportunity to confirm or revise the coders' methods of coding PST reflections. The reasons interviewees gave for writing a certain way were compared with the coders' rationales. If the rationales were the same, the coders continued coding the other messages the same way. If the rationales were different, the coders considered revising the coding scheme to better fit the level of reflection that was taking place.

### *Terminal Questionnaire*

The second questionnaire (Appendix F) was used to determine if there were any changes in abilities, preferences, and attitudes of PSTs with respect to reflection, and to provide a measure of the satisfaction with the reflection tool, scaffolds, activity, instructor, and course as a whole. Answers to the multiple-choice and open-ended questions were analyzed to determine if there were any emergent trends and reasons that would explain the observed reflection levels.

### *Observations*

Observation data were analyzed to determine if there were any qualitative differences among treatment groups, e.g., class characteristics, use of soft scaffolding. It was also employed to find emergent trends that might explain the similarities or differences in reflection levels of the treatment groups.

The analysis was similar to the constant comparative method used for the interviews. Each week, the researcher compared and summarized observation notes on each class (treatment group). Comparisons were made between groups and between each week's set of observation notes. This technique not only allowed the researcher to identify emergent trends and test hypotheses over time, but also served as a means of triangulation, i.e., observation data were later compared with interview and discourse data.



## CHAPTER 4: RESULTS

This chapter describes the findings based on data analyses and presents the findings in the order in which the research questions were asked. Before answering the first research questions, the participants are described in greater detail based on data collected from the first questionnaire. Next, findings related to the computer-mediated discourse analysis (CMDA) of reflection levels are presented. Both descriptive and inferential statistics are presented to illustrate the effect of the online tool and scaffold type on the levels of reflection as coded by two different schemes. Last, data from the second questionnaire, participant interviews, and researcher observations are presented to triangulate findings and to identify factors that might have contributed to the observed levels of reflection.

### Participant Characteristics

A total of 48 out of 96 PSTs who enrolled in the Spring 2005 semester of EC301 participated in this study. Forty-six out of 48 participants submitted complete and error-free initial questionnaires, resulting in a response rate of 96%. Questionnaire items related to demographics, Internet tool preferences, Internet-related abilities, and reflection characteristics were analyzed to describe the overall characteristics of the 46 respondents.

#### *General Demographics*

All the participants were Caucasian, predominantly female, and in their early 20s. The majority of the participants were female (85%) and the minority were male (15%). They were typically 20 to 21 years old, with only one male individual who was 43. Eighty-three percent were juniors while 17% were seniors.

### *Internet Tool Preferences*

As this study relied heavily on using Web-based tools for reflective discourse, the preferences of participants were analyzed. In terms of preferred computing platform, 76% indicated that they preferred using PCs, 4% preferred using Macs, and 20% were comfortable using both. In terms of Web browser preferences, 74% indicated they used Microsoft Internet Explorer (MSIE), 24% Mozilla Firefox, and 2% Netscape. Overall, about three-quarters of the participants were MSIE and solely PC users.

### *Internet-related Abilities*

Participants were asked to rate their abilities with various Internet-related tasks on a 5-point Likert-type scale (5=excellent; 4=good; 3=average; 2=poor; 1=very poor or not at all). Participants reported that their skills were above average with respect to email (M=4.43, SD=0.72), Web browsing (M=4.28, SD=0.62), and using discussing forums employed in Oncourse (M=3.98, SD=0.88). However, they were average to poor with respect to blogging (M=2.65, SD=1.30) and maintaining their own Web pages (M=2.35, SD=0.85). Based on these data, it appeared that the participants were more familiar with using online discussion forums than blogs.

### *Reflection Characteristics*

As this study focused on the quality of PSTs' reflection, data on their previous experiences with, and preferences for, reflection were analyzed. A majority of the participants (83%) could recall that they had been asked to reflect as part of previous coursework. However, only 28% indicated that they were required to maintain a journal or diary as part of coursework.

Participants were asked to rate reflection statements on a 5-point Likert-type scale (5=strongly agree; 4=agree; 3=neutral; 2=disagree; 1=strongly disagree). When asked if they

considered themselves to be reflective, 17.4% strongly agreed, 63.0% agreed, and 19.6% were neutral. When asked if reflection was NOT important, 21.7% strongly disagreed, 54.3% disagreed, and 23.9% were neutral. Based on these data, four out of five of the participants considered themselves to be reflective and three-quarters considered reflection to be important.

Participants were then asked to state their preferred method of reflection (individually or collaboratively). The preference for individual reflection was as follows: 82.6% strongly agreed or agreed, 13.0% were neutral, 40.4% disagreed or strongly disagreed. The preference for collaborative reflection was as follows: 54.4% strongly agreed or agreed, 26.1% were neutral, 19.6% disagreed or strongly disagreed. Based on these data, there seemed to be a strong preference or mindset for reflection as an individual activity.

The questionnaire also included an open-ended question that required participants to provide a personal definition of reflection. The majority of definitions revolved around the idea that reflection was *introspective* and *reactive* in nature. A typical statement was "...looking back on something and thinking about what you've learned or simply how it affected you." Of the 46 respondents, only three indicated that reflection was *proactive* in that it might affect what they did in future (e.g., "Thinking about past action, thoughts and how I would change what I did or said") and only six indicated that reflections should be recorded (e.g., "Looking back onto your experience that you went through. Writing your feelings and words down on to paper").

#### *Participant Characteristics Summary*

In summary, four out of five the participants could recall being required to reflect as part of prior coursework but only about one in four recalled being asked to record their reflections. Four out of five of the participants considered themselves to be reflective and preferred to reflect

individually. Finally, most of the participants had a very basic understanding of reflection in that it was considered reactive in nature.

#### Research Questions One and Two: Differences Due to Tools and Scaffolds?

Based on the nature of analyses of reflective discourse data, it was more convenient and efficient to answer the first two research questions together. The first research question was: What were the quantitative and qualitative differences between preservice teachers' reflections in discussion forums and blogs? The second research question was: What were the quantitative and qualitative differences between preservice teachers' reflections when scaffolding was minimal and when it was enhanced? Answers to these questions are provided in three main stages. First, measures of participation are described to highlight broad similarities or differences in reflective discourse between treatment groups. Second, structural measures in the form of length measures, pronoun frequencies, and formality measures are described to define the genre of discourse as well as highlight similarities or differences in reflective writing among treatment groups. Third, graphical representations and inferential statistics are used to describe the similarities or differences in reflection levels among treatment groups.

#### *Participation Measures*

The total number of words written by the participants in each group was calculated in order to determine the average number of words each participant wrote in the video case critique and post lesson plan reflection assignments. This allowed a rough comparison of reflective writing among treatment groups. The findings are presented in Table 4.1 and represented graphically in Figures 4.1 and 4.2. Three participants did not submit the post lesson plan reflection assignment.

In the video case critique, the bloggers wrote more on average than those who used the forum to reflect. This was the case whether they were using the minimal scaffold ( $S_0$ ) or the enhanced scaffold ( $S_1$ ). PSTs whose reflections were supported with the enhanced scaffold wrote an average of three times more than those who were supported with the minimal scaffold.

Table 4.1

*Participation measures of reflective discourse in the four treatment groups*

<b>Video case critique</b>					
Treatment group	$T_F S_0$	$T_B S_0$	$T_F S_1$	$T_B S_1$	Total
No. of participants	9	15	8	16	48
No. of words written by group	872	1,552	2,615	5,680	10,719
Least no. of words	50	61	203	241	
Most no. of words	164	140	713	530	
Avg. no. of words per participant	96.9	103.5	326.9	355.0	

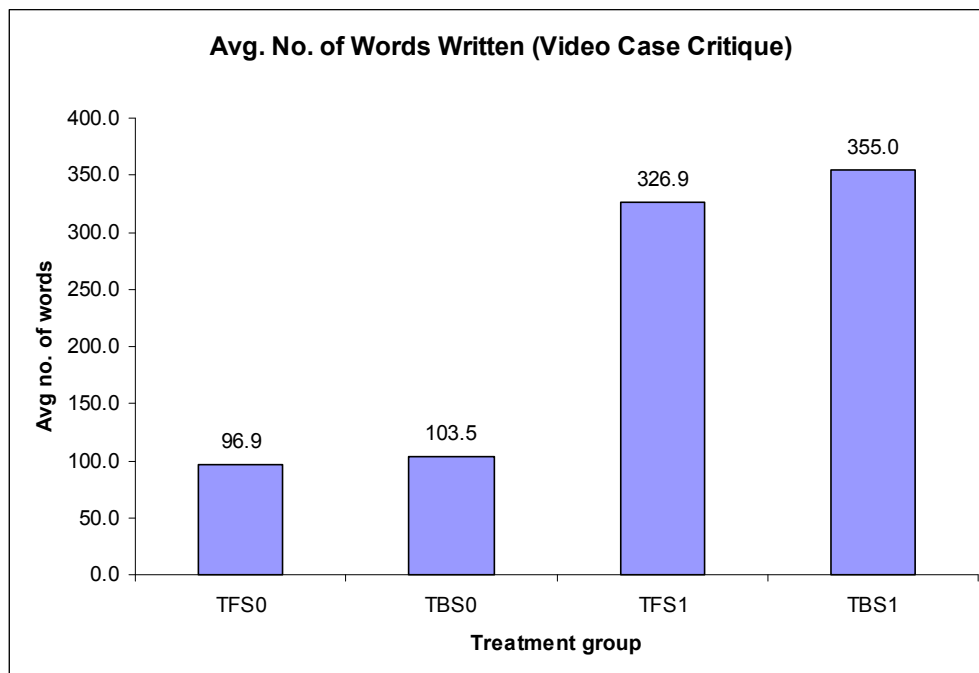
  

<b>Post lesson plan reflection</b>					
Treatment group	$T_F S_0$	$T_B S_0$	$T_F S_1$	$T_B S_1$	Total
No. of participants	9	15	6	15	45
No. of words written by group	2,010	2,837	1,837	5,767	12,451
Least no. of words	99	133	182	225	
Most no. of words	325	356	464	537	
Avg. no. of words per participant	223.3	189.1	306.2	384.5	

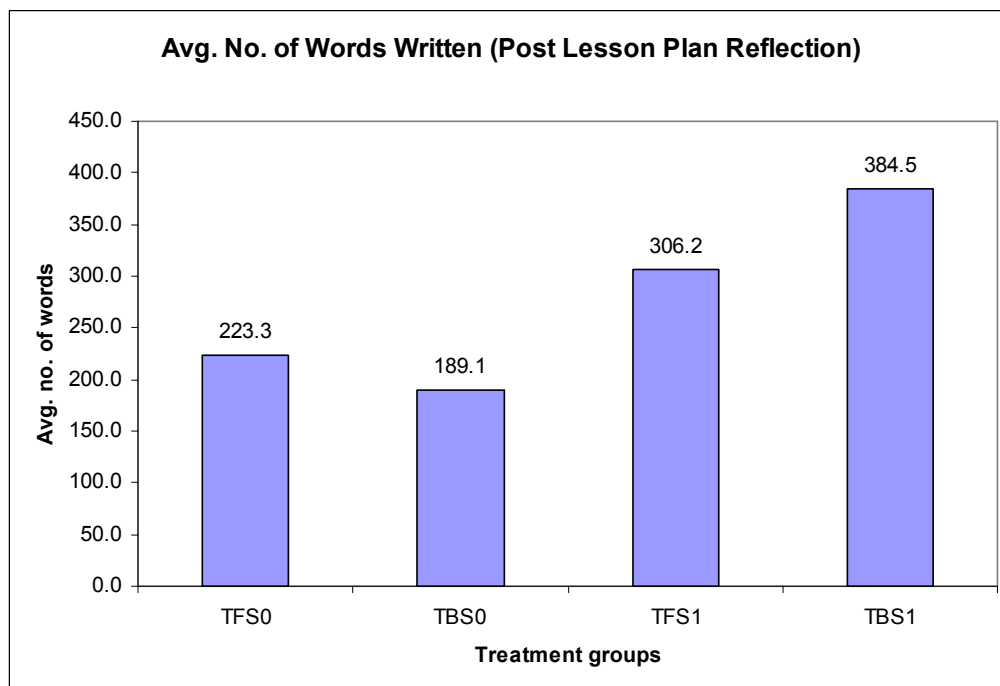
For the post lesson plan reflection assignment, PSTs whose reflections were supported with the enhanced scaffold wrote more than those who were supported the minimal scaffold, as was the case with the video case assignment. Like the video case assignment, bloggers wrote more on average (384.5 words) than forum users (306.2 words) when they used the enhanced scaffold. However, unlike the video case assignment, bloggers wrote less (189.1 words) than forum users (223.3 words) when they used the minimal scaffolds.

*Structural Measures*

*Length measures.* The average utterance (sentence) lengths of all four treatment groups were calculated for comparison and the findings are presented in Table 4.2. The measure of



*Figure 4.1.* Average number of words written by PSTs in each treatment group for the video case critique assignment



*Figure 4.2.* Average number of words written by PSTs in each treatment group for the post lesson plan reflection assignment

utterance lengths was used to place the reflective writing along the speech to formal writing continuum.

Table 4.2

*Length measures of reflective discourse in the four treatment groups*

<b>Video case critique</b>				
Treatment group	T <sub>F</sub> S <sub>0</sub>	T <sub>B</sub> S <sub>0</sub>	T <sub>F</sub> S <sub>1</sub>	T <sub>B</sub> S <sub>1</sub>
Total no. of characters	4,046	7,449	12,042	26,499
Total no. of words	872	1,552	2,615	5,680
Total no. of utterances	44	88	147	290
Ave. word length	4.6	4.8	4.6	4.7
Ave. utterance length	19.8	17.6	17.8	19.6

<b>Post lesson plan reflection</b>				
Treatment group	T <sub>F</sub> S <sub>0</sub>	T <sub>B</sub> S <sub>0</sub>	T <sub>F</sub> S <sub>1</sub>	T <sub>B</sub> S <sub>1</sub>
Total no. of characters	9,280	13,057	7,886	26,529
Total no. of words	2,010	2,837	1,837	5,767
Total no. of utterances	111	155	97	316
Ave. word length	4.6	4.6	4.3	4.6
Ave. utterance length	18.1	18.3	18.9	18.2

Overall, the average utterance lengths ranged from 17.6 to 19.8 words. In terms of length measures, this placed the reflective discourse in between email (16.4 words) and memo writing (19.9 words) (Cho, in press). The average utterance lengths for the post lesson plan reflection were very similar among all four treatment groups (ranging from 18.1 to 18.9) while the range of average utterance length was wider (from 17.6 to 19.8) for the video case assignment. There was no clear pattern when comparing between online tool treatment groups or scaffold treatment groups.

*Pronoun frequencies.* The frequencies of first (I, me, my, mine, we, us, ours), second (you, your, yours), and third (he, him, his, she, her, hers, they, them, theirs) person pronouns

were calculated and compared across groups in order to gauge how personal the reflections were. The findings are summarized in Table 4.3 and Figures 4.3 and 4.4.

Third person pronouns dominated in the video case assignment (Figure 4.3) whereas first person pronouns dominated in the post lesson plan reflection (Figure 4.4). This was expected since PSTs critiqued a teacher in the video case but reflected on their own work in the post lesson plan reflection assignment.

An interesting finding was that in the video case assignment, bloggers used proportionately more first person pronouns than their counterparts who used forums when scaffolding was held constant (e.g.,  $T_{BS_0}=8.4 > T_{FS_0}=5.7$ ). However, the pattern did not repeat itself for the first person pronouns for the post lesson plan reflection.

Table 4.3

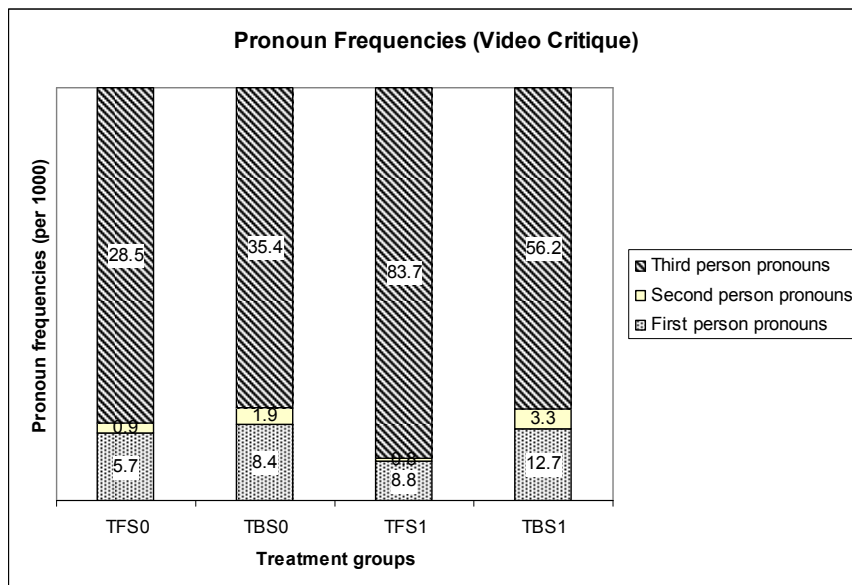
*Pronoun frequencies in the reflective discourse in the four treatment groups*

<b>Video case critique</b>				
Treatment group	Pronoun frequencies (ratio per 1000 words)			
	$T_{FS_0}$	$T_{BS_0}$	$T_{FS_1}$	$T_{BS_1}$
First person pronouns	5.7	8.4	8.8	12.7
Second person pronouns	0.9	1.9	0.8	3.3
Third person pronouns	28.5	35.4	83.7	56.2

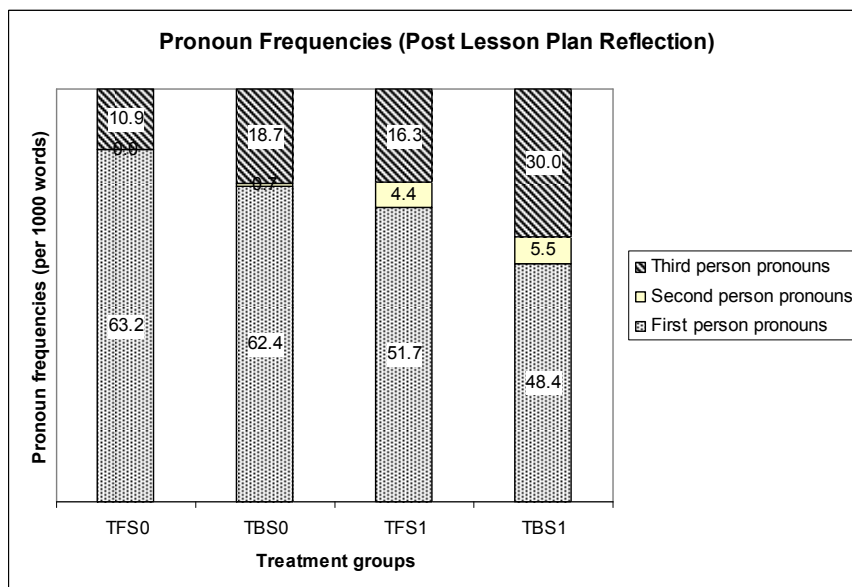
  

<b>Post lesson plan reflection</b>				
Treatment group	Pronoun frequencies (ratio per 1000 words)			
	$T_{FS_0}$	$T_{BS_0}$	$T_{FS_1}$	$T_{BS_1}$
First person pronouns	63.2	62.4	51.7	48.4
Second person pronouns	0.0	0.7	4.4	5.5
Third person pronouns	10.9	18.7	16.3	30.0





*Figure 4.3.* Pronoun frequencies (per 1000 words) in each treatment group for the video case critique assignment



*Figure 4.4.* Pronoun frequencies (per 1000 words) in each treatment group for the post lesson plan reflection assignment

For both assignments, when the tool variable was held constant, the use of enhanced scaffolds always resulted in greater use of third person pronouns when compared to minimal scaffold (e.g.,  $T_{FS1}=83.7 > T_{FS0}=28.5$ ). Another noteworthy finding was that in the post lesson plan reflection, the use of enhanced scaffolds resulted in greater use of third person pronouns (e.g.,  $T_{FS1}=16.3 > T_{FS0}=10.9$ ) and simultaneously reduced the use of first person pronouns (e.g.,  $T_{FS1}=51.7 < T_{FS0}=63.2$ ). Overall, the enhanced scaffold seemed to promote writing that might be considered less personal or more outward-looking.

*Measures of formality.* The frequencies of contractions (e.g., “don’t” over “do not”) and nominalizing suffixes (e.g., “-ment”, “-tion”) were calculated and compared across groups in order to gauge how formal the reflections were. The use of contractions would be indicative of informal writing while the use of nominalizing suffixes would indicate more formal writing. The findings are summarized in Table 4.4.

Table 4.4

*Formality measures of the reflective discourse in the four treatment groups*

<b>Video case critique</b>				
	Frequencies (ratio per 1000 words)			
Treatment group	$T_{FS0}$	$T_{BS0}$	$T_{FS1}$	$T_{BS1}$
Contractions	0.0	0.0	0.0	0.2
Nominalizing suffixes	9.2	21.9	17.2	13.6

<b>Post lesson plan reflection</b>				
	Frequencies (ratio per 1000 words)			
Treatment group	$T_{FS0}$	$T_{BS0}$	$T_{FS1}$	$T_{BS1}$
Contractions	0.0	0.0	0.0	0.2
Nominalizing suffixes	24.9	18.7	8.2	14.7

These data indicate that overall the reflective writing was much more formal than informal. The use of enhanced scaffolds reduced the ratio of nominalizing suffixes with one

exception. When critiquing the video case, forum users who had the enhanced scaffold were more formal than those who had the minimal scaffold ( $T_{FS1}=17.2 < T_{FS0}=9.2$ ). There was no consistent trend when comparing the effect of the tool.

### *Summary of Participation and Structural Findings*

When the tool variable was held constant, the use of enhanced scaffolds seemed to promote reflections that were longer on average than when the scaffold was minimal, more outward-looking (less self-referencing) in the form of writing, and less formal in nature. When the scaffold variable was held constant, there was no clear effect of the online tool on these measurements.

### *Comparison of Reflection Levels*

PST reflective discourse was coded according to two schemes: A modified version of Hawkes and Romiszowski's (2001) reflection rubric (henceforth referred to as Coding Scheme 1) and a modified version of Crotty and Allyn's (2001) reflection scale (Coding Scheme 2). The analysis of reflection levels in each reflection assignment took place in two broad steps. First, the total number of references to each reflection level was tallied and expressed as percentages of the total number of coded segments for each treatment group (Tables 4.5 and 4.6). For example, for the video case assignment by the  $T_{FS0}$  group (Table 4.5), the percentage of reflection at level I (Coding Scheme 1) was calculated by dividing the number of segments coded at level I (2) by the total number of segments for that group (27). This resulted in the figure of 7.4%. Graphs were then generated to provide visual representations of the differences in reflection levels (Figures 4.5 and 4.6). Second, the differences in reflection levels were analyzed to determine if the observed differences were statistically significant. In both steps, comparisons of reflection

levels were made between online tool treatments (forum or blog) and then between scaffold type treatments (minimal or enhanced).

Table 4.5

*Video case critique assignment: Reflection levels as percentages of the total number of coded segments in each treatment group*

Coding Scheme 1 (H&R)							
Level	I	II	III	IV	V	VI	VII
T <sub>F</sub> S <sub>0</sub>	7.4%	66.7%	3.7%	3.7%	18.5%	0.0%	0.0%
T <sub>F</sub> S <sub>1</sub>	6.3%	53.1%	4.7%	14.1%	21.9%	0.0%	0.0%
T <sub>B</sub> S <sub>0</sub>	28.9%	57.8%	0.0%	11.1%	2.2%	0.0%	0.0%
T <sub>B</sub> S <sub>1</sub>	7.0%	54.7%	13.3%	18.0%	6.3%	0.8%	0.0%

Coding Scheme 2 (C&A)							
Levels	0	I	II	III	IV	V	VI
T <sub>F</sub> S <sub>0</sub>	7.4%	48.1%	22.2%	0.0%	22.2%	0.0%	0.0%
T <sub>F</sub> S <sub>1</sub>	6.3%	34.4%	21.9%	4.7%	28.1%	4.7%	0.0%
T <sub>B</sub> S <sub>0</sub>	31.1%	44.4%	15.6%	0.0%	8.9%	0.0%	0.0%
T <sub>B</sub> S <sub>1</sub>	7.0%	36.7%	21.1%	12.5%	15.6%	6.3%	0.8%

Table 4.6

*Post lesson plan reflection: Reflection levels as percentages of the total number of coded segments in each treatment group*

Coding Scheme 1 (H&R)							
Levels	I	II	III	IV	V	VI	VII
T <sub>F</sub> S <sub>0</sub>	8.9%	82.2%	0.0%	4.4%	4.4%	0.0%	0.0%
T <sub>F</sub> S <sub>1</sub>	20.0%	61.4%	2.9%	1.4%	0.0%	0.0%	0.0%
T <sub>B</sub> S <sub>0</sub>	24.0%	66.7%	2.7%	2.7%	4.0%	0.0%	0.0%
T <sub>B</sub> S <sub>1</sub>	15.6%	54.4%	8.8%	6.3%	8.1%	0.6%	0.0%

Coding Scheme 2 (C&A)							
Levels	0	I	II	III	IV	V	VI
T <sub>F</sub> S <sub>0</sub>	8.9%	44.4%	37.8%	0.0%	4.4%	4.4%	0.0%
T <sub>F</sub> S <sub>1</sub>	20.0%	40.0%	21.4%	2.9%	1.4%	0.0%	0.0%
T <sub>B</sub> S <sub>0</sub>	24.0%	33.3%	33.3%	2.7%	2.7%	4.0%	0.0%
T <sub>B</sub> S <sub>1</sub>	15.6%	21.9%	32.5%	8.8%	7.5%	7.5%	0.0%

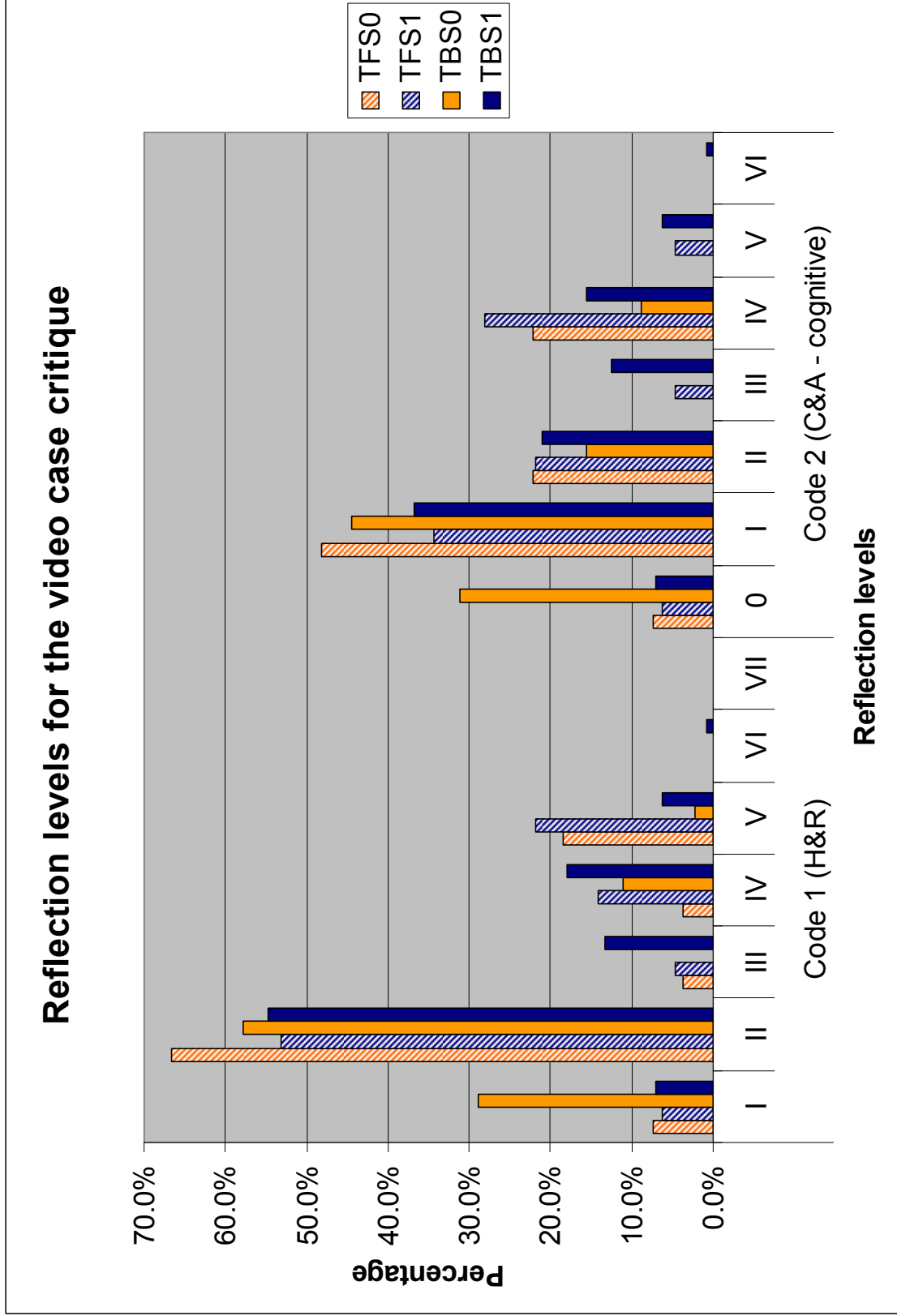


Figure 4.5. Reflection levels for the video case critique assignment

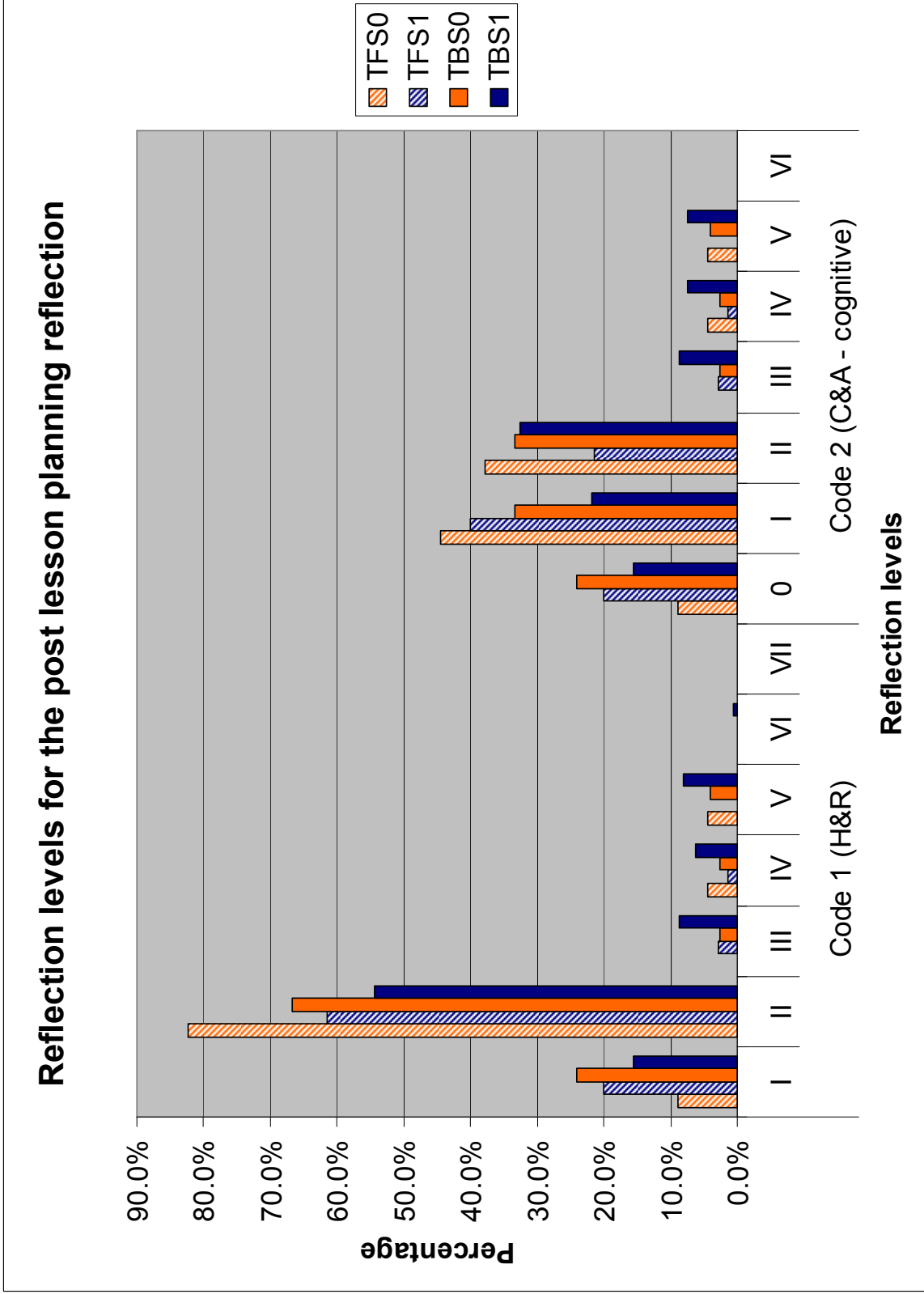


Figure 4.6. Reflection levels for the post lesson plan reflection assignment

Focusing first on the video case assignment, it was clear that lower levels of reflection dominated. This was the case for levels I and II of Coding Scheme 1 and levels 0, I, and II for Coding Scheme 2. Levels I and II of Coding Scheme 1 accounted for as low as 59.4% of the coded segments in treatment group  $T_{FS1}$  and as high as 86.1% in treatment group  $T_{BS0}$ . Levels 0, I, and II of Coding Scheme 2 accounted for as low as 62.6% of the coded segments in treatment group  $T_{FS1}$  and as high as 91.1% in treatment group  $T_{BS0}$ .

Two interesting trends that emerged when comparing the effect of scaffolding and keeping the tool constant (Figure 4.5, compare lined bars with one another and compare bold colored bars with one another). When considering levels I and II (Coding Scheme 1), the use of minimal scaffolding always resulted in a greater percentage of these levels of reflection than enhanced scaffolding. Likewise, when considering levels 0 and I (Coding Scheme 2), the use of minimal scaffolding always resulted in a greater percentage of these levels of reflection than enhanced scaffolding. However, from level III onwards of both Coding Schemes, the use of enhanced scaffolding always resulted in a greater percentage of these levels of reflection than minimal scaffolding. If reflections of level III or more of both coding schemes are considered higher levels of reflection, then the use of enhanced scaffolding may have promoted higher levels of reflection.

The trend described earlier did not repeat itself when comparing the effect of tool type while keeping scaffolding type constant (Figure 4.6, compare light bars with one another and compare dark bars with one another). The online tool used did not have a consistent effect on promoting or hindering any particular level of reflection for the video case assignment.

Like the video critique assignment, lower levels of reflection were dominant in the post lesson plan assignment. Levels I and II of Coding Scheme 1 accounted for as low as 70.0% of

the coded segments in treatment group  $T_{BS_1}$  and as high as 91.1% in treatment group  $T_{FS_0}$ . Likewise, levels 0, I, and II of Coding Scheme 2 accounted for as low as 70.0% of the coded segments in treatment group  $T_{BS_1}$  and as high as 91.1% in treatment group  $T_{FS_0}$ .

However, the other trends for the post lesson plan reflection assignment were less clear than those of the video critique assignment. The only notable trend that emerged was when comparing the effect of scaffolding on blog users' reflections (Figure 4.6, compare bold shaded bars with one another). When considering levels I and II (Coding Scheme 1), the use of minimal scaffolding always resulted in a greater percentage of these levels of reflection than enhanced scaffolding. Likewise, when considering levels 0 to II (Coding Scheme 2), the use of minimal scaffolding always resulted in a greater percentage of these levels of reflection than enhanced scaffolding. However, from level III (of Coding Schemes 1 and 2) onwards, the use of enhanced scaffolding always resulted in a greater percentage of these levels of reflection than minimal scaffolding. This suggests that the use of enhanced scaffolding promoted higher levels of reflection in with blog use. This pattern did not repeat itself when comparing the effect of scaffolding for the forum users.

#### *Summary of Visual Comparison of Reflection Levels*

In both assignments, lower levels of reflection dominated the discourse. In the video critique assignment, the use of enhanced scaffolds promoted higher levels of reflection regardless of the tool used. In the post lesson planning reflection assignment, only the use of blogs with enhanced scaffolds promoted higher levels of reflection.

#### *Statistical Comparison of Reflection Levels*

The ANOVA of reflection levels based on both coding schemes revealed that there was no significant difference for the effect of tool type ( $P > 0.05$ ). However, the type of scaffolding



had a significant impact on the reflection levels ( $P < 0.05$ ). To determine how the type of scaffolding influenced PST reflection, independent t-tests were performed to compare the means of each reflection level for each coding scheme. The results of the comparisons are shown in Tables 4.7 and 4.8. As multiple comparisons were made between means of reflection levels, the Bonferroni adjusted alpha-level ( $\alpha = 0.0071$ ) was used to determine statistical significance.

The statistical analyses only indicate that significant differences exist between some reflection levels as a result of different scaffold use. To determine if the scaffold hindered or promoted each level of reflection, the results in Tables 4.7 and 4.8 were compared with Figures 4.5 and 4.6 respectively.

As with the visual comparison, reflection levels III and upward from both coding schemes were considered higher levels of reflection because they included at the minimum the use of pedagogical terms and applications of theory. Reflection level II and below for both coding schemes were considered lower levels of reflection.

In the comparison of reflections levels from the video critique assignment (Table 4.7 and Figure 4.5), for coding scheme 1, the enhanced scaffolds significantly reduced level II reflections (low level) and significantly promoted levels III through V (higher levels). For coding scheme 2, the enhanced scaffolds significantly reduced levels I reflection (lower level) and significantly promoted levels III through V (higher levels).

The pattern was less consistent and extensive for the comparison of reflections levels from the post lesson plan reflection (Table 4.8 and Figure 4.6). For coding scheme 1, the enhanced scaffold had a significant impact on level I and it seemed to promote it with forums but hinder it with blogs. This was also the case for level 0 of coding scheme 2. For coding scheme 1, the enhanced scaffolds significantly reduced level II (lower level) and promoted level III (higher

level). Likewise for coding scheme 2, the enhanced scaffolds significantly reduced level II (lower level) and promoted level III (higher level).

Table 4.7

*Significance values of reflection levels as a result of different scaffold types for the video critique assignment*

Coding Scheme 1		Coding Scheme 2	
Level	P value	Level	P value
I	.660	0	.849
II	<b>.000</b>	I	<b>.000</b>
III	<b>.000</b>	II	<b>.000</b>
IV	<b>.000</b>	III	<b>.000</b>
V	<b>.007</b>	IV	<b>.000</b>
VI	.328	V	<b>.000</b>
VII	N.A.	VI	.328

Note: Significant P values highlighted in bold were based on the Bonferroni adjusted level of significance ( $0.05/m=0.0071$  where  $m=7$  and  $m$  was the number of pairs of means compared).

Table 4.8

*Significance values of reflection levels as a result of different scaffold types for the post lesson plan reflection assignment*

Coding Scheme 1		Coding Scheme 2	
Level	P value	Level	P value
I	<b>.002</b>	0	<b>.002</b>
II	<b>.000</b>	I	.030
III	<b>.000</b>	II	<b>.000</b>
IV	.076	III	<b>.000</b>
V	.069	IV	.083
VI	.329	V	.018
VII	N.A.	VI	.329

Note: Significant P values highlighted in bold were based on the Bonferroni adjusted level of significance ( $0.05/m=0.0071$  where  $m=7$  and  $m$  was the number of pairs of means compared).

### *Summary of Statistical Comparison of Reflection Levels*

The ANOVA of reflection levels revealed that there was no significant difference for the effect of tool type ( $P > 0.05$ ). However, the type of scaffolding had a significant impact on the reflection levels ( $P < 0.05$ ). In the case of the video critique assignment, the enhanced scaffolds significantly hindered lower levels of reflection, i.e., level II of coding scheme 1 and levels I and II of coding scheme 2. The enhanced scaffolds also significantly promoted higher levels of reflection, i.e., levels III, IV, and V of both coding schemes. In the case of the post lesson plan reflection, the enhanced scaffold significantly hindered level II reflections of both coding schemes and significantly promoted level III reflections of both coding schemes.

#### Research Question Three: Interaction Between Tool and Scaffold Variables?

The third research question was: In terms of reflection, how did the tool and scaffolding variables moderate or interact with each other in the following situations

- forum with scaffolds vs. blogs with no scaffolds?
- forum with no scaffolds vs. blogs with scaffolds?

The ANOVA of reflection levels for both coding schemes revealed that there was no significant difference in the interaction of tool type and scaffold type ( $P > 0.05$ ). As a result, the tool and scaffold variables appeared to affect PST reflections independently.

#### Research Question Four: Reasons for Differences in Reflection Levels?

One critical finding from the first two research questions was that the use of enhanced scaffolding promoted higher level reflections regardless of tool use for the video critique assignment. The other was that the use of enhanced scaffolding promoted higher level reflections with blogs for the post lesson planning assignment. The final research question was: What might have accounted for any observed differences in reflection levels between the treatment groups?

To answer this question, three sources of data were analyzed: the two questionnaires, interviews with a sub-sample of eight preservice teachers and the instructor, and researcher observations of the classroom both face-to-face and online.

### *Findings from the Questionnaires*

*First questionnaire.* Forty-six out of 48 participants submitted complete and error-free initial questionnaires, resulting in a response rate of 96%. Chi-square tests were conducted to determine the homogeneity of the treatment groups based on gender, year in college, prior experience with journal writing, prior experience with reflecting, perceived ability to reflect, perceived importance of reflection, and technical ability with forum and blog tools. There were no significant differences across the groups for all measures ( $P > 0.05$ ). These factors did not appear to significantly influence reflection levels.

*Second questionnaire.* Forty-one out of a total of 48 participants submitted complete and error-free follow up questionnaires, resulting in a response rate of 85%. Results from the questionnaire helped to partially explain why enhanced scaffolding may have had a more statistically significant impact on promoting higher levels of reflection than tool type. These results are presented first before results from the interviews and observations.

*Findings related to tool use.* Two questionnaire items recorded the opinions of the PSTs concerning the helpfulness of the online tools for reflection. One item required PSTs to rate the online tool assigned to them for reflection (Table 4.9). On average, just over 60% rated the tools they used for reflection to be average, poor, or very poor. Based on this finding, a considerable portion of PSTs were not convinced that the tool assigned to them helped them reflect.

A second questionnaire item asked PSTs to provide reasons for their ratings of the tool. One commonly cited reason was the way the course or assignments were designed and

conducted. For example, PSTs who thought that forums did not help them reflect mentioned “Oncourse was not very interactive, you did not get feed back [sic] right away” and “I just didn't like oncourse [sic] all that much, because it seemed somewhat tedious the way the discussion forums are set up.” A PST who thought that blogs did not help with reflection said, “I didn't like posting because it was like the same thing every week.”

Table 4.9

*PSTs ratings of their assigned online tools for reflection*

	Forum users		Blog users		Average	TOTAL
	T <sub>F</sub> S <sub>0</sub>	T <sub>F</sub> S <sub>1</sub>	T <sub>B</sub> S <sub>0</sub>	T <sub>B</sub> S <sub>1</sub>		
Excellent	11.1%	0.0%	15.4%	15.4%	10.5%	39.0%
Good	66.7%	16.7%	7.7%	23.1%	28.5%	
Average	22.2%	66.6%	46.1%	61.5%	49.1%	61.0%
Poor	0.0%	16.7%	7.7%	0.0%	6.1%	
Very poor	0.0%	0.0%	23.1%	0.0%	5.8%	
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%	

Another recurrent reason for not liking the online tools was personal preferences. An Oncourse user remarked, “I do not write down my reflections all that well. I am more of a vocal person. I can express myself through talking better than I can with written words.” One blogger said, “I didnt [sic] really use it until we made the portfolios, I never looked at it to reflect, it was hard to read” while another commented “I did not really over-exert myself because I did not like the blogging.” Technical difficulty with tool use was cited only once (“Blogger was confusing... I think it would be more useful to use to post on oncourse [sic]”).

In summary, one reason why the use of the tools was not viewed favorably was because of personal preferences for some other mode of reflecting. The second reason was that the use of

the tools was associated with the design and conduct of the course. Data suggests that if PSTs did not like the way EC301 was conducted, they did not like to use the associated tools.

*Findings related to scaffold use.* A total of five questionnaire items recorded the opinions of the PSTs concerning the helpfulness of the scaffolds. When asked if the video critique scaffolds helped them reflect online, 70.7% strongly agreed or agreed, 22.0% were undecided, and 7.3% disagreed or strongly disagreed. When asked if the post lesson plan reflection scaffolds helped them reflect online, 75.6% strongly agreed or agreed, 19.5% were undecided, and 4.9% disagreed or strongly disagreed. Another questionnaire item required them to rate the scaffolds they received for each assignment (Tables 4.10 and 4.11). On average, at least half of the respondents rated both scaffolds as excellent or good at helping them reflect online.

When asked to provide reasons for their ratings, PSTs who used the minimal and enhanced scaffolds provided very similar answers. For example, some PSTs who used minimal scaffolds mentioned:

- “The templates were helpful to start the papers.”
- “They just told you what to write/look for, it was pretty easy to follow” and “It was nice to have specific questions that had to be answered.”
- “They really help give you guiding questions to reflect on, so that we are actually taking time to base our reflection on one question instead of thinking about a lesson as a whole. It breaks down the work for you into a smaller, easier to handle, question.”

Likewise, PSTs who used enhanced scaffolds mentioned:

- “It is always extremely helpful to have a template for an assignment because they are great guides for what you need to do and makes the work easier and faster to get done.”

- “The templates made it easy to reflect on the video critique and the lesson plan. It took me through the video critique and the lesson plan step by step and encouraged me to look at smaller parts of each instead of the whole thing.”

Table 4.10

*PSTs ratings of their assigned scaffolds for the video case assignment*

	Minimal scaffolds		Enhanced scaffolds		Average	TOTAL
	T <sub>FS0</sub>	T <sub>BS0</sub>	T <sub>FS1</sub>	T <sub>BS1</sub>		
Excellent	11.2%	30.8%	0.0%	23.1%	16.3%	51.5%
Good	44.4%	15.4%	50.0%	30.8%	35.2%	
Average	44.4%	38.4%	50.0%	38.4%	42.8%	48.5%
Poor	0.0%	7.7%	0.0%	7.7%	3.8%	
Very poor	0.0%	7.7%	0.0%	0.0%	1.9%	100.0%
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%	

Table 4.11

*PSTs ratings of their assigned scaffolds for the post lesson plan reflection assignment*

	Minimal scaffolds		Enhanced scaffolds		Average	TOTAL
	T <sub>FS0</sub>	T <sub>BS0</sub>	T <sub>FS1</sub>	T <sub>BS1</sub>		
Excellent	11.1%	30.8%	0.0%	23.1%	16.2%	54.2%
Good	55.6%	7.7%	50.0%	38.5%	37.9%	
Average	11.1%	46.2%	50.0%	38.5%	36.4%	45.8%
Poor	22.2%	7.7%	0.0%	0.0%	7.5%	
Very poor	0.0%	7.7%	0.0%	0.0%	1.9%	100.0%
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%	

Based on these answers, the reported benefits were that both types of scaffolds provided guidance, structure, and focus during the reflective process. In addition, users of the enhanced scaffolds mentioned the following:

- “I rate it this because many of my classes do not offer templates. I feel like these templates for reflection include questions that generate a response that requires a bit more brainwork.”

- “They were good in giving ideas for what to reflect on and sometimes they gave ideas that I hadn't thought of, and that gave my reflection more depth.”

The benefit mentioned for the enhanced scaffolds that were not mentioned by users of the minimal scaffolds was that the former encouraged PSTs to think more deeply about issues.

### *Findings from the Interviews*

Much data was collected from the interviews with the eight PSTs (two from each treatment group) and the EC301 course instructor. However, only the analysis of data that were relevant to four issues are presented to answer the following questions:

1. What were the PSTs previous experiences with reflection? How might they have influenced their ability to reflect as they completed the EC301 assignments?
2. What forms of soft scaffolding (if any) did the PSTs provide one another and the instructor provide for the PSTs? How might these have affected the levels of reflection online?
3. Why did the enhanced scaffolds promote higher levels of reflection?
4. Why did the online tools not have a consistent influence on the levels of reflection?

In seeking answers to these questions, the researcher used the constant comparative method to determine if there were any differences in data from PSTs who rated themselves high in technology skills and ability to reflect (TR) versus those who rated themselves low in technology skills and reflection (tf). The researcher then compared the answers of the PST interviewees between treatment groups. In summarizing the interview findings, the interviewees are represented by their initials, the treatment group they were in, and their self-rated technology and reflection abilities in parentheses, e.g., LB (T<sub>F</sub>S<sub>1</sub>, TR) was a PST in the forum plus enhanced scaffold treatment group who rated herself high in technology skills and in her ability to reflect.



*What were the PST's previous experiences with reflection?* All interviewees recalled having to reflect in at least one other course they had taken prior to EC301. The most cited examples were mandatory field experiences where they had to maintain a journal while they observed a senior teacher's classroom. In most cases, the journal was described as paper-based and handwritten. Two PSTs from the T<sub>B</sub>S<sub>1</sub> group and one from the T<sub>B</sub>S<sub>0</sub> group described having to later submit a word-processed version of their handwritten reflections.

In all the examples cited, there were few or no guidelines on the requirements for these reflections. In the case of field experiences, a few PSTs recalled being given broad guidelines on submitting a paper on what the classroom teacher did, how the students reacted to the teacher and the lesson, and what the PSTs thought and felt about what they observed. One PST, AC (T<sub>F</sub>S<sub>1</sub>, tr), described a content-related course he was taking where he was not given any structure or guidelines on how to maintain his journal. He said that his instructor was "very vague with his descriptions, he doesn't give us any expectations... do whatever you want he says." In summary, the interviewees' previous experiences with reflection were with traditional journals where the reflective writing was less structured.

*How might these experiences have influenced their ability to reflect as they completed the EC301 assignments?* The interviewees revealed that their prior experience with reflection gave them a running start in terms of being reflective thinkers. For example, LF (T<sub>B</sub>S<sub>0</sub>, TR) mentioned that she had internalized previous methods of reflection: "...because I have formatted many reflections before, those formats (such as what I liked, what I didn't like, and what I would change for next time) are always in my mind." However, they highlighted differences in the way they were required to reflect in EC301 compared to their previous course work. For example, JH (T<sub>F</sub>S<sub>1</sub>, tr) said prior experience with reflection "affected my reflections somewhat because it

provided the foundation for my reflecting process. However, the reflections in EC301 were very different than [sic] my earlier reflections because the EC301 reflections were guided reflections with specific questions to answer.” However, BY (T<sub>BS1</sub>, TR) considered the reflective process to be the same but the focus different: “[In the field experience,] you’re looking at how the students interacted with what you did, how they, um, reacted to it, if they got anything out of it. So it’s basically the same process only more specific to what you are doing. So I think, yeah, definitely, prior reflecting affected [EC301 reflections].” In short, prior experience with reflection provided PSTs with a foundation on reflective writing. However, the PSTs recognized that the manner in which they were required to reflect and the content which they reflected upon were different in EC301.

*What forms of soft scaffolding (if any) did the PSTs provide one another?* While EC301 was conducted in a blended environment, much of the course was taught face-to-face. All interviewees indicated that they liked being able to meet face-to-face in their assigned groups to discuss their lesson plans. They did not discuss the video case critiques because they were individual assignments. They identified the benefits of working in groups as being able to get feedback, exchanging ideas or getting different perspectives, and spotting mistakes in their lesson plans. The instructor summed it up when she said they found PST peer critiques helpful because they got “a second set of eyes to look at [it] in case the instructor missed something or, um, they themselves missed something.” However, the “soft” scaffolding PSTs provided one another was essentially from a hard scaffold. This was because they were provided with handouts with guiding questions to help them critique one another’s lesson plans.

Despite the perceived benefits of meeting face-to-face, AC (T<sub>F</sub>S<sub>1</sub>, tr) mentioned that it was difficult to remain on task because of the limited amount of time allocated to group

discussions (see Observation results). SK ( $T_{FS_0}$ , TR) mentioned another negative aspect of the face-to-face discussions:

I think that they could have been helpful, but I think that we did it too many times. I think that this made it drag out in a way and to be honest, I do not think that people took them as seriously as we should have. I do not think that very many people changed their lesson plans very much, if at all. By this time we had written several lesson plans for Math and Science that we all felt very comfortable with it. Therefore, I do not feel we needed this much time to write the lesson plan or critique them.

The instructor felt that some of them might not have been comfortable in letting others read what they had prepared and that most PSTs thought that they had good lesson plans already:

I think that a lot of them feel like, you know, [pretends to be a PST] ‘Whatever I write is right’, you know, ‘Whatever lesson plan I come up with is the right thing, and no one need to critique it at this point’.

When asked if the PSTs used the set of scaffolds for in-class lesson plan critiques as expected, the instructor said that one PST told her that her peers were not critical enough and most were afraid to give constructive criticism. She described an example of PSTs using a rubric to grade one another’s lesson plans and how most of them rushed through the activity and gave each other full points.

They got done really fast, they gave everybody 30 out of 30s, and they were missing some really key points... There’s maybe one or two, maybe three people at the most that... gave me back the rubrics so I could see that they actually put in effort and wrote comments... The students are still so afraid to give that constructive criticism, you know, they want everything to be positive and lovely!

She believed that their attitudes were because lesson planning and critiquing were not yet real to the PSTs. She remarked “They need to be put in more real world contexts basically. I think it’s too ideal for them, [pretends to be a PST] oh, it’s just a class, doesn’t mean anything to me yet.”

In essence, the PSTs rarely provided one another with soft scaffolding in class because of time

constraints or because they did not appreciate the cyclic nature of reflection in EC301. When they did, it was based on the hard scaffolding that they had received.

*What forms of soft scaffolding (if any) did the instructor provide for the PSTs?* Seven out of the eight interviewees could not recall getting specific feedback online from the instructor. Some indicated that the feedback they received was general in nature and provided to everyone during class (see Observation results). Only one interviewee, LF (T<sub>B</sub>S<sub>0</sub>, TR), mentioned getting help via email from the instructor. She emailed the instructor about the amount of technology that she had incorporated into her science lesson plan. The instructor then provided direct instruction by suggesting what she considered was enough technology for that lesson.

The instructor reported that she supported the PSTs by meeting individually with them if they needed it and emailing them every day and replying to them as quickly as possible. The support was mostly technical in nature. She felt that she delivered the same content and presentation materials to all her classes and provided consistent support to all groups (see Observation results). However, she thought that she might have given more time and encouragement to the blog groups.

*How might the soft scaffolding have affected the levels of reflection online?* Based on the information gathered during the interviews, the “soft” scaffolding during face-to-face group work was actually based on the hard scaffolds that were provided as handouts. Two interviewees reported that they transferred this scaffolding online but there was a consensus that the face-to-face group discussions were not taken as seriously as they should have been. With one exception, the PSTs interviewed reported that the instructor did not provide soft scaffolding for them online and any feedback they received during class was general in nature, i.e., not directed at individuals. One individual reported that the instructor provided some direct instruction as a soft

scaffold. The amount of soft scaffolding that PSTs provided one another was minimal. The degree to which this scaffolding affected reflections online was also minimal.

*Why did the enhanced scaffolds promote higher levels of reflection?* Interviewees identified two features common to both the minimal and enhanced scaffolds. The first was that the scaffolds provided a framework of questions that helped guide or structure their reflections. However, two PSTs voiced their concerns about the rigidity of the scaffolds. For example, JH (T<sub>F</sub>S<sub>0</sub>, tr) mentioned that the fixed nature of the guiding questions might not permit room for other comments or elaboration: “if I had something else I wanted to say that wasn’t in one of the questions, I really couldn’t write it... maybe a section that would allow us to write whatever, anything else, any comments or anything, that would help.” On the other hand, LF (T<sub>B</sub>S<sub>0</sub>, TR) recognized that there were a few open-ended questions in the scaffolds and cited as an example the last question in video critique scaffold that required PSTs to choose one video and summarize it: “I think that as long as there are open-ended questions, I think you can pretty much say your opinion... for example, [refers to question in a hardcopy of template provided by researcher] choose one video of your choice and summarize what it tells you... what you got from it.” The second feature common to both minimal and enhanced scaffold was that they had open-ended questions which gave PSTs more freedom to express themselves. These two features might have helped PSTs reflect at higher levels.

Users of the minimal scaffolds were shown the enhanced scaffolds and asked to comment on them. The consensus among these users was that the enhanced scaffolds would have provided even more structure than the minimal scaffolds and this would have made them think more deeply and write more in-depth about issues. For example, after examining the enhanced scaffold for the video critique assignment, LF (T<sub>B</sub>S<sub>0</sub>, TR) commented:

This does make me think more, um, specifically, it's asking to observe the children in this situation and see if they were grasping the technology... how you could have done this differently, um, so a lot more specific than just saying, 'What were the strengths and weaknesses?' So it's actually saying, 'Was this useful?' and 'Was this, like, helpful to the students?'

Users of the enhanced scaffolds were shown the minimal scaffolds and asked to comment on them. They replied that the minimal scaffolds were less detailed, and if they had used them, would not have considered things they did with the enhanced template. For example, RL (T<sub>B</sub>S<sub>1</sub>, tr) explained that the shorter ones placed the “expectation on the student to elaborate, which I wouldn't say they were necessarily going to do. Speaking from experience, I would often like to [be] more reflective on my work, but a busy schedule prevents me from it. The longer template had more questions to jog my memory, and in turn, I feel as though I was more thoughtful.” BY (T<sub>B</sub>S<sub>1</sub>, TR) preferred the longer one for the video case critique because the assignment was early in the semester and “it kind of got you in the mindset for the rest of the course and it brought up a lot of things that you should be looking for”. LB (T<sub>F</sub>S<sub>1</sub>, TR) pointed out that some questions in the enhanced scaffolds were ones that she would not have considered at all on her own. For the lesson plan reflection scaffold, she revealed that she would not have considered Q4 at all (Consider how you might conduct the same lesson without technology) and she “would never have gone into such detail or depth” in her lesson plan if she was not asked Q2 (What instructional strategies (e.g., modeling procedures, group work) have you incorporated into your lesson plan?). Two other interviewees, BY (T<sub>B</sub>S<sub>1</sub>, TR) and RL (T<sub>B</sub>S<sub>1</sub>, tr), echoed this opinion and gave similar examples. In short, the enhanced scaffolds encouraged the PSTs to think more deeply about issues, focused their reflections on critical issues, and provided valuable questions that PSTs would not have considered on their own.

*Why did the online tools not have a consistent influence on the levels of reflection?* In seeking answers to this question, the researcher asked interviewees to identify features of the forum and blog tools that promoted and hindered reflection. Ultimately, the PSTs' preferences and mindsets most likely played an important role in the effectiveness of the tool in promoting reflection.

In terms of hindrances towards reflection, two forum users mentioned issues that could be considered personal preferences. AC (T<sub>F</sub>S<sub>1</sub>, tr) noted that he did not like reading off a computer screen, while JH (T<sub>F</sub>S<sub>0</sub>, tr) stated that he liked "the feel of pen and paper" to reflect. As for the blog users, RL (T<sub>B</sub>S<sub>1</sub>, tr) mentioned how she did not like how the blog tool would sometimes change the formatting of her entries depending on the browser she used: "I'm not sure if it really hindered it (reflections), but sometimes I had a few frustrations with the formatting. For example, I ran into a few problems with different Web browsers." AC (T<sub>F</sub>S<sub>1</sub>, tr) and AC (T<sub>B</sub>S<sub>0</sub>, tr) mentioned the occasional slow Internet access to the tools as a barrier. None of the interviewees who rated themselves as having good technology skills mentioned any problems or barriers.

All the forum users interviewed liked being able to read the reflections of others in the shared forum space. Another forum user, JH (T<sub>F</sub>S<sub>0</sub>, tr), explained that by doing this, he was able to "observe different models of reflection." AC (T<sub>F</sub>S<sub>1</sub>, tr), supported this view and suggested another benefit:

You can, like, use Oncourse to reference other people's work, and like, get ideas for your own stuff... Within the classroom, it would be very limited because you can only really concentrate on what one person is saying at a time rather than have all these paper and ideas listed... even then...being in class and staying on task would only be one fraction of the time in class... Oncourse is always there when it's running.

In essence, PSTs viewed the forum as a repository of ideas and resources for reflection that they could access when it was convenient for them.

Like the forum users, the bloggers liked being able to read others' reflections to gain new insights and ideas. Interestingly, only the bloggers pointed out that they liked being able to leave comments on the reflections of others. In addition, AH (T<sub>B</sub>S<sub>0</sub>, tr) described how she liked the convenience of being able to read someone else's comments on her lesson plan and then edit it online immediately. Like the forum users, the blog users liked having convenient access to their blogs. As BY (T<sub>B</sub>S<sub>1</sub>, TR) pointed out, she could access it at her workplace if she needed to. RL (T<sub>B</sub>S<sub>1</sub>, tr) added that since her blog already contained examples of her submitted work and reflections, it was convenient to simply create links from her electronic portfolio to specific blog entries. This was not possible with the forum tool because access to the forum space was password-protected. This was possible with the blogs because they were Web pages and each blog entry had a unique URL. Furthermore, the PSTs owned their blogs as opposed to the instructor owning the course and hence the forum.

Like the forum users, the blog users saw the blogs as a reference and resource that was convenient and accessible. Unlike the forum users, one blog user, AH (T<sub>B</sub>S<sub>0</sub>, tr), described how one could easily comment on another person's reflection and immediately edit one's own lesson plan (itself a blog entry) after reading a comment: "When, like, someone reads your lesson and their comments are posted under it, it's kind of easier to, maybe, to compare, and then go back and edit, add those details in it." In addition, RL (T<sub>B</sub>S<sub>1</sub>, tr) illustrated how the individual ownership of blogs led to a novel and unexpected use of the blog, i.e., linking an electronic portfolio to blog entries:

Everyone, including myself, was also very thankful for our blog work when the time came to make our portfolio web pages. The classes without blogs had to upload all of their reflections one by one, whereas we simply created a link to our blog and all of the reflections and documents were housed in one location.



Since the PSTs had used Oncourse before, the blog users were also asked to consider how they might have reflected if they used the forum tool. RL ( $T_{BS_1}$ , tr) thought that using Oncourse would be less efficient. She described how a blog had every entry on one page and contrasted this with how you had to “go hunting for items” in Oncourse. As a result, “you can just get frustrated, want to quit, and just not complete the assignment.” She gave an example of another class where she had to “search through all these folders” while trying to find the lesson plans of her peers in order to print them out. On the other hand, LF ( $T_{BS_0}$ , TR) felt that the difference between blogs and an online forum lay simply in the format of discussion. In the case of blogs, one had to visit each person’s blog while a discussion could be held in one place in a forum. This made a group discussion more convenient with forums and less so with blogs.

All interviewees recognized the value of having EC301 delivered offline and online. They reasoned that reflecting online not only gave them a space to write their reflections and read each other’s reflections, but more importantly gave them time to think alone. As LF ( $T_{BS_0}$ , TR) pointed out, “I enjoyed reflection both ways because face-to-face is more personal, but sometimes it is most helpful to reflect on your own and let your ideas flow online, without worrying what the other person is thinking.”

In summary, the benefits or barriers of the tools for reflection were very much due to individual preferences and technology skills. If a person preferred the simplicity of maintaining a traditional journal over an online one, then this would have been a major barrier to reflection. The benefits identified by the PSTs were limited to some technical affordances: repositories of ideas and insights, convenient access to the tools, and asynchronous use. However, not all the interviewees shared the same barriers or perceived all the benefits. As a result, the usefulness of the tools for reflection probably varied from one PST to another.

### *Findings from the Observations*

Like the interviews, much data was collected from the observations of the PSTs and the EC301 course instructor as they interacted online and during face-to-face class sessions.

However, only data that were relevant to three issues were examined to answer the following questions:

1. What forms of soft scaffolding (if any) did the instructor provide for the PSTs? How might these have affected the levels of reflection?
2. What forms of soft scaffolding (if any) did the PSTs provide one another? How might these have affected the levels of reflection?
3. What other factors might have contributed to the finding that blogs used in conjunction with enhanced scaffolding promoted higher levels of reflection?

*What forms of soft scaffolding (if any) did the instructor provide for the PSTs? How might these have affected the levels of reflection?* The first four classroom observations were of the instructor conducting an introduction to the video critique activity. The instructor showed PSTs how to access the video case online and discussed five questions (Appendix M). The instructor collected PST responses by typing them and projecting them onscreen with all four classes. She did not elaborate on these ideas or provide any other form of scaffolding. PSTs then had a week to complete an individual critique and reflection of an assigned video case using the discussion forum or their blogs. PSTs were not required to critique one another nor did the instructor provide any comments or feedback online.

The remaining 20 observations were of the instructor showing PSTs how to plan a lesson that integrated technology. The PSTs prepared their lesson plans in two main stages over seven weeks. They also critiqued each other's plans after each stage of lesson preparation. The plans

were completed using a lesson plan template (Appendix N) while the critiques were guided with questions on handouts (final critique example in Appendix O). The first stage of lesson planning required PSTs to complete the first half of the lesson plan, i.e., from target audience to ISTE standards for students. The next stage required PSTs to complete the second half of the lesson plan, i.e., from student objectives to materials needed.

The instructor was generally very consistent with the instructional activities in her four classes. For example, in Week 7 (see class schedule in Appendix J) she showed examples of good and bad objectives to the PSTs. The PSTs had to distinguish between the objectives as a form of practice before they wrote their own for their lesson plans. With each class, she read out the examples and asked PSTs if they were “good” or “bad.” One or more PSTs would answer and the instructor would move on to the next example. At no point did the instructor stop to explain why an objective was good or bad nor did she correct misconceptions, i.e., if a bad objective was labeled good by a PST. In Week 8, she mentioned to all her classes that some PSTs had not provided enough information about their target audiences. She then provided direct instruction by reminding them what she expected to be included for the target audience section of their lesson plans.

The pattern of presenting materials in a straightforward manner, not confronting misconceptions, and providing reminders based on the content covered the previous week repeated itself for the rest of the lessons observed. The scaffolding that the instructor provided took the form of direct instruction. It was the researcher’s opinion that these did not affect PST reflection because they were procedural in nature, e.g., how to describe the target audience adequately or what criteria to use when selecting Web sites as resources. The instructions or

reminders were not strategic or metacognitive in nature, e.g., how to critically reflect on one's work.

*What forms of soft scaffolding (if any) did the PSTs provide one another? How might these have affected the levels of reflection?* PSTs were not required to comment on each other's work for the video case critique because they were submitted as individual assignments.

However, as the interviews revealed, PSTs liked to read each other's online reflections to see how someone else answered the same questions. Referring to reflections written by others might be considered using an unintended soft scaffold, especially if the reader decided to use the writer's reflections as a model. However, since all the PSTs used the hard scaffolds to guide their reflections, it was ultimately the hard scaffolding that influenced the writing.

Each PST had to critique their peers' lesson plans both in-class and online prior to submitting their own post lesson plan reflection. PSTs reviewed a peer's lesson plan and critiqued it based on questions in a hard scaffold which took the form of a handout in class or an online Word document. They were expected to ask one another questions and suggest improvements based on questions that were already in the scaffolds. Naturally, PSTs were free to ask questions other than the ones in the scaffolds. However, based on two recurring behaviors observed in class, they rarely seemed to venture far from the hard scaffolds.

First, instead of actively discussing the lesson plan within their groups with a peer, PSTs would often read a copy of a partner's lesson plan and critique it by writing in the handout (hard scaffold). They would then submit the handout to their peers and verbally clarify their comments if necessary. This was evidenced by the near silence of the group activities. They may have resorted to this tactic because of personal preference or the fact that the instructor typically kept

her classes short. Instead of using the entire hour allocated to EC301, the classes were often just 30 to 35 minutes long with 15 minutes for group discussions.

Second, some individuals and groups opted not to critique a peer's lesson plan in class because they were allowed to leave the room and meet elsewhere for group "work" (thereby leaving them unmonitored), learned that the handouts were not going to be collected or graded by the instructor, or realized that they needed to critique another person's lesson plan online. In the first two scenarios, they did not use any form of scaffolding (hard or soft) because they did not do the work. In the third scenario, they used the online version of the handout, a Word document, to critique a peer's work because their work was more visible there.

In short, the soft scaffolding that PSTs provided one another was probably minimal. They did not use any scaffolds when they went off-task but used the hard scaffold exclusively when they submitted a peer critique online or directly to a peer in-class. They might have discussed their lesson plans with one another outside class time or possibly in other classes, but it was not possible to observe and record this interaction. However, this was unlikely given how the instructor revealed during her interview that PSTs were generally not keen on discussing their lesson plans.

*What other factors might have contributed to the finding that blogs used in conjunction with enhanced scaffolding promoted higher levels of reflection?* Both forum users and blog users were required to answer questions in the video critique and post lesson plan reflection scaffolds. As the scaffolds consisted simply of questions typed in a Word document, PSTs had two options when submitting their work online. The first was copying and pasting the questions into the text editing box of either of the online tool and typing their answers there. The other was typing their answers in the scaffold and copying and pasting both the questions and their answers into the

online tool. The second method was used because they could save a soft copy of their answers, make hardcopies of their answers by printing them out (as the instructor occasionally requested that they do), and rely on Word to check for spelling grammatical errors.

In lurking online, the researcher noticed two patterns in the way PSTs posted their reflections online. Some PSTs simply copied and pasted the questions and answers online. The forum or blog was used simply as delivery mechanism, nothing more. They did not fully explore the technical affordances of each tool. Their postings were typically difficult to read because questions were not distinguished from answers or sentences appeared as blocks of text without paragraphing or other spacing between logical chunks of text.

Other PSTs went beyond copying and pasting. While the forum users were limited by a plain text submission box, a few attempted to create bulleted points or insert spacing between logical chunks of text. The tool allowed users to mark up their text with HTML but either the PSTs did not know how to do so or found this process too tedious. There was no preview function, so if a PST made a mistake, he or she would have to submit another posting because student users were not allowed to delete postings. In this case, the technical affordances of the forum tool were very low.

The blog tool, on the other hand, offered greater affordances. Text could be edited and formatted like a Word document and previewed before submission. As PSTs in the blog treatment group were assigned a personal blog each, they were free to customize it by changing the layout, colors, and graphics or providing personal information and creating links to other sites. Even though it was not required, eight out of the 31 PSTs assigned blogs personalized their blogs according to their personal preferences. They were not provided instructions to do so, nor did any of them approach the instructor or the researcher for technical help. Ten of them took the

trouble to format their messages carefully or added relevant images and links to their postings. It is the researcher's observation and opinion that the greatest affordance of the blog tool over the forum tool was giving the PST a sense of ownership.

The finding that blogs used in conjunction with enhanced scaffolding promoted higher levels of reflection was in the context of the post lesson plan reflection. The minimal and enhanced scaffolds used to support this reflection (Appendix C and D) differed by three main questions and had five questions in common. On the other hand, the technology section of the minimal and enhanced scaffolds (Appendix A and B) for the video critique activity had no questions in common. As the scaffolds for the post lesson plan reflection had some similarities, they might have promoted similar types of responses. The difference in the quality of reflection might then have been due to the different questions and the affordances of the blog tool. In other words, the similarity of the scaffolds might have allowed the different technical affordances of the tools to take effect.

### Summary of Findings

This chapter presented the results of data analysis related to the four research questions. With regard to the effect of the tools and type of hard scaffolding on PST reflections, the discourse analysis revealed that when the tool variable was held constant, the use of enhanced scaffolds seemed to promote reflections that were longer on average than when the scaffold was minimal, less self-referencing in the form of writing, and less formal in nature. When the scaffold variable was held constant, there was no clear effect of the online tool on these measurements.

The second questionnaire, interviews, and observations revealed that the PSTs' previous experiences with reflection and journal writing were different from their experiences in EC301

because they were highly structured in EC301. They also revealed that the amount of soft scaffolding that the PSTs provided for one another and the instructor provided for the PSTs was minimal.

The qualitative analysis of the reflection levels in the video critique assignment revealed that the use of enhanced scaffolds promoted higher levels of reflection regardless of the tool used. In the post lesson planning reflection assignment, only the use of blogs with enhanced scaffolds promoted higher levels of reflection over forums. The statistical analyses supported the qualitative examination of data and also revealed that: a) the effect of the tools was independent of the scaffolds, b) the type of tool did not significantly affect reflection levels, c) the type of scaffolds significantly affected reflection levels, d) enhanced scaffolds significantly hindered lower levels of reflection and promoted higher levels of reflection in the video critique assignment, and e) enhanced scaffolds significantly hindered level II of reflections and promoted level III reflection in the post lesson plan reflection assignment.

The second questionnaire, interviews, and observations provided some possible reasons for the findings. The questionnaire revealed that up to three quarters of PSTs believed that the scaffolds helped them reflect. Both types of scaffolds provided guidance, structure, and focus on critical issues during the reflective process. In addition, users of the enhanced scaffolds described how the enhanced scaffolds encouraged them to think more deeply. Interviews with PSTs confirmed these findings and revealed that the enhanced scaffolds also provided valuable questions that PSTs would not have considered on their own. The interviews also revealed that both the forum and blog tool were viewed more as convenient references and resources for reflection than as tools for reflection. However, PSTs recognized that the online and asynchronous nature of the tools provided them with time alone to reflect. The questionnaire and



interviews revealed that some PSTs' resistance towards or dislike of their assigned tool was related to personal preferences or course design. These findings suggest why the effect of the tools on reflection was inconsistent except for when blogs were used to aid post lesson plan reflections. Blog users cited the ease-of-use of blogs over forums and described examples of use that stemmed from their ownership of their blogs. Furthermore, the researcher observed that the minimal and enhanced scaffolds for the post lesson plan reflection had some questions in common. The effect of the scaffolding might have been reduced while the effect of the blogs made more obvious in this case.

## CHAPTER 5: DISCUSSION AND CONCLUSION

The purpose of this study was to examine the effects of the online tool and type of scaffolding on the quality of preservice teacher reflection in a blended learning environment. Findings from the previous chapter are summarized in this chapter and are discussed in light of the findings of previous research studies. In doing so, this chapter presents implications for researchers whose agenda is to measure reflection and course designers and/or teacher educators whose agenda is to promote reflective practice.

### Review of Findings and Links to Literature

Before the review and discussion of the findings, it should be noted that most prior studies of online reflection (e.g., Hernández-Ramos, 2004; Reilly, 2005; Stiler & Philleo, 2003; West, Wright, & Graham, 2005) did not make attempts to define and measure reflection or describe how reflection was promoted. As a result, effective comparisons to the findings from this study were more the exception than the rule.

### *General Effects of Types of Online Tool and Scaffolding on Reflection*

The first two research questions were:

- What were the quantitative and qualitative differences between preservice teachers' reflections in discussion forums and blogs?
- What were the quantitative and qualitative differences between preservice teachers' reflections when scaffolding was minimal and when it was enhanced?

The findings on utterance length measures (ranging from 17.6 to 19.8 words in all treatment groups) indicated that the reflective discourse was between email (16.4 words) and memo writing (19.9 words) (Cho, in press), implying that the reflective writing was quite complex in nature. Based on the participation and other structural measurements, the use of

enhanced scaffolds seemed to promote reflections that were longer on average than when the scaffold was minimal, more outward-looking (less self-referencing) in the form of writing, and slightly less formal in nature, all when the tool variable was held constant. When the scaffold variable was held constant, there was no consistent trend on the effects of the online tool on these measurements. This was the case for both reflection assignments. The assignments differed structurally in pronoun use: third person pronouns were dominant in the video critique while first person pronouns were dominant in the post lesson plan reflection.

The longer reflections that were a result of using enhanced scaffolds was expected since there were more questions to answer in the enhanced scaffolds than in the minimal scaffolds (e.g., compare Appendix C with Appendix D). In the case of the video critique assignment, the PSTs were critiquing the teacher in the case study so their greater use of third person pronouns was expected. In the case of the post lesson planning reflection, PSTs were critiquing themselves and their lesson plans so the greater use of first person pronouns was also expected. However, the findings on pronoun frequencies revealed that the writing was less self-referencing as a result of enhanced scaffold use and regardless of assignment. Furthermore, while enhanced scaffolds seemed to reduce the formality of reflections, the reflections were overwhelmingly more formal than informal. The enhanced scaffolds might have encouraged PSTs to “step outside of themselves” in order to be more critical of what they observed in the video case study or when evaluating their own lesson plans. This in turn might be due to the fact that the scaffolds consisted of questions an expert practitioner might ask themselves when planning a lesson that integrated technology. As some PSTs indicated during the interviews, some of the questions in the scaffolds were issues that they would never have considered on their own. If the PSTs’ reflections were unassisted with scaffolds, they would have remained internal monologues (as

described by Widdowson, 1983). However, with the scaffolds, they participated in assisted monologues (Scardamalia, Bereiter, & Steinbach, 1984). One might argue that the PSTs were having assisted dialogs in that an expert asked challenging questions and the PSTs tried to answer them. This might have resulted in their writing less personally and to use more formal language. The fact that the PSTs were reflection asynchronously and in an educational context (as opposed to synchronously and in an informal or social context) might also explain why they were less personal and more formal.

Despite the predominantly formal nature of the postings, the enhanced scaffolds seemed to reduce the formality of the reflections slightly. At least two possible reasons might explain this phenomenon. First, the enhanced scaffolds were longer than the minimal ones. In answering the questions in the enhanced scaffolds, PSTs might have tried to complete their reflections quickly, and in doing so, wrote more informally. Second, the enhanced scaffolds asked more personally directed questions, e.g., in the video critique “As a result of this lesson, what have you learned about teaching and integrating technology?” and in the post lesson planning reflection “What instructional strategies (e.g. modeling procedures, group work) have you incorporated into your lesson plan? Be specific. Why have you selected these strategies?” Questions such as these might have encouraged PSTs to answer in a slightly less formal manner.

Based on the discourse analysis of PST reflections, it was discovered that lower levels of reflection dominated the discourse. For example, the lower levels of reflection (levels I and II of Coding Scheme 1) accounted for as low as 59.4% in treatment group  $T_{FS1}$  for the video critique while the lower levels of reflection (levels 0, I, and II of Coding Scheme 2) accounted for as high as 91.1% in treatment group  $T_{FS0}$  for the post lesson plan reflection. These observations are not without precedent. In their study of in-service teacher reflections, Hawkes and Romiszowski

(2001) found that the majority of messages they coded (70% of face-to-face and 63% of online) were rated at low levels (levels I to III, original version of Coding Scheme 1) of reflection. The superficial nature of PST reflections in the current study might be attributed to the less developed schema in novices (Borko & Livingston, 1989; Carter, Cushing, Sabers, Stein, & Berliner, 1988; Leinhart & Greeno, 1986).

However, it should be noted that the percentages of low level reflections for the post lesson plan reflection in the current study were somewhat inflated due to an optional question in that went unanswered by most PSTs. The question was “If you have any other comments about your lesson plan that are not addressed by answering the questions above, share it here” and was included in the minimal and enhanced scaffolds for the post lesson plan reflection. When left unanswered, it was coded level I and level 0 in coding schemes 1 and 2 respectively. Thirty-six out of the 41 (87.8%) PSTs that completed the post lesson planning reflection opted not to answer this question. Even so, the predominance of low levels of reflection (levels I and II of coding scheme 1 and levels 0 to II for coding scheme 2 in this study) can be explained logically. The researcher reasoned that individuals need to first build a broad base of low level reflections (e.g., recalling and explaining events) before attempting to reflect at higher levels (e.g., applying theory to practice or evaluating one’s strengths and weaknesses). However, having a foundation for reflection does not guarantee higher level reflection.

The focus of this study was what might promote higher levels of reflection. In seeking answers to the third research question, statistical analysis revealed that tools did not seem to interact with or moderate the effect of the scaffolds. This finding could be explained by the fact that the scaffolding was not built into the tool like some previous studies (Guzdial, 1994; Jackson,

Krajcik, & Soloway, n.d.). Therefore, the effect of the tool type and the scaffold type could be determined independently.

Based on the findings of this study, the use of enhanced scaffolds generally promoted higher levels of reflection when compared to the minimal scaffolds. The qualitative and statistical analyses of reflection levels revealed that the enhanced scaffolds had a greater impact on promoting higher level reflections in the video critique assignment than the post lesson plan reflection. Neither of the online tools had a consistent ability to promote higher levels of reflection. Only in the case of the post lesson planning reflection assignment did the use of blogs seem to promote higher levels of reflection over forums when used in conjunction with enhanced scaffolds. The following sections are a discussion of the findings from the fourth research question which was: What might have accounted for any observed differences in reflection levels between the treatment groups?

#### *Effect of Scaffolding Type on Reflection*

*Enhanced scaffolds promoted expert-like reflection.* It could be argued that the enhanced scaffolds provided a simulated apprenticeship with a teacher who had more experience with integrating technology. In Greene and Magliaro's (2004) study, preservice teachers interacted with in-service teachers and university faculty in an online educational psychology course. The preservice teachers reported that the opportunities to reflect on video case studies in the presence of more experienced mentors helped them to understand and synthesize information they were learning. As Collins (1991) pointed out, by interacting with mentors and learning their perspectives, novices may enrich their individual reflections as they adopt new ways of thinking and learning. In another study, Lin et al. (1999) concluded that such interaction allowed learners to compare their thoughts and problem-solving processes with those of experts, and in doing so,

improved the process of individual reflection. In the current study, PSTs did not interact directly with an expert or mentor, but had access to their “thoughts” in the form of a scaffold that included guiding questions based on what an expert practitioner might consider when examining issues of technology integration.

The importance of providing scaffolds in the form of social interaction or guiding questions in electronic form (as was the case in the current study) cannot be underestimated. In Chapter 2, reflection was described as both cognitive and metacognitive in nature (Driscoll, 2000; Duell, 1986). Both constructs are intertwined (Ge, 2001), because to think about the process of thinking (metacognition), PSTs need to already have specific content or a problem in mind (cognition). PSTs’ difficulties with reflection might lie in the area of cognition (e.g., a lack of knowledge in a particular subject matter or pedagogical theory) or in metacognition (e.g., a lack of effective strategies to self-evaluate). As PSTs lack teaching experience, they are likely to be lacking in both cognition and metacognition in the area of technology integration. The enhanced scaffold used in the current study may have provided what Lin et al. (1999) referred to as process models of expert thinking. The enhanced scaffolds made inherently tacit reflections of an expert explicit (Ge, 2001; Rosenshine & Meister, 1992; Scardamalia et al, 1984; Wood et al, 1976). In so doing, they not only helped PSTs to retrieve knowledge and enhanced understanding and metacognition, but also might have sped up the adoption of expert-like thinking.

*Enhanced scaffolds provided structure and focus.* The enhanced scaffolds may have reduced degrees of freedom and accentuated critical tasks (Wood et al., 1976). Given a complex problem or issue, a novice might not know where or how to begin. This was an issue that some PSTs highlighted during the interviews. The enhanced scaffolds simplified PSTs’ tasks by providing boundaries and structuring the learning task so that they could manage it. For example,

in the video case activity, the enhanced scaffold guided the learner to focus first on the technology in the hands of students, then on instructional strategies, and then on alternatives. In the enhanced scaffold for post lesson plan reflection, PSTs were guided to think first about learner needs, then about the value that their choice of technology brought to the lesson, and then about technology preparation. While both the scaffolds divided complex tasks into smaller, logical chunks, the enhanced scaffolds provided questions that an expert might ask while the minimal scaffold limited itself to questions that a novice or intermediate teacher might ask.

#### *Effect of Type of Online Tool on Reflection*

The most commonly cited reason for discussion forums and blogs to promote reflection was their asynchronous nature (DiMauro & Gal, 1994; Hernández-Ramos, 2004; Herrington & Oliver, 2002; Lee, 2005; Lin et al. (1999); West et al., 2005). These authors reasoned that asynchronous communication allowed users of these tools time to formulate and articulate their ideas and responses. The findings from the interviews supported this view on the technical affordances of the tools. However, the interviews and the second questionnaire also explained why the online tools did not have a consistent effect on promoting higher levels of reflection.

*Perceived affordances of tools and individual preferences.* Interviewees recognized that both online tools were asynchronous and allowed users to reflect fewer time constraints. Interviewees also described how both tools were easily accessible and served as convenient repositories of ideas and insights. However, the interviews and questionnaire revealed that the effectiveness of the tools in promoting online reflection depended on individual PST preferences and their perceived affordances of the tools. If an individual preferred traditional journal writing or was technologically less able, then the use of the online tool was a barrier to reflection. On the other hand, some PSTs creatively took advantage of the accessibility of blogs by linking their



blog entries to their electronic portfolios even though this was not required of the course. They were able to do this because the blogs were owned by each PST unlike the forum spaces that were password-protected and owned by the instructor. In short, despite the technical affordances of the tools, their ability to promote reflection depended more on the PSTs' personal preferences and technical abilities.

*Technical affordance of blogs more apparent when used with enhanced scaffolding.*

Numerous authors believe that blogging encourages reflective writing (Blood, 2002; Downes, 2004; Ge & McAdoo, 2004; Hernández-Ramos, 2004; Kadjer & Bull, 2003; Oravec, 2003; Roberts, 2003; Stiler & Philleo, 2003; West, Wright, & Graham, 2005; Williams & Jacobs, 2004). However, they did not provide definitive measures of reflection or were unable to do so. The perception that blogs promoted reflection was based largely on technical affordances such as ease of use and user customizability. Those studies also rationalized that the asynchronous nature of blogs, like discussion forums, allowed learners time and space to compose messages. One of the most important affordances of blogs that might promote reflection is the users' ownership of the writing or other intellectual property in their blogs (Downes, 2004; Ferdig & Trammell, 2004; Godwin-Jones, 2003). Some of the PSTs assigned individual blogs displayed evidence of ownership: they customized their blogs with different templates and images and used their blog entries as resources for their electronic portfolios.

Why did the findings for the post lesson plan reflection show that blogs had an effect on reflection? Unlike the scaffolds used in the video critique assignment, the scaffolds for the post lesson plan reflection had some questions in common. This might have diluted the effect of the scaffold and allowed the affordances of blogs to be more apparent. In this case, their greater ease of use (reduced technical barrier) and the greater sense of ownership might have contributed to

the observed reflection levels. Unfortunately, this study did not determine the PSTs' perceptions of blog ownership or how such ownership might have affected their ability to reflect.

### Implications

This study has potential impact on three areas: research on online reflection, design or selection and use of scaffolds in preservice teacher courses or curricula where reflection as a desired outcome, and selection and use of online tools to promote reflection.

#### *Research on Online Reflection*

Unlike most previous studies on online reflection (e.g., DiMauro & Gal, 1994; Herrington & Oliver, 2002; Lee, 2005; Reilly, 2005; Stiler & Philleo, 2003; West, Wright & Graham, 2005), this study clearly defined reflection based on an extensive review of literature. It also measured reflection with two scales of reflection, one by Hawkes and Romiszowski (2001) and the other by Crotty and Allyn (2001). Two measurement scales instead of one were used to take into account the complex nature of reflection and to compensate for the weaknesses of the other scale. It should be noted that the reflection profiles of each assignment generated by each coding scheme were very similar (compare profiles in Figure 4.5 and Figure 4.6). When there was a rise in lower levels of reflection as measured by one coding scheme, there was a corresponding rise in those levels in the other coding scheme. By combining these two measures, this study offers another method of measuring preservice teacher reflection (Table 5.1). The new scale differs from the original scales in that it adds a "zero" level of reflection to take into account irrelevant discourse, combines the cognitive and other elements of reflection, and elaborates on these elements of reflection. Even though researchers are likely to customize measurement scales to the needs of their studies, the combined scale provides a more precise starting point for measuring reflection.

Table 5.1

*Combined reflection scale based on Hawkes and Romiszowski's (2001) rubric and Crotty and Allyn's (2001) reflection scale for novice teachers*

Level	Description
0	Describes an irrelevant examples, events, or experiences or description is missing. Reflection is unrelated to practice.
1	Briefly describes relevant evidence or artifact. Factually states examples or experiences based on simple recall.
2	Describes examples, events, or experiences in simple, layperson terms. Demonstrates an understanding of student development and relevant instructional plans.
3	Describes examples, events, or experiences using pedagogical terms (e.g., teacher modeling, jig-saw grouping, scaffolded activities, think-pair-share strategy, KWL framework, etc.). Connects college coursework concepts with practical classroom applications (e.g., from educational psychology: constructivist environment, information retrieval, etc.; classroom management techniques; linking objectives to content and assessment, etc.). Applies previously learned concepts with the present situation.
4	Explains and elaborates on examples, events, or experiences based on rationale of personal preference or experience such that the preservice teacher remains largely in own comfort zone. Typically has "... because..." statements. Explanation shows evidence of taking a teacher's perspective by deconstructing examples, events, or experiences.
5	Explains and elaborates on examples, events, or experiences using cause/effect principle. Rationalizations or reconstructions are from a theoretical, broader, or an otherwise outward looking perspective. Typically has "... because..." and "if... then..." statements. Preservice teacher shows evidence of learning from new experiences and based on a teacher's perspective.
6	Explains and elaborates on examples, events, or experiences while incorporating non-imagined contextual factors (e.g. environmental limitations, learner needs, teacher needs, etc.). Includes an awareness of their own professional development. Evaluates current teaching abilities and determines what is needed for the future.
7	Explains and elaborates on examples, events, or experiences and cites guiding principle and current context, while referencing moral and ethical issues.

Finally, this quasi-experimental study utilized multiple methods and relied on multiple sources of data which facilitated the collection, measurement, and analysis of reflection levels. In so doing, it provided a model for an empirical examination of factors that might influence reflection.

#### *Strategic Use of Scaffolds to Promote Reflection*

This study included two different forms of scaffolding as a treatment variable in order to measure the effect of scaffolding on reflection. This was particularly important because a pedagogically significant strategy was considered alongside the use of the online tool for promoting reflection. This has implications not only on the way reflection may be studied in future research but also on the way reflection is promoted by teacher educators.

There was a marked difference in this study compared to some previous studies. Previous studies compared the effect of the presence versus the absence of scaffolds (e.g., Lee, 2005; Osman & Hannafin, 1994). The current study focused on the effect of the type of scaffold present, i.e., minimal or enhanced. It began with the assumption that scaffolds would aid reflection but explored the effectiveness of both in promoting higher levels of reflection. As this study found enhanced scaffolding to have a greater impact on promoting higher levels of reflection than the tool, it recommends the *strategic* use or selection of scaffolds, not just their use, to promote reflection. This recommendation is not without precedent. In their study, Gilbert and Dabbagh (2005) discovered that structure that assisted the facilitation and evaluation of online discussions increased the cognitive quality of online discussions.

#### *Use of Online Tools to Promote Reflection*

Despite the statistically significant influence of the scaffold over the tool on promoting reflection, one finding revealed that blogs used in conjunction with enhanced scaffolds could

promote reflection. The critical affordance that blogs offered over discussion forums was ownership of the tool and the content generated. However, as Ferdig and Trammell (2004) pointed out, it is also important that bloggers own their learning. Ensuring such ownership is a complex task, but providing the necessary conditions is a major step to accomplishing this ownership.

If blogs are to be used to promote reflection, the current study first recommends they be supported with scaffolds that are built upon on the choices and questions of expert practitioners. Course designers or teacher educators should also be aware of the type of reflection they would like to promote. If the reflection is to be individually mediated, then blogs are a good choice. If reflection is to be collaboratively facilitated, then discussion forums or wikis may be better alternatives. Blogs may be used collaboratively but it is this researcher's experience teaching online with blogs that other tools such as RSS aggregators and learner education on the proper use of these tools must be included for collaborative reflection to be effective.

#### Limitations

Notable limitations of this study included, but are not limited to, the following: (1) soft scaffolding was difficult to standardize and control for, (2) control treatment groups were not implemented, (3) only two possible online tools were examined, (4) the survey instruments were not used in any previously known studies, (5) the effect of gender on reflective writing was not examined, (6) small sample size, and (7) generalizability.

#### *Soft Scaffolds*

The soft scaffolding provided by the instructor or PSTs might have influenced reflection levels but it was difficult to predict, standardize, or control. Even though the anticipated type and amount of assistance was discussed with the instructor in advance of the course, its use depended

on the needs of different situations and on the preferences or experience of each PST. Ultimately, the soft scaffolding that was observed and collected as qualitative data was minimal. However, it was not possible or practical to collect data from all possible forms of interaction, e.g., exchanges of email, PSTs discussing EC301 assignments offline and outside of the classroom.

### *No Control Groups*

The scaffolds that were designed for this study were partly based on those used in the previous iteration of the course. As their use was already part of the course, it was not possible or ethical to compare the effects of “no scaffold” groups and scaffolded groups. A “no scaffold” treatment would have been an ideal control. Instead, the scaffolds were augmented to take two forms: minimal support and enhanced support. This was the first time these scaffolds were used in this manner in the course. Even though they were discussed and refined with the course instructor and course coordinator prior to use, they were not previously tested in any course.

Likewise, there was no control tool group. Such a group could have used traditional, hand-written journals to reflect. However, as EC301 focused on technology integration and promoted technology use in the classroom, traditional journals were not a logical choice. In addition, more sections of EC301 would have had to be involved to implement control groups.

### *Online Tools Examined*

Only two out of a myriad of possible online tools were used in this study to determine their effect on reflection levels. The forum tool was available by default as it was part of the university’s course management system. Blogger.com’s blogging system was selected for its ease-of-use and its popularity. However, the forum and blog tools were asynchronous in nature and this study did not consider how other asynchronous tools (e.g., email) or how synchronous communication (e.g., instant messaging) might have affected reflection.

### *Survey Instruments*

The survey instruments were not based on instruments of other studies. Studies focusing on the online reflections of preservice teachers were scarce and such studies either did not conduct surveys or include samples of surveys in the publication. As a result there were no measures of validity or reliability for the surveys generated for this study. Furthermore, while this study did not compare the reflective abilities of the PSTs at the beginning and at the end of the study, it attempted to gauge this property by asking PSTs to rate themselves. Such self-reports are not particularly accurate and only provide a rough measure of their reflection abilities.

### *Gender Not Examined*

The possible effect of gender on reflective writing was not examined in this study. Previous studies indicated that, in general, females and males may be predisposed to writing in certain ways and writing about certain topics (e.g., Herring & Paolillo, in press). While the PSTs reflections in the current study were guided by specific questions in the scaffolds, the gender effect might have played a role in shaping their answers.

### *Sample Size*

The number of volunteers for this study was relatively small. As a result of the volunteers originating from different classes, the number of volunteers assigned to each treatment group was uneven. These reduced the power of the inferential statistics and the reader should take caution when interpreting those results.

### *Generalizability*

The generalizability of this study to other contexts is limited for various reasons. For example, while EC301 was described as “blended,” the extent of face-to-face and online instruction depended on the instructor’s skills, experience, and preferences. If the course were

taught by a different instructor, its implementation would invariably change due to those factors. The enhanced scaffolds were generated by considering the critical issues that an expert practitioner might consider. Other readers or researchers might have different opinions regarding the characteristics of an expert teacher or what an expert might consider important. The way the online tools were used is unlikely to be implemented identically elsewhere. For example, even if a common vendor provided the engine behind each institution's discussion forum, it would be customized according to the policies of that institution and further customized by the owner of each course. Finally, the tasks performed by the PSTs focused on various aspects of technology integration in K-12 classrooms. As the participants were undergraduate majoring in elementary studies, the findings do not necessarily apply to secondary majors, much less to other fields of study.

#### Directions for Future Research

##### *Larger Sample in Variations of the Study*

The number of participants was a limiting factor in this study. The study could be repeated with larger number of participants per treatment group to better determine the statistical significance of the treatment variables. One option might be to sample from the same population and repeat the study over time. This option would be a good way to determine the validity and reliability of the questionnaires and coding instruments. This is particularly important given the lack of studies that focus on reflection using online tool and supports. Another option would be to conduct the study with a similar population in a different institution to determine the generalizability of the findings. Yet another option might be to conduct the study in a fully online and asynchronous course. This would reduce a considerable amount of unobservable and unrecorded soft scaffolding that participants provide one another.



### *True Scaffolding Study*

The scaffolds used in this study were used once for each assignment. To remain true to the definition of scaffolds, their use should be faded and eventually removed over time. A course that was suitably designed or that could accommodate such a design would be necessary, but it would be interesting to then measure the changes in reflection levels as the scaffolding faded.

### *Perceptions of Blog Ownership*

The perception of blog ownership identified by various authors as a key technical affordance (Downes, 2004; Ferdig & Trammell, 2004; Godwin-Jones, 2003) could have influenced reflection levels in this study. However, evidence of this ownership was only partially recorded by researcher observations. It could be recorded and measured more effectively by the addition of interview and survey questions related to this area.

### *Learner Engagement*

Learner engagement is a critical aspect of authentic and meaningful learning. This is true in traditional learning environments (Dewey, 1904), online learning environments (Conrad, 2002; Herrington, Oliver, & Reeves, 2003), and arguably in blended learning environments. With the aid of interviews and questionnaires, data could be collected on whether the learners perceived their tasks to be authentic and if they felt that they were engaged in their tasks. Furthermore, it would be interesting to determine if the level of authenticity and engagement was attributed to the tool, scaffold, or other factors such as course design.

## Conclusion

Previous studies (DiMauro & Gal, 1994; Herrington & Oliver, 2002; Hernández-Ramos, 2004; Lee, 2005; Reilly, 2005; Stiler & Philleo, 2003; West, Wright & Graham, 2005) and various authors (Downes, 2004; Ge & McAdoo, 2004; Kadjer & Bull, 2003; Oravec, 2003;

Roberts, 2003; Williams & Jacobs, 2004) have collectively claimed that online tools such as discussion forums or blogs alone promote reflection. However, they did not provide definitive measures of reflection or were unable to do so. This study measured levels of reflection based on two scales and provided quantitative and qualitative evidence that the two online tools, Blogger.com blogs and the discussion forum tool in Oncourse, did not significantly promote higher levels of reflection. Instead, results suggest that it was the presence of scaffolding that was more critical in promoting higher levels of reflection. Furthermore, it was the type of scaffolding, not its mere presence, which influenced the type of reflection. Enhanced scaffolds that consisted of expert practitioner questions helped preservice teachers to not only reflect on issues they would not otherwise consider but also think more deeply on those issues. Therefore, the answer to the question “Does scaffolded blogging promote preservice teacher reflection?” is yes, provided the scaffolds are designed to promote higher levels of reflection.

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## APPENDIX A: MINIMAL REFLECTION SCAFFOLD OF VIDEO CASE CRITIQUE

Note: The scaffold for this assignment differed from the enhanced scaffold in the “Technology video” section (highlighted in grey).

Name \_\_\_\_\_  
EC301 Elementary Video Critique

You will be watching a video found at the following link:

<http://www.intime.uni.edu/video/031moue/0/>

The above link is where you will be watching three videos: Activity Overview, Learning, and Technology. You will be able to access the videos in the drop-down menu, where it says “additional videos for this teacher.”

The teacher you will be viewing is a resource teacher, who meets with her students about an hour/2 hours a week, and is working with them on a science project about temperatures in Missouri.

Please watch the videos in their entirety and answer the questions below. Hint: Looking at the lesson plan that is included may help you answer some questions as well.

In order to view these videos, you will need Real Player. This software is free to download from (<http://www.real.com>). All of the computers in STC labs have real player installed in them. Make sure not to leave this assignment to the last minute before class in case of any network problems.

Bring a print copy to class. Type your answers in this document and save it. Submit an electronic version in the OnCourse discussion forum. To do this, copy and paste the questions and answers into your reply in Oncourse.

### **After watching the Activity Overview video, answer the following questions:**

After watching the overview, what kinds of prep work do you believe the teacher had to go through to arrive at her present lesson?

What kind of pre-requisite knowledge do you believe children needed to have before engaging in the activity?

Using the Indiana Standards, what science and mathematics standards might this project address? (Copy and paste complete standards from <http://www.indianastandards.org>)

### **After watching the Learning video, answer the following questions:**

How did the teacher get the children involved in the beginning of the video? Cite specific examples.

Are the ways the teacher engages the children in learning age-appropriate? Why or why not?

What were some of the major reflections children had at the end of the video? What tactics did the teacher use to help elicit responses from the children?

Do you believe the children learned anything they will be able to utilize in the future school work? Why or why not?

**After watching the Technology video, please answer the following questions.**

Identify two uses of technology in the video.

Discuss the strengths and weaknesses of technology use/integration in the video

### **Your Choice of Video**

Choose one video of your choice from the drop down menu that you have not already watched and summarize what it tells you about this project.



## APPENDIX B: ENHANCED REFLECTION SCAFFOLD OF VIDEO CASE CRITIQUE

Note: The scaffold for this assignment differed from the minimal scaffold in the “Technology video” section (highlighted in grey).

Name \_\_\_\_\_  
EC301 Elementary Video Critique

You will be watching a video found at the following link:

<http://www.intime.uni.edu/video/031moue/0/>

The above link is where you will be watching three videos: Activity Overview, Learning, and Technology. You will be able to access the videos in the drop-down menu, where it says “additional videos for this teacher.”

The teacher you will be viewing is a resource teacher, who meets with her students about an hour/2 hours a week, and is working with them on a science project about temperatures in Missouri.

Please watch the videos in their entirety and answer the questions below. Hint: Looking at the lesson plan that is included may help you answer some questions as well.

In order to view these videos, you will need Real Player. This software is free to download from (<http://www.real.com>). All of the computers in STC labs have real player installed in them. Make sure not to leave this assignment to the last minute before class in case of any network problems.

Bring a print copy to class. Type your answers in this document and save it. Submit an electronic version in the OnCourse discussion forum. To do this, copy and paste the questions and answers into your reply in Oncourse.

### **After watching the Activity Overview video, answer the following questions:**

After watching the overview, what kinds of prep work do you believe the teacher had to go through to arrive at her present lesson?

What kind of pre-requisite knowledge do you believe children needed to have before engaging in the activity?

Using the Indiana Standards, what science and mathematics standards might this project address? (Copy and paste complete standards from <http://www.indianastandards.org>)

### **After watching the Learning video, answer the following questions:**

How did the teacher get the children involved in the beginning of the video? Cite specific examples.

Are the ways the teacher engages the children in learning age-appropriate? Why or why not?

What were some of the major reflections children had at the end of the video? What tactics did the teacher use to help elicit responses from the children ?

Do you believe the children learned anything they will be able to utilize in the future school work? Why or why not?

**After watching the Technology video, please answer the following questions.**

How does the teacher demonstrate the technology the students will use? Be specific.

How much student interaction with technology do you see? What technologies are they using? Again, be specific.

Do all of the children seem to grasp the technologies they are using? Explain.

How did the use of technology alter this lesson? Was the technology absolutely necessary? Explain your answer.

What teaching strategy/strategies did the teacher use? What other strategies might have been effective and why?

What are some alternatives for conducting the lesson?

As a result of this lesson, what have you learned about teaching and integrating technology?

### **Your Choice of Video**

Choose one video of your choice from the drop down menu that you have not already watched and summarize what it tells you about this project.

## APPENDIX C: MINIMAL REFLECTION SCAFFOLD OF LESSON PLAN REFLECTION

Note: All the questions in the minimal scaffold were also in the enhanced scaffold.

### **EC301 Lesson Plan Individual Reflection**

*Instructions: This template is designed to help you reflect on your lesson plan. Be honest about your answers to these questions. This reflection is not based on how “bad” or “good” your plan is, but on the level of your reflection and your ability to critique your own work constructively. REMOVE THESE INSTRUCTIONS BEFORE POSTING ONLINE.*

Name of lesson plan designer:

1. Consider how you might conduct the same lesson without technology. How does the use of technology alter your lesson?
2. What value does the technology bring to your lesson?
3. What feedback have you received from your peers? Do you agree with the feedback? Why?
4. What changes are you making to your lesson plan? Why?
5. If you have any other comments about your lesson plan that are not addressed by answering the questions above, share it here.

~ End ~

## APPENDIX D: ENHANCED REFLECTION SCAFFOLD OF LESSON PLAN REFLECTION

Note: The scaffold for this assignment differed from the minimal scaffold in that additional questions were provided (highlighted in grey).

### EC301 Lesson Plan Individual Reflection

*Instructions: This template is designed to help you reflect on your lesson plan. Be honest about your answers to these questions. This reflection is not based on how “bad” or “good” your plan is, but on the level of your reflection and your ability to critique your own work constructively. REMOVE THESE INSTRUCTIONS BEFORE POSTING ONLINE.*

Name of lesson plan designer:

1. How have you designed the lesson to meet the needs of the learners you described?
2. What instructional strategies (e.g. modeling procedures, group work) have you incorporated into your lesson plan? Be specific. Why have you selected these strategies?
3. What value does the technology bring to your lesson? What might your students learn as a result of your efforts to integrate technology?
4. Consider how you might conduct the same lesson without technology.
  - a. How does the use of technology alter your lesson?
  - b. What kind of technology preparation would you and your students need *prior* to the lesson?
  - c. What could you do to get them and you prepared?
5. What feedback have you received from your peers? Do you agree with the feedback? Why?
6. What changes are you making to your lesson plan? Why?
7. What have you learned from the process of discussing and reflecting on your lesson plan?
8. If you have any other comments about your lesson plan that are not addressed by answering the questions above, share it here.

~ End ~

## APPENDIX E: INITIAL QUESTIONNAIRE

**EC301 (Spring 2005)**  
**Integrating Technology in Teaching – Part I**  
**Preservice Teacher Questionnaire 1**

Note: This questionnaire will take you not more than 15 minutes to complete. Please answer the questions honestly and to the best of your knowledge. Only the researcher will see your answers.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. Please state your *current* age: \_\_\_\_\_ Gender: F / M (circle your gender)
2. Year in college: Freshman / Sophomore / Junior / Senior / Other: \_\_\_\_\_ (circle your year)
3. Please indicate your abilities with the following technologies (5=excellent; 4=good; 3=average; 2=poor; 1=very poor or not at all)

Technology	Your ability (please circle)				
a. Email	5	4	3	2	1
b. Web browsing	5	4	3	2	1
c. Participating in asynchronous online discussions, e.g. Oncourse	5	4	3	2	1
d. Web publishing (maintain own web page)	5	4	3	2	1
e. Blogging	5	4	3	2	1

4. Have you been asked to reflect as part of coursework before? Yes / No (please circle)
5. Have you been asked to keep a journal or diary as part of coursework before? Yes / No (please circle)
6. How would you define “reflection”?

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7. Please indicate your agreement with the following sentences (SA=strongly agree; A=agree; N=neutral; D=disagree; SD=strongly disagree):

a. I consider myself to be a reflective person	SA	A	N	D	SD
b. I do <b>not</b> consider myself to be a reflective person	SA	A	N	D	SD
c. I think that reflection is important	SA	A	N	D	SD
d. I think that reflection is <b>not</b> important	SA	A	N	D	SD
e. I think that being <b>alone</b> helps me reflect	SA	A	N	D	SD
f. I think that being in a <b>group</b> helps me reflect	SA	A	N	D	SD

Thank you for your time and effort!

~ END OF QUESTIONNAIRE ~

## APPENDIX F: TERMINAL QUESTIONNAIRE

**EC301 (Spring 2005)**  
**Integrating Technology in Teaching – Part I**  
**Preservice Teacher Questionnaire 2**

Note: This questionnaire will take you not more than 15 minutes to complete. Please answer the questions honestly and to the best of your knowledge. Only the researcher will see your answers.

Last name: \_\_\_\_\_

Date: \_\_\_\_\_

1. I think that my ability to reflect is:
  - a. Better than before EC301
  - b. The same as before EC301
  - c. Worse than before EC301
  
2. Please indicate your agreement with the following sentences (SA=strongly agree; A=agree; N=neutral; D=disagree; SD=strongly disagree; X: I did not complete this assignment):

a. I think that it is <b>not</b> important for teachers to reflect.	SA	A	N	D	SD	
b. I think that it is important to reflect <b>alone</b> .	SA	A	N	D	SD	
c. I think that it is important to reflect as a <b>group</b> .	SA	A	N	D	SD	
d. I think that reflection is an easy thing to do.	SA	A	N	D	SD	
e. I think that the EC301 video critique reflection was easy to do.	SA	A	N	D	SD	X
f. I think that the EC301 final lesson plan reflection was easy to do.	SA	A	N	D	SD	X
g. The video critique template helped me to reflect <b>online</b> .	SA	A	N	D	SD	
h. The final lesson plan template helped me to reflect <b>online</b> .	SA	A	N	D	SD	
i. Overall, the instructor helped me to reflect.	SA	A	N	D	SD	
j. My peers helped me to reflect in class.	SA	A	N	D	SD	
k. My peers helped me to reflect on line.	SA	A	N	D	SD	
l. I would have liked to have more help in reflecting on my work.	SA	A	N	D	SD	

3. How would you rate the (5=excellent; 4=good; 3=average; 2=poor; 1=very poor or not at all)

a. Use of Oncourse for reflection*	5	4	3	2	1
b. Use of Blogger for reflection*	5	4	3	2	1
c. Helpfulness of the <i>video critique</i> template	5	4	3	2	1
d. Helpfulness of the <i>lesson plan reflection</i> template	5	4	3	2	1
e. In-class group work for reflection	5	4	3	2	1
f. Helpfulness of the instructor	5	4	3	2	1
g. Instructor as a whole	5	4	3	2	1
h. EC301 course as a whole	5	4	3	2	1

4. What are your reasons for the rating of Oncourse/Blogger\* for reflection?

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5. What are your reasons for your rating of the reflection templates?

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6. What are your reasons for your rating of in-class reflection?

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7. What are your reasons for your rating of the instructor?

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8. If you had a choice of how you would reflect, you would prefer to do so:

- a. Face to face only
- b. Online only
- c. Both face to face and online only

9. What changes, if any, would you make to the course requirements for reflection?

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Thank you for your time and effort!

~ END OF QUESTIONNAIRE ~

\* Only one of these items was here depending on which treatment group received this questionnaire

## APPENDIX G: EC301 COURSE REQUIREMENTS

Note: The following was extracted from the assignments/evaluation section of the EC301 syllabus provided by the participant instructor. The assignments selected for discourse analysis were the Technology-Integrated Lesson and the Video Critique. The Technology Reflections (1 and 2) were not selected because they were essentially statements of personal philosophy at the beginning and at the end of EC301.

### 8. Evaluation:

Final grades will be based on participation in the studios and completion of the technology integrated lesson activity.

Points will be awarded as follows:

Technology Reflections (1 and 2)	10 Points
Attendance & Participation	10 Points
Technology-Integrated Lesson	45 Points
Technology Inventory	15 Points
Video Critique	10 Points
Addition of Materials to Electronic Portfolio	10 Points

## APPENDIX H: INTERVIEW PROTOCOL FOR PRESERVICE TEACHERS

**PST interview questions***Introductory protocol*

- Thank interviewee for his/her time. Invite him/her to take some refreshments.
- State purpose of interview, approximate duration, and number of questions.
- Mention that there is no right or wrong answers and only I will have access to transcript and audio recordings. Ask interviewee to be honest and answer to the best of his/her knowledge.

**Name:** \_\_\_\_\_

**Date:** \_\_\_\_\_

1. (Introductory, warm-up questions): Where from, why teach?
2. Have you kept a journal before as part of coursework? If so, please describe it.
3. [For T<sub>B</sub>] If you have any experience keeping an online journal or blogging, please describe it.  
// [For T<sub>F</sub>] If you have any experience using discussion forums to reflect, please describe it.
4. In the context of teaching practice, what does being “reflective” mean to you? Do you think that it is important to be reflective as a teacher? Why or why not?
5. [For T<sub>B</sub>] I would like to get some feedback on your use of a blog for this class. What has the experience been like so far? // [For T<sub>F</sub>] I would like to get some feedback on your use of the OnCourse discussion forum for reflecting in this class. What has the experience been like so far?
6. How did the technology (Oncourse/Blog tool) help or hinder your reflection assignments?
7. Did you find the templates (scaffolds) for the video critique, lesson planning, and planning critiques helpful? Why?
8. Did you find the in-class critiques of your lesson plan helpful? Why? How did they influence what you did online (if at all)?
9. [For T<sub>B</sub>] If you had used Oncourse to reflect on the in-class critiques of the video case and lesson plans, do you think it would have made a difference in your ability to reflect on integrating technology? Why? // [For T<sub>F</sub>] If you did not use Oncourse to reflect and relied

only on the in-class critiques of the video case and lesson plans, do you think it would have made a difference in your ability to reflect on integrating technology? Why?

10. Would you have preferred to do reflections a) face-to-face only, b) face-to-face and online critiques, or c) online critiques? Why?
11. Did you get any feedback or comments from your instructor? If so, please describe it.
12. Did the knowledge that I was going to read your assignments affect the way you wrote? Why?
13. (Show interviewee a transcript of his/her writing) You wrote this on [date] when you were describing/discussing/reflecting/etc. on [context]. Could you explain why you wrote this?
14. (Show interviewee alternative template) What if you received the other (shorter/longer) template?
15. Did your prior experience with reflection (see your answer to Q2) affect the way you reflected in EC301? If so, how?
16. If you feel that you reflect internally (in your head), what is the value, if any, in writing down reflections?
17. Would you say that your ability to reflect is a) better than before, b) the same as before, or c) worse than before taking EC301? Why?

*Concluding protocol*

- Thank interviewee for his/her time again.
- Describe the member checking process: Interviewee will receive a copy of my interview notes by email and asked to check it and return it by email.
- Mention the possibility of a follow up interview consisting of clarifying questions by email.

## APPENDIX I: INTERVIEW PROTOCOL FOR EC301 INSTRUCTOR

**Instructor interview**

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*Introductory protocol*

- Thank interviewee for his/her time. Invite him/her to take some refreshments.
- State purpose of interview, approximate duration, and number of questions.
- Mention that there is no right or wrong answers and only I will have access to transcript and audio recordings. Ask interviewee to be honest and answer to the best of his/her knowledge.

Name: \_\_\_\_\_

Date: \_\_\_\_\_

1. (Introductory, warm-up questions): Where from, how did you get involved with EC301? What other responsibilities do you hold?
2. What is your definition of reflection?
3. Is reflection important for preservice teachers (PSTs)? Why?
4. How did you help the preservice teachers (PSTs) to reflect?
5. What kind of structure/assistance did you provide to the PSTs in the groups? Do you think you treated them the same/differently?
6. How, if at all, did the PSTs help one another to reflect?
7. What are your impressions of the quality of reflections by the PSTs? What do you think were the differences (if any) in the reflections between treatment groups?
8. What other factors might have influenced how and how much the PSTs reflected?

*Concluding protocol*

- Thank interviewee for his/her time again.
- Describe the member checking process: Interviewee will receive a copy of my interview notes by email and asked to check it and return it by email.
- Mention the possibility of a follow up interview consisting of clarifying questions by email.

## APPENDIX J: OBSERVATION SCHEDULE

Note: Class observations were carried out on the weeks highlighted in grey.

**EC301 Class Schedule**

Week	Start of Week	Topic	Assignments
1	Aug 29	Introduction to course; Review of syllabus Overview of OnCourse and EC301 website Reflection 1 assignment	
2	Sept 5	Brainstorm: What could we do with technology in Schools?	Reflection 1 Due
3	Sept 12	Overview of technology available in schools Technology Inventory Introduction	For Class: Read Peck, Cuban & Kirkpatrick
4	Sept 19	Video Discussion	Video Critique Due
5	Sept 26	Overview of ISTE technology standards	
6	Oct 3	Developing effective lesson plans Review of lesson plan assignment	
7	Oct 10	Lesson Plans – Being Student Centered	Lesson Plan First Page Due
8	Oct 17	No Formal Class Meeting: Work on Full Lesson Plan and finish Technology Inventory	
9	Oct 24	Peer Review of Lesson Plans Focus: Student Activities and Learning Goals	Full Lesson Draft Technology Inventory Due
10	Oct 31	Evaluation and selection of computer and Web-based educational resources Bring your resources that you plan to use in your lesson	
11	Nov 7	Peer Review of Lesson Plans Focus: Evaluation and Learning Goals	Updated Draft Online Discuss
12	Nov 14	Peer Review of Lesson Plans Focus: Student Materials	Updated Draft Online Discuss
13	Nov 21	No Formal Class Meeting: Final lesson Plan due before leaving town for Thanksgiving	Final Lesson Plan & all materials
14	Nov 28	Portfolio Workshop	
15	Dec 5	Class Wrap up – Looking forward to W401	Reflection 2 and Portfolio
16	Dec 12	Finals Week Course/Instructor evaluation	

APPENDIX K: EXAMPLES OF CODED MACROSEGMENTS USING A MODIFIED  
VERSION OF HAWKES AND ROMISZOWSKI'S CODING SCHEME

Level	Description	Example question and answer	Rationale
1	No description of event. Message unrelated to practice. Description missing.	<i>Q: How have you designed the lesson to meet the needs of the learners you described?</i> A: Yes.	PST misread the question and did not answer it.
2	Events and experiences described in simple, layperson terms.	<i>Q: How have you designed the lesson to meet the needs of the learners you described?</i> A: This lesson has been designed around resources of the computer. It will give my students a better understanding of programs available to them and allow them to create a project of their own. They will have adequate time to learn the programs.	PST provided a straightforward answer that a layperson might understand.
3	Description of events and experiences employ pedagogical terms (e.g. teacher modeling, jig-saw grouping, scaffolded activities, think-pair-share strategy, using the KWL framework (Know, Want to know, Lessons learned, etc)).	<i>Q: What teaching strategy/strategies did the teacher use?</i> A: The teacher demonstrated how to use the technology and modeled the material for the class. She took them step by step through the directions and went over questions as a whole class.	PST used the terms “demonstrated” and “modeled”.
4	Explanation of events or experiences is accompanied by rationale of tradition or personal preference. Typically has “... because...” statements; preservice teacher remains largely in own comfort zone.	<i>Q: What other strategies might have been effective and why?</i> A: The teacher could have let the children discover the internet on their own and see if they were able to find the information. Of course she would have to closely monitor the students to make sure they are on the right track and not getting discouraged. This could have helped the students understand the material and become more familiar with how to find information on the internet.	PST rationalized an alternative strategy based on personal preference or experience.
5	Explanation of an event or	<i>Q: What changes are you making to</i>	PST has taken an

Level	Description	Example question and answer	Rationale
	experience using cause/effect principle. Typically has "... because..." and "if... then..." statements; rationalizes from a theoretical, broader, or an otherwise outward looking perspective.	<i>your lesson plan? Why?</i> A: I have clarified the goals and made them clearer in the outline. I have also assessed more of the work on completion and effort as opposed to it being right. It is great to hear feedback from your peers about what they think is in need of correction because we are all going after the same goal here. Another opinion is always a valued asset!	outward looking perspective.
6	Explanation provided that identifies cause and effect factors while also considering non-imagined contextual factors (e.g. environment, learner, community, etc.).	<i>Q: How have you designed the lesson to meet the needs of the learners you described?</i> A: I think kindergarteners have so much energy and sometimes they have trouble sitting in their seats for long periods of time. This lesson allows them to move freely around the classroom while still learning about animals. Also I feel kindergarteners will immediately take an interest in learning about animals.	PST was accurately aware of the behavior and preferences of very young learners.
7	Explanation of events, experiences, or opinions that cites guiding principle and current context, while referencing moral and ethical issues.	[No segment of text was coded at this level.]	N.A.



APPENDIX L: EXAMPLES OF CODED MACROSEGMENTS USING A MODIFIED  
VERSION OF CROTTY AND ALLYN'S CODING SCHEME

Level	Description	Example question and answer	Rationale
0	Describes irrelevant event or description is absent.	<p><i>Q: Consider how you might conduct the same lesson without technology. How does the use of technology alter your lesson?</i></p> <p>A: When writing a lesson plan that uses a lot of technology a teacher must create a back up lesson plan that doesn't use any technology. By having an extra lesson plan prepared that doesn't use technology appliances the teacher will be prepared for an event for not electricity or technology difficulties.</p>	PST did not answer the question "How does the use of technology alter your lesson?"
1	Briefly describes the relevance of the evidence or artifact. Factually states examples or experiences.	<p><i>Q: What feedback have you received from your peers? Do you agree with the feedback? Why?</i></p> <p>A: My peers have all given me pretty straightforward feedback, saying that I have covered the required information, with the exception of students with disabilities, but I fixed that right away.</p>	PST stated taking into account students with disabilities but did not elaborate.
2	Demonstrates an understanding of student development and relevant instructional plans. Provides a straightforward explanation of a phenomenon or observation.	<p><i>Q: What feedback have you received from your peers? Do you agree with the feedback? Why?</i></p> <p>A: By [sic] peers gave me additional ideas for helping disabled students. I agreed with the idea that they need to work in groups in order to accomplish such a large task.</p>	PST stated taking into account students with disabilities and elaborated.
3	Connects college coursework concepts with practical classroom applications (e.g. from educational psychology: constructivist environment, information retrieval, etc.; classroom	<p><i>Q: What feedback have you received from your peers? Do you agree with the feedback? Why?</i></p> <p>A: My peers have given me pretty good feedback. They have all told me to add some gearing up and gearing down activities to meet the needs of all of the students – the more advanced students and the less advanced</p>	PST mentioned gearing up and down and rubrics.

Level	Description	Example question and answer	Rationale
	management techniques; linking objectives to content and assessment, etc.). Connection of past concepts with the present situation.	students. They have also told me to add a rubric for collaboration activities.	
4	Shows evidence of taking a teacher's perspective. ("... because..." statements; elaborations based on preference, experience, understanding, etc.)	<p><i>Q: What changes are you making to your lesson plan? Why?</i></p> <p>A: I will be changing some of the assessments to better correlate with my objectives. I need to change them so that I actually know what and why I'm testing my students on certain things. I need to know what to assess and by connecting them to my objectives, I feel that I will accomplish this.</p>	PST rationalized the need to align assessments with objectives.
5	Shows evidence of learning from teacher's perspective based on new experiences. Possibly establishes short terms goals based on perceived strengths and weaknesses.	<p><i>Q: What have you learned from the process of discussing and reflecting on your lesson plan?</i></p> <p>A: I have begun to notice some of my patterns in teaching. I tend to miss small details in my papers and need someone to proofread them to lookout for me. It is valuable experience to do these lesson plans and assess your work since someday you will be assessing someone else's work.</p>	PST performed a critical self examination.
6	Includes an awareness of their own professional development as a teacher. Evaluates current teaching abilities and determines what is needed for the future.	<p><i>Q: As a result of this lesson, what have you learned about teaching and integrating technology?</i></p> <p>A: It is a great way of bringing change to the class. If it used in a great way and not overdone, the students will grow right along with the changing technology. It is a great idea to attend workshops and keep up with technology so you can assist your students to your best ability.</p>	PST rationalized the need to attend workshops for professional development.

APPENDIX M: QUESTIONS DISCUSSED IN CLASS FOR VIDEO CRITIQUE  
DEMONSTRATION

1. How the technology was used – What types of technology skills and experiences do you think kids were getting?
2. What value is added by including technology in the lesson from a content aspect?
3. What is the value added of having a content area (Classroom) teacher teaching technology?
4. How does using technology encourage collaboration and cooperation among teachers? And interdisciplinary/ cross-disciplinary projects?
5. What did they do with technology that really did not add much? What did they do without using technology, where technology could have enhanced the activity?

APPENDIX N: EC301 LESSON PLAN TEMPLATE

Lesson Designer \_\_\_\_\_ Last Revision Date \_\_\_\_\_

<b>Target Audience of the Lesson:</b>
<b>Big Idea of the Lesson:</b>
<b>Overall Goal for the Lesson:</b>
<b>Indiana Content Standards Addressed: (Copy and paste entire standard from <a href="http://www.indianastandards.org/">http://www.indianastandards.org/</a>)</b>
<b>ISTE CNETS Student Standards Addressed (Copy and paste from <a href="http://cnets.iste.org/students/">http://cnets.iste.org/students/</a>)</b>

<b>Student Objectives for the lesson. (Given a condition, the students will, to what level).</b>
<b>Length of Lesson: (minutes, number of class periods, or days or weeks needed).</b>
<b>Schedule of Activities: (Break down your activity into a timeline of events. Focus on what students will be doing and what teachers will be doing during each part of the activity.)</b>
<b>How will these activities be assessed? (Go back to your objectives, what will the students do? Make sure that each objective is paired to an assessment measure that allows students to show it).</b>

<b>Adaptations: How might the lesson need to be adapted for students with special needs?</b>
<b>Materials Needed: Go through each activity and identify what items (both technology and not) are needed to complete this lesson. Include a breakdown according to individual student or student groups.</b>

## APPENDIX O: IN CLASS HARD SCAFFOLD FOR LESSON PLAN CRITIQUES

Lesson Plan Designer \_\_\_\_\_ Reviewer \_\_\_\_\_

Question:	Yes	No
Is the target audience clear?		
Does it provide enough detail to give a rich description of the classroom?		
What other information would be helpful to know about the students or classroom?		
Is the big idea clear?		
Does the author have a clear idea of what they want students to do?		
Does the goal match the standards they chose?		
Are the standards chosen appropriate for the target audience they outlined?		
Are the technology standards compatible with the content standards chosen?		
Do the big idea, goal, and standards seem compatible with the target audience?		
Are there other standards that could be addressed with this lesson? (Look at <a href="http://www.indianastandards.org">http://www.indianastandards.org</a> and <a href="http://cnets.iste.org">http://cnets.iste.org</a> )		
What is a strength of this lesson plan? Use specific examples.		
How could this lesson be improved? Use specific examples.		
Is the time appropriate for the lesson? Why or why not?		
Does the assessment seem to match the objectives? Give an example.		

Do the activities match the objectives? Give an example.

Do the activities prepare the students for the assessment? Explain how.

Do you have any other suggestions for special needs students?

Do the plans for technology seem appropriate? *Are the students using the technology? Is the technology appropriate for the content? How will the technology help students learn?*

Do the plans for materials seem appropriate for the activities? How might you improve them?



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<b>Education</b>	<b><i>Ph. D. Degree in Instructional Systems Technology</i></b> <i>Indiana University, Bloomington, IN</i>	2006
	<b><i>Masters Degree in Educational Technology</i></b> <i>Arizona State University, Tempe, AZ</i>	2002
	<b>Postgraduate Diploma in Secondary Education (With Distinction)</b> <i>National Institute of Education, Singapore</i>	1996
	<b>B.S. (Honors) Degree in Zoology</b> <i>National University of Singapore, Singapore</i>	1994
	<b>B.S. Degree in Biology</b> <i>National University of Singapore, Singapore</i>	1993

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<b>Experience</b>	<b><i>Associate Instructor and Research Assistant, Indiana University, Bloomington</i></b> <ul style="list-style-type: none"> <li>• Redesigned syllabus and revised content of W401 (Integrating Technology in Teaching – Part II) for online delivery</li> <li>• Taught W401 online in Fall 2005 and Spring 2006</li> <li>• Mentored and coordinated efforts of new instructors in Spring 2006</li> <li>• Design, developed, implemented, and evaluated online tools for the PIHnet research group</li> </ul>	2002-2006
	<b><i>Instructor and Graduate Assistant, Arizona State University, Tempe</i></b> <ul style="list-style-type: none"> <li>• Designed syllabus, created content and materials, and taught EDT455 (Authoring Tools: Dreamweaver)</li> <li>• Taught EDT455 in Spring and Summer 2001, and Spring 2002</li> <li>• Designed and facilitated online training for Payne Academy teachers on the use of WebCT and online instructional strategies</li> <li>• Managed design team for the Decision Point project to design, develop, and implement a video case study Web interface and database</li> </ul>	2001-2002
	<b><i>Project Manager, National Institute of Education and Ednovation, Singapore</i></b> <ul style="list-style-type: none"> <li>• Recruited, trained, and managed design teams for microLESSONS™ project</li> <li>• Designed microLESSONS™</li> <li>• Coordinated and maintained schedules and standards with the National Institute of Education, Ednovation, and the Ministry of Education</li> </ul>	1999-2000
	<b><i>Teacher Educator, National Institute of Education, Singapore</i></b> <ul style="list-style-type: none"> <li>• Lectured and tutored preservice teachers on instructional technology and technology use/integration</li> <li>• Prepared lecture and tutorial materials</li> </ul>	1996 and 1999-2000

**Experience  
(continued)**

**Teacher and IT coordinator, Temasek Junior College, Singapore.**

1995-1999

- As a teacher: Lectured and tutored Biology students; prepared lecture, tutorial, and laboratory materials; planned and led field trips
- As teacher-in-charge of Climbing Club: Responsible for environmental education and safety of students locally and overseas (Malaysia, Thailand, and Australia)
- As IT coordinator: Responsible for the professional development of colleagues and planning of school IT infrastructure

**Infantry Officer, Singapore Armed Forces.**

1987-1991

- Trained army recruits and prepared training materials
- Responsible for day-to-day logistics of leading a platoon and co-managing a company of soldiers
- Planned and implemented military exercises and events
- Led award-winning Work Improvement Team (WIT) in 1990

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**Publications**

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- Hur, J. W., Tan, A., Brush, T., Saye, J., & Chen, L. (2005). Redesigning the Persistent Issues in History Network (PIHnet) online forum and journal to promote interaction and reflection. *Tech Trends*, 49(6), 63-68.
- Stock, L., Tan, A., Brush, T. (2002). *Te@chnology: Building a foundation for pre-service teachers in understanding the process of effective technology integration into lessons*. Paper presented at the annual conference of the Society for Information Technology and Teacher Education, Nashville, TN.
- Tan, A. (2005). *Does blogging have a place in teacher education? Incorporating blogs and determining their effectiveness in PIHnet*. Paper presented at the annual conference of the Society for Information Technology and Teacher Education, Phoenix, AZ.
- Tan, A. (2005). *Educational blogging: Much ado about something? (Or a review of blogging in education and a research agenda)*. Paper presented at the annual Instructional Systems Technology conference, Bloomington, IN.

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**References**

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*Divisional Director of Academic Computing & Information Services, National Institute of Education, Singapore / Former head of Instructional Science Academic Group*
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